

GESTURE RECOGNITION

USING

WINDOWED DYNAMIC TIME WARPING

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Abstract

In today's world, computers and machines are ever more pervasive in our environment. Human beings are using an increasing number of electronic devices in everyday work and life. Human-Computer Interaction (HCI) has also become an important science, as there is a need to improve efficiency and effectiveness of communication of meaning between humans and machines. In particular, we are no longer restricted to using only keyboards and mice as input devices, but every part of our body, with the introduction of human body area sensor networks. The decreasing size of inertial sensors such as accelerometers, gyroscopes have enabled smaller and portable sensors to be worn on the body for motion capture. In this way, captured data is also different from the type of information given by visual-based motion capture systems. In this project, we endeavour to perform gesture recognition on quaternions, a rotational representation, instead of the usual X, Y, and Z axis information obtained from motion capture. Due to the variable lengths of gestures, dynamic time warping is performed on the gestures for recognition purposes. This technique is able to map time sequences of different lengths to each other for comparison purposes. As this is a very time-consuming algorithm, we introduce a new method known as "Windowed" Dynamic Time Warping, which exponentially increases the speed of recognition processing, along with a reduced training set, while having a comparable accuracy of recognition

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Chapter 1 Introduction

1.1 Objectives

The main objective of this project is gesture recognition. In the Graduate University of Chinese Academy of Sciences (GUCAS), researchers have developed an inertial sensors based body area network. Inertial sensors, accelerometers, gyroscopes, and magnetometers, are placed on various parts of the human body to perform motion capture. These sensors are able to capture the 6 degrees of freedom of major joints in the form of acceleration, angular velocity, and position. This information allows one to reproduce the motion. With this information, the objective is to perform processing and then recognition/identification of gestures. Present techniques will be analysed and chosen accordingly for gesture recognition. As such techniques are often imported from the field of speech recognition; we will attempt to modify it to suit the task of gesture recognition.

1.2 Background

A gesture is a form of non-verbal communication in which visible bodily actions communicate conventionalized particular messages, either in place of speech or together and in parallel with spoken words [1]. Gestures can be any movement of the human body, such as waving the hand, or nodding the head. In gestures, we have a transfer of information from the motion of the human body, to the eye of the viewer, who subsequently “decodes” that information. Moreover, gestures are often a medium for conveying semantic information, the visual counterpart of words [2]. Therefore gestures are vital in the complete and accurate interpretation of human communication.

As technology and technological gadgets become ever more prevalent in our society, the development of Human-Computer Interface, or HCI, is also becoming more important. Increases in computer processing power and the miniaturization of sensors have also increased the possibilities of varied, novel inputs in HCI. Gestures input is one important way in which users can communicate with machines, and such a communication interface can be even more intuitive and effective than traditional mouse and keyboard, or even touch interfaces. Just as humans gesture when they speak or react to their environment, ignoring gestures will result in a potent loss of information.

Gesture recognition has wide-ranging applications[3], such as:

Developing aids for the hearing impaired;

- Enabling very young children to interact with computers;
- Recognizing sign language;
- Distance learning, etc.

1.3 Problem

Gestures differ both temporally, and spatially. Gestures are ambiguous and incompletely specified, and hence, machine recognition of gestures is non-trivial. Different beings also gesticulate differently, therefore increasing the difficulty of gesture recognition. Moreover, different types of gestures differ in their length, the mean being 2.49s with the longest at 7.71s and shortest at 0.54s[2].

There have been many comparisons drawn between gestures and speech recognition, having similar characteristics, such as varying in duration and feature (gestures – spatially, speech—frequency). Therefore techniques used for speech recognition have

often been adapted and used in gesture recognition. Such techniques include Hidden Markov Model (HMM), Time Delay Neural Networks, Condensation algorithm, etc. However, statistical techniques such as HMM modelling and Finite State Machines often require a substantial training set of data for high recognition rates. They are also computationally intensive, which adds to the problem of providing real time gesture recognition. Other algorithms such as the condensation algorithm are more suited for their ability to track objects in clutter[3] in visual motion capture systems. This is inapplicable in our system which is an inertial sensor based motion capture system.

Current work has mostly been gesture recognition based on Euler's Angles or Cartesian coordinates in space. These coordinate systems are insufficient in the representation of motion in the body area network. Euler's angles require additional computations for the calculation of distance and suffer gimbal lock, while Cartesian angles are inadequate, being only able to represent position of body parts, but not orientation.

1.4 Solution

Instead of using a statistical method of recognising a gesture, a deterministic method, known as Dynamic Time Warping, is applied to quaternions. Dynamic time warping is a method for calculating the distance between two different-length sequences. In this case, it allows us to overcome the temporal variations of gestures and perform distance measurement and comparison.

To overcome the inadequacies of rotational representation, quaternions are used to represent all orientations. Quaternions are a compact and complete representation of rotations in 3D space. We will demonstrate the use of Dynamic Time Warping on quaternions and demonstrate the accuracy of using this method.

To decrease the number of calculations involved in distance calculation, I will also propose a new method, Dynamic Time Warping with windowing. Unlike spoken syllables in voice recognition, gestures have higher variance in their representations. With windowing, this will allow gestures to be compared to those which are closer in length, instead of the whole dictionary, and hence improve the efficiency of gesture recognition.

1.5 Scope

In the following chapter 2, a literature review of present gesture recognition systems is conducted. There will be a brief review of the methods used currently, and the various problems and advantages. The development process and design considerations will be elaborated upon and discussed in detail in chapter 3, with the intent to justify the decisions made. In chapter 4, we present the simulation environment, and the results in the following chapter 5 with a discussion and comparison to results available from other papers. Finally we end with a conclusion in chapter 6, where further improvements will also be considered and suggested.

Chapter 2 Literature Review

To gain insight into gesture recognition, it is important to understand the nature of gestures. A brief review of the science of gestures is done, with a study of present gesture recognition techniques, with the aim of gaining deeper insight into the topic and knowledge about the current technology. Often, comparisons will be drawn to voice recognition systems due to the similarities between voice signals and gestures.

2.1 Gestures

2.1.1 Types of Gestures

Communication is the transfer of information from one entity to another. Most traditionally, voice and language is our main form of communication. Humans speak in order to convey information by sound to one another. However, it will be negligent to postulate that voice is our only form of communication. Often, as one speaks, one gestures, arms and hands moving in an attempt to model a concept, or even to demonstrate emotion. In fact, gestures often provide additional information to what the person is trying to convey outside of speech. According to [4], Edward T.Hall claims 60% of all our communication is nonverbal. Hence, gestures are an invaluable source of information in communication.

Gestures come in 5 main categories – emblems (autonomous gestures), illustrators, and regulators, affect displays, and adaptors[5]. Of note are emblems and illustrators. Emblems serve to have a direct verbal translation and are normally known by his/her respective social circle. Examples include

shoulder shrugging (I don't know), nodding (affirmation). In contrast, illustrators serve to encode information which is otherwise hard to express verbally, e.g. directions. Emblems and illustrators are frequently conscious gestures by the speaker to communicate with others, and hence, are extremely important in its communication.

We emphasize the importance of gestures in communication, as often, gestures not only communicate, they also help the speaker formulate coherent speech by aiding in the retrieval of elusive words from lexical memory[2]. Krauss's research indicates a positive correlation between a gesture's duration and the magnitude of the asynchrony between a gesture and its lexical affiliate. By accessing the content of gestures, we can better understand the meaning conveyed by a speaker.

2.1.2 Gesture and its Features

With the importance of gestures in the communication of meaning, and its intended use in HCI, it is impertinent to determine the features of gestures for extraction for modelling and comparison purposes. Notably, the movement and rotation of human body parts and limbs are governed by joints. Hence, instead of recording motion of every single part of the body, we can simplify the extraction of information of gestures by gathering information specifically on the movement and rotation of body joints. Gunna Johansson [6] placed lights on the joints and filmed actors in a dark room to produce point-light displays of joints. He demonstrated the vivid impression of human movement even though all other characteristics of the actor were subtracted away. We deduce from this that human gestures can be recorded primarily by observing the motion of joints.

2.2 Gesture Recognition

Gestures and voice bear many similarities in the field of recognition. Similarly to voice, gestures are almost always unique, as humans are unable to create identical gestures every single time. Humans, having an extraordinary ability to process visual signals and filter noise, have no problem understanding gestures which “look alike”. However, ambiguous gestures as such pose a big problem to machines attempting to perform gesture recognition, due to the injective nature of gestures to meanings. Similar gestures vary both spatially and temporally, hence it is non-trivial to compare gestures and determine their nature.

Most of the tools for gesture recognition originate from statistical modelling, including Principle Component Analysis, Hidden Markov Models, Kalman filtering, and Condensation algorithms[3]. In these methods, multiple training samples are used to estimate parameters of a statistical model. Deterministic methods include Dynamic time warping [7], but these are often used in voice recognition and rarely explored in gesture recognition. The more popular methods are reviewed below.

2.2.1 Hidden Markov Model (HMM)

The Hidden Markov Model was extensively implemented in voice recognition systems, and subsequently ported over to gesture recognition systems due to the similarities between voice and gesture signals. The method was well documented by [8].

Hidden Markov Models assume the first order Markov property of time-domain processes, i.e.

$$P(s_t | s_{t-1} s_{t-2} \dots s_1) = P(s_t | s_{t-1}) \quad (1)$$

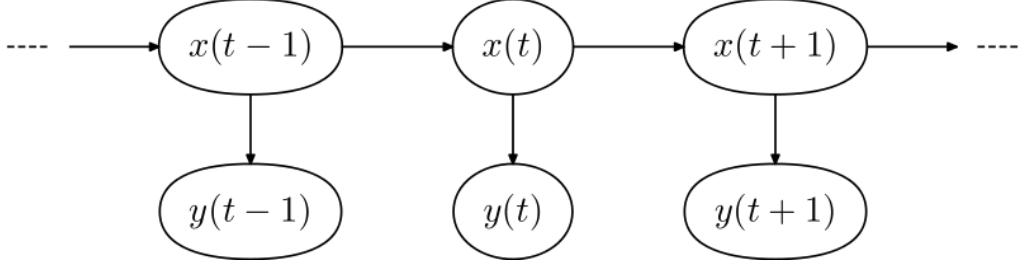


FIGURE 1 ARCHITECTURE OF HIDDEN MARKOV MODEL

The current event only depends on the most recent past event. The model is a double-layer stochastic process, where the underlying stochastic process describes a “hidden” process which cannot be observed directly, and an overlying process, where observations are produced from the underlying process stochastically and then used to estimate the underlying process. This is shown in Figure 1, the hidden process being $x(t)$ and the observation process being $y(t)$. Each HMM is characterised by $\lambda = (A, B, \pi)$, where

- $A = \{a_{ij}\}$ is a state transition matrix.

$$A = \{a_{ij}\} = P(s_t | s_{t-1}) \quad (2)$$

- $B = \{b_{jk}\}$ is the probability of observing symbol v_k from state s_j .
- $\pi = \{\pi_i\}$ is the initial state distribution.

$$\pi = \{\pi_i\} = P\{s_i\} \text{ at } t = 1 \quad (3)$$

Given the Hidden Markov Model and an observation sequence $O = o_1 o_2 \dots o_t$,

three main problems need to be solved in its application,

1. Adjusting $\lambda = (A, B, \pi)$ to maximise $P(O|\lambda)$, i.e. adjusting the parameters to maximise the probability of observing a certain observation sequence.
2. In the reverse situation, calculate the probability $P(O|\lambda)$ given O for each HMM model λ_i .
3. Calculate the best state sequence which corresponds to an observation sequence for a given HMM.

In gesture recognition, we concern ourselves more with the first two problems.

Problem 1 corresponds to training the parameters of the HMM model for each gesture with a set of training data. The training problem has a well-established solution, the Baum-Welch algorithm [8] (equivalently the Expectation-Modification method) or the gradient method. Problem 2 corresponds to the evaluation of the probability of the various HMMs given a certain observation sequence, and hence determining which gesture was the most probable.

There have been many implementations of the Hidden Markov Model in various gesture recognition experiments. Simple gestures, such as drawing various geometry shapes, were recorded using the Wii remote controller, which provides only accelerometer data, and accuracy was between 84% and 94% for the various gestures [9]. There have also been various works involving hand sign language recognition using various hardware, such as glove-based input[10][11], and video cameras[12].

2.2.2 Dynamic Time Warping

Unlike HMM, dynamic time warping is a deterministic method. Dynamic time warping has seen various implementations in voice recognition [7][13]. As has been described above, gestures and voice signals vary both temporally and spatially, i.e. in multiple dimensions. Therefore, it is impossible to just simply calculate the distance between two feature vectors from two time-varying signals. Gestures may be accelerated in time, or stretched depending on the user. Dynamic time warping is a technique which attempts to match similar characteristics in various signals through time. This is visualized through Figure 2 and Figure 3, which is a mapping of similar points of both graphs to each other sequentially through time. In Figure 3, a warping plane is shown, where the time sequences indexes are placed on the x and y axes, and the graph shows the mapping function from the index of A to the index of B.

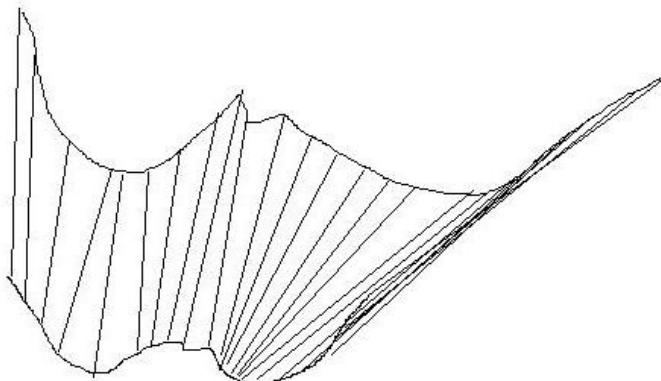


FIGURE 2 MATCHING OF SIMILAR POINTS ON SIGNALS

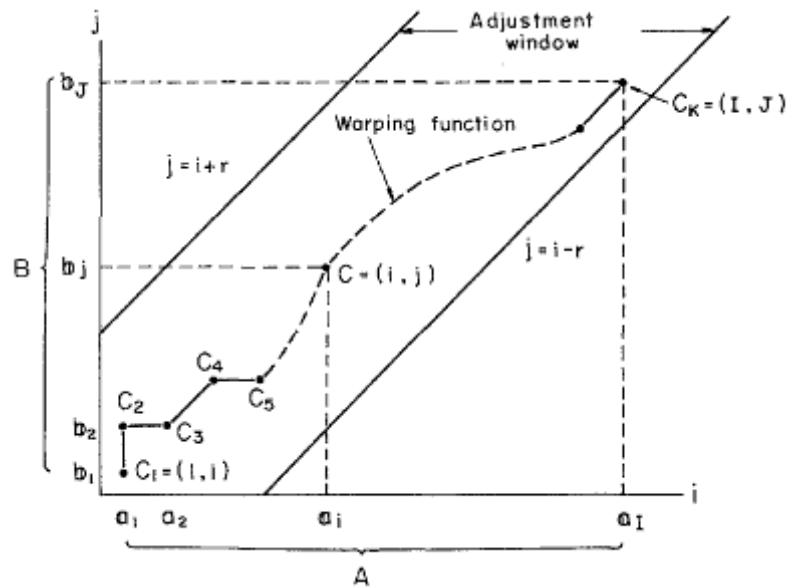


FIGURE 3 GRAPH OF MATCHING INDEXES [7]

Chapter 3 Design and Development

In this section, the various options considered for use are discussed and chosen for implementation further on. Initially, we will give a brief description of the setup for gesture recognition in our experiment.

3.1 Equipment setup

Motion capture was done using an inertial-sensor based body area sensor network, created by a team in GUCAS. Each sensor is made up of 3-axis gyroscope, 3-axis accelerometers, which will track the 6 degrees of freedom of motion, and a magnetometer which provides positioning information for correction. The inertial sensor used is shown in Figure 4.

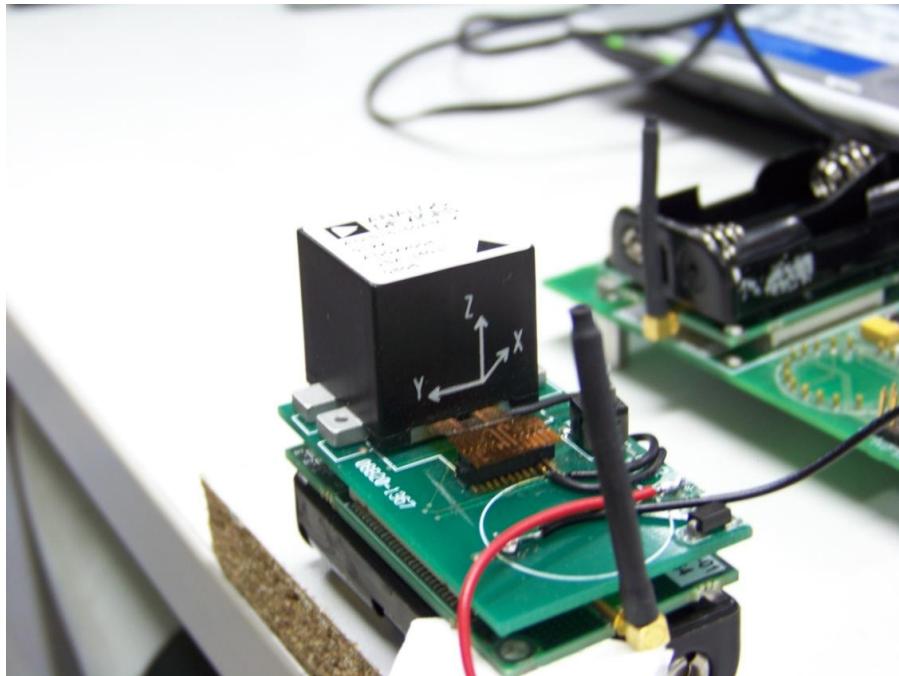


FIGURE 4 INERTIAL SENSOR

As shown in Figure 5 below, these sensors (in green) are then attached to various parts of the human body (by Velcro straps) so as to capture the

relevant motion information of the body parts, acceleration, angular velocity and orientation.

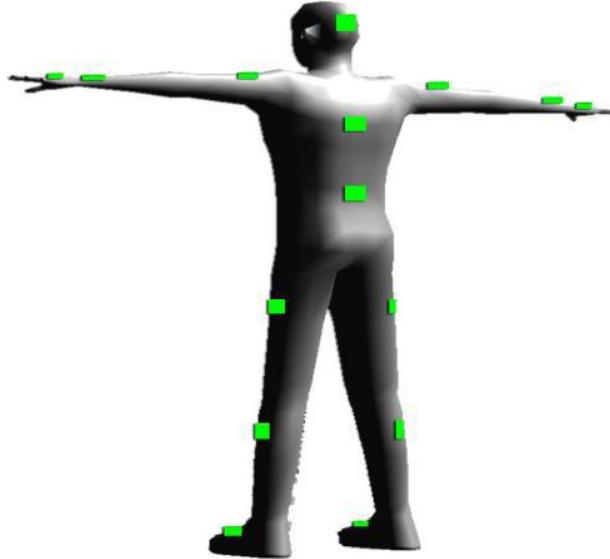


FIGURE 5 BODY SENSOR NETWORK

For this thesis, the gesture recognition will only be performed on upper body motions. The captured body parts are hence

1. Head
2. Right upper arm
3. Right lower arm
4. Right hand
5. Left upper arm
6. Left lower arm
7. Left hand

We also have to take note of the body hierarchical structure used by the original body motion capture system team.

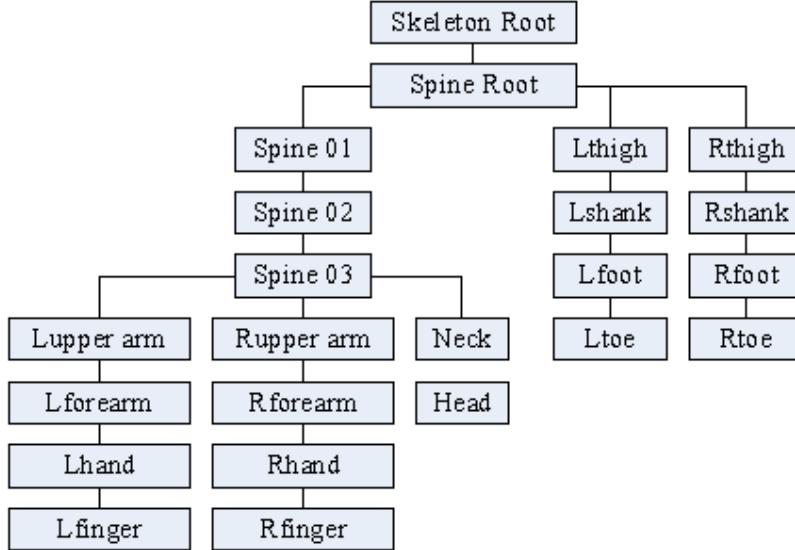


FIGURE 6 BODY JOINT HIERARCHY[14]

As can be observed from the Figure 6 above, the body joints obey a hierarchical structure, with the spine root as the root of all joints, and are close representations of the human skeleton structure. Data obtained from the sensors are processed by an Unscented Kalman Filter and motion data will be produced, with the form according to the needs of the user.

3.2 Design Considerations

3.2.1 Motion Representation

By capturing the motion information of major joints, we are hence able to reproduce the various motions, and also perform a comparison with new input for recognition. However, representations of motion can take various forms. In basic single camera-based motion capture systems, 3D objects are projected into a 2D plane in the camera and motion is recorded in 2-dimensional Cartesian coordinates. These Cartesian coordinates can then further be processed to generate velocity/acceleration profiles. In more complex systems, with multiple motion-capture cameras or body inertial micro sensors,

they can capture more complete motion information, such as 3-dimensional Cartesian coordinates positioning, or even rotational orientations. However, using Cartesian coordinates as a representation of motion results in the loss of orientation information, which is important in gesture recognition. For example, nodding the head may not result in much positioning change of the head, but involves more of a change in orientation. Therefore, we will focus on a discussion of orientation representation, as the body micro sensors allow us to capture this complete information of motion of body parts.

3.2.2 Rotational Representation

3.2.2.1 Euler Angles

Euler angles are a series of three rotations used to represent an orientation of a rigid body. They were developed by Leonhard Euler[15] and are one of the most intuitive and simplest ways to visualize rotations. Euler angles break a rotation up into 3 arbitrary parts, where according to Euler's rotation theorem; any rotation can be described using three angles. If the rotations are written in terms of rotation matrixes **D**, **C**, and **B**, then a general rotation matrix **A** can be written as,

$$A = BCD \quad (4)$$

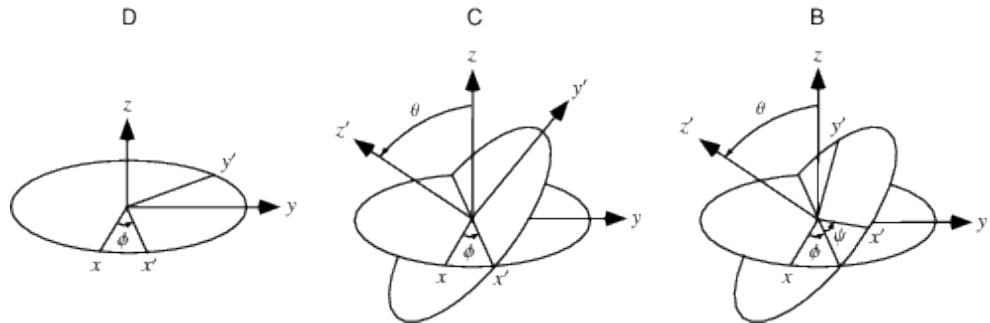


FIGURE 7 EULER ANGLES ROTATION[16]

Figure 7 shows this sequence of rotations. The so-called “x-convention” is the most common definition, where rotation given by (ϕ, θ, ψ) is

1. The first rotation about z-axis of angle ϕ using **D**
2. The second rotation about the former x-axis of angle $\theta \in [0, \pi]$ using **C**
3. The rotation about the former z-axis by an angle ψ using **B**

Although Euler angles are intuitive to use and have a more compact representation than others (three dimensions compared to four for other rotational representations), they suffer from a situation known as “Gimbal lock”. This situation occurs when one of the Euler angles approaches 90° . Two of the rotational frames will combine together, hence losing one degree of rotation. In worst-case scenarios, all three rotational frames combine into one, hence resulting in only one degree of rotation.

3.2.2.2 *Quaternions*

Quaternions are tuples with 4 dimensions, compared to a normal vector in the xyz plane which has only 3 dimensions. In a quaternion representation of rotation, singularities are avoided, therefore giving a more efficient and accurate representation of rotational transformations. A quaternion, which is of 4 dimensions, has a norm of 1, and is typically represented by one real dimension, and three imaginary dimensions. The three imaginary dimensions, which are i , j , and k , are unit length and orthogonal to one another. The graphical representation is shown in Figure 8.

$$q = xi + yj + zk + w \quad (5)$$

$$w^2 + x^2 + y^2 + z^2 = 1 \quad (6)$$

$$ij = k \quad (7)$$

$$ji = -k \quad (8)$$

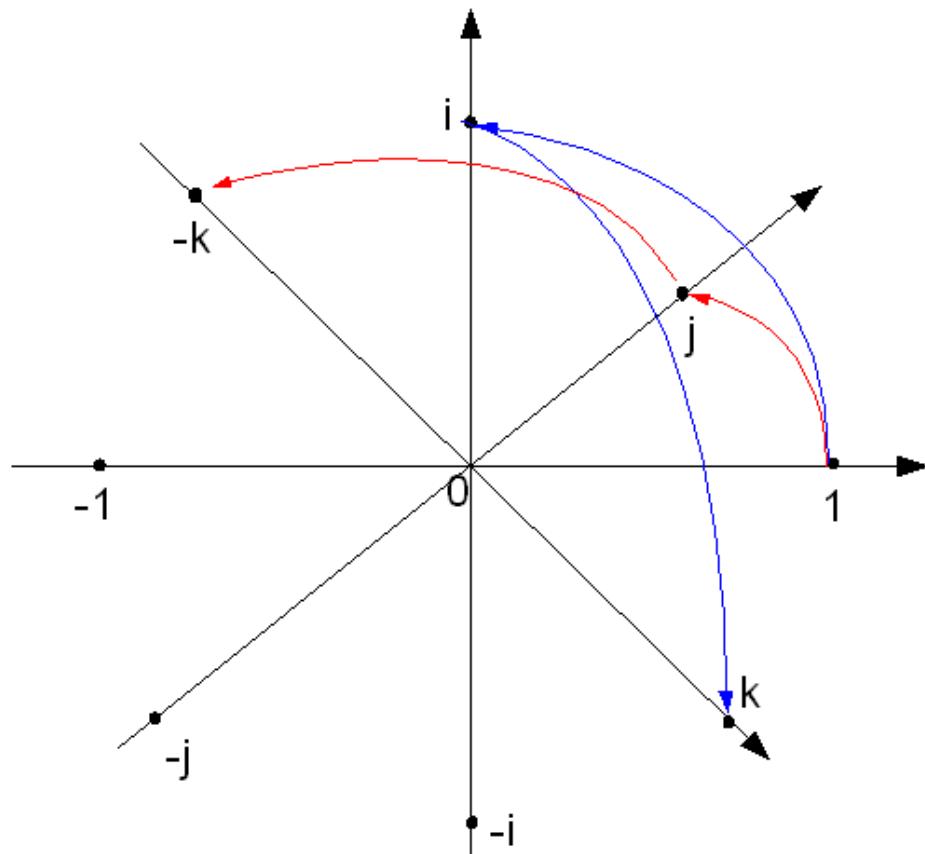
$$ij = -ji \quad (9)$$

Quaternions (w, x, y, z) typically represent a rotation about the (x, y, z) axis by an angle of

$$\alpha = 2\cos^{-1}w = 2\sin^{-1}\sqrt{x^2 + y^2 + z^2} \quad (10)$$

Therefore, it is no longer a series of rotations, but just a single rotation about a given axis, and hence avoiding the gimbal lock problem. The representation of a matrix is also more compact than the transformation represented by a 3 by 3 matrix, and whereby a quaternion vector which is slightly off on its numbers still represent a rotation, a matrix with numbers which are inaccurate will no longer be a rotation in space. In any case, a quaternion rotation can be represented by a 3 by 3 matrix as

$$\begin{pmatrix} w^2 + x^2 - y^2 - z^2 & 2xy - 2wz & 2wy + 2xz \\ 2wz + 2xy & w^2 - x^2 + y^2 - z^2 & 2yz - 2wx \\ 2xz - 2wy & 2wx + 2yz & w^2 - x^2 - y^2 + z^2 \end{pmatrix} \quad (11)$$



Graphical representation of
quaternion units product as
 90° -rotation in 4D-space

$$ij = k$$

$$ji = -k$$

$$ij = -ji$$

FIGURE 8 GRAPHICAL REPRESENTATION OF QUATERNION UNITS PRODUCT AS 90° ROTATION IN 4D SPACE[17]

Compared to 3-by-3 rotational matrices, quaternions are also more compact, requiring only 4 storage units, instead of 9. These properties of quaternions make their use favourable for representing rotational representations.

3.2.3 Gesture Recognition Algorithm

As mentioned in the literature review, there are numerous possibilities for consideration in choosing a gesture recognition technique. Most popular among the stochastic methods is the Hidden Markov Model. For a deterministic method, we can look to dynamic time warping, which allows the comparison of two different length observation sequences.

3.2.3.1 Hidden Markov Model

The Hidden Markov Model assumes the real state of the gesture is hidden. Instead, we can only estimate the state through observations, which, in the case of gesture recognition, is the motion information. In the implementation of the Hidden Markov Model, the first order Markov property is assumed for gestures. Subsequently, the number of states has to be defined for the model used to model each gesture. Evidently, for a more complicated gesture, a higher number of states are required to model that gesture sufficiently. However, if gestures are simpler, using a larger number of states will be inefficient. Moreover, the number of parameters to be estimated and trained for a HMM is large. For a normal HMM model of 3 states, a total of 15 parameters need to be evaluated[18]. As the number of gestures increase, the number of HMM models will also increase. Since HMM only trains with positive data, HMM does not reject negative data.

3.2.3.2 Dynamic Time Warping

Dynamic Time Warping (DTW) is a form of pattern recognition using template matching. It works on the principle of looking for points in different signals which are similar in both sequentially in time. A possible mapping is shown in Figure 9.

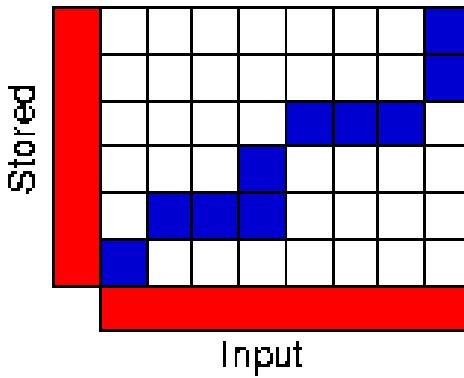


FIGURE 9 DTW MATCHING[19]

For each gesture, the minimum number of templates is one, hence allowing for a small template size to be used. Almost no training is required, as the only training only involves recording a motion to be used as a template for matching. However, DTW has a disadvantage of being computationally expensive, as a distance metric has to be calculated when comparing two gesture observation sequences. Therefore, the number of gestures that can be differentiated at a time cannot be too large.

3.3 Implementation Choices

Quaternions are the obvious choice for rotational representation. Quaternions encode completely the position and orientation of a body part with respect to higher levels joints, hence allowing more accurate gesture recognition. In the choice of gesture recognition technique, DTW was chosen over HMM for its

simplicity in implementation and hence, easily scalable without extensive training sets. In the following chapter, an improved DTW technique will also be introduced which will serve to reduce the computational cost of DTW techniques in gesture recognition.

Chapter 4 Dynamic Time Warping with Windowing

4.1 Introduction

Dynamic Time Warping is a technique which originated in speech recognition [7], and seeing many uses nowadays in handwriting recognition and gestures recognition[20]. It is a technique which “warps” two time dependant sequences with respect to each other and hence, allows a distance to be computed between these two sequences. In this chapter, the original DTW algorithm is detailed, along with the various modifications which were used in our gesture recognition. At the end, the new modification will be described.

4.2 Original Dynamic Time Warping

In a gesture recognition system, we express feature vectors of two of the gestures to be compared against each other as,

$$O_1 = O_{11} O_{12} O_{13} \dots O_{1t_1} \dots O_{1T_1} \quad (12)$$

$$O_2 = O_{21} O_{22} O_{23} \dots O_{2t_2} \dots O_{2T_2} \quad (13)$$

In loose terms, these two sequences form a much larger feature vector for comparison. Evidently, it is impossible to compute a distance metric between two vectors of unequal dimensions. A local cost measure is defined

$$d: \mathcal{F} \times \mathcal{F} \rightarrow \mathbb{R} > 0 \quad (14)$$

where

$$O_{1t_1}, O_{2t_2} \in \mathcal{F} \text{ for } t_1 \in [1, T_1], t_2 \in [1, T_2] \quad (15)$$

Accordingly, the cost measure should be low if two observations are similar, and high if they are very different. Upon evaluating the cost matrix for all elements in O_1, O_2 , we obtain $C_{T_1 \times T_2}$. From this local cost matrix, we wish to obtain a correspondence mapping elements in O_1 to elements in O_2 that will result in a lowest distance measure. We can define this mapping correspondence as

$$F = c(1), c(2) \dots c(k) \dots c(K) \quad (16)$$

where

$$c(k) = c(O_{1k}, O_{2k}) \quad (17)$$

A possible mapping of the 2 time series is shown in Figure 10. This mapping shows the matching of two time sequences to each other with the same starting and ending points, hence warping the two sequences together for comparison purposes further on.

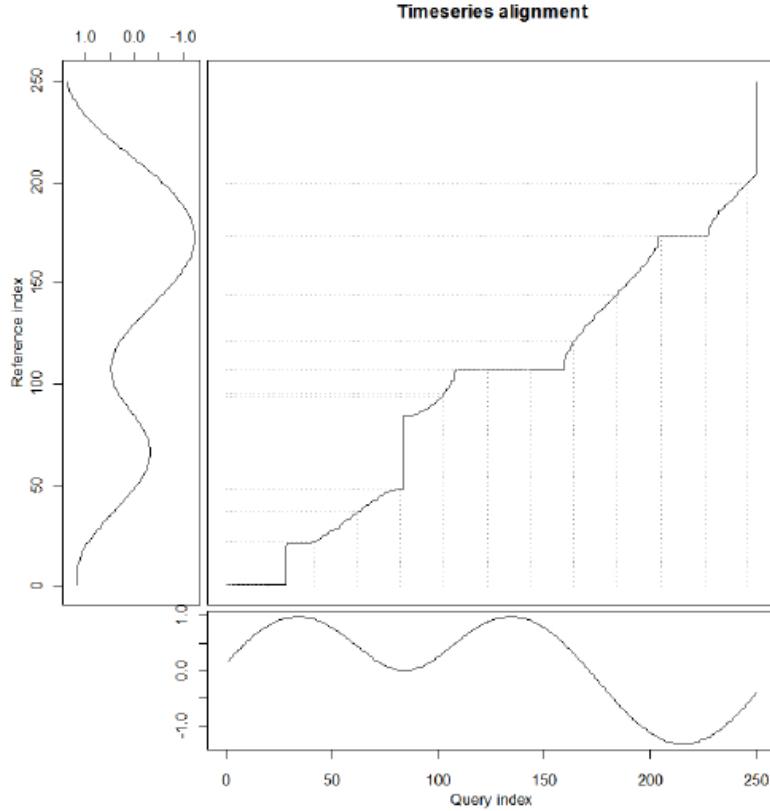


FIGURE 10 MAPPING FUNCTION F[21]

The mapping function has to follow the time sequence order of the respective gestures. Hence, we impose several conditions on the mapping function.

1. Boundary conditions: the starting and ending observation symbols are aligned to each other for both gestures.

$$c(1) = c(O_{11}, O_{21}) \quad (18)$$

$$c(K) = c(O_{1T_1}, O_{2T_2}). \quad (19)$$

2. Monotonicity condition: the observation symbols are aligned in order of time. This is intuitive as the order of observation signals in a gesture signal should not be reversed.

$$1k_1 \leq 1k_2 \leq \dots \leq 1K \quad (20)$$

$$2k_1 \leq 2k_2 \leq \dots \leq 2K \quad (21)$$

3. Step size condition: No observation symbols are to be skipped.

$$1k_{i+1} - 1k_i \leq 1 \quad (22)$$

$$2k_{i+1} - 2k_i \leq 1 \quad (23)$$

Consequently, we arrive at an overall cost function defined as

$$C(F) = \sum_{k=1}^K c(k) \quad (24)$$

which gives an overall cost/distance between two gestures according to a warping path, as defined by the function F. Since the function $C(F)$ denotes all possible warping paths between two gestures' observation sequences O_1 and O_2 , the dynamic time warping algorithm is to find the warping path which gives the lowest cost/distance measure between the two gestures.

$$DTW(O_1, O_2) = \min(C(F)) \forall \text{possible warping paths} \quad (25)$$

It is not trivial to calculate all possible warping paths. In this scenario, we apply dynamic programming principles to calculate the distance to each $c(k)$ recursively. We define D as the accumulated cost matrix.

1. Initialise $D(1,1) = d(O_{11}, O_{21})$
2. Initialise $D(T_1, T_2) = 9999$ (arbitrary large number)
3. Calculate

$$\begin{aligned}
D(t_1, t_2) = & \\
\min \{ & D(t_1 - 1, t_2 - 1), D(t_1 - 1, t_2), D(t_1, t_2 - 1) \} \\
& + d(O_{1t_1}, O_{2t_2})
\end{aligned} \tag{26}$$

4.3 Weighted Dynamic Time Warping

With the original dynamic time warping, the calculation is more biased towards the diagonal direction. This is because a diagonal direction involves a horizontal and vertical step. To ensure a fair choice of all directions, we thus modify the accumulated matrix calculation,

$$\begin{aligned}
D(t_1, t_2) = & \\
\min \{ & D(t_1 - 1, t_2 - 1) + c_1 d(O_{1t_1}, O_{2t_2}), D(t_1 - 1, t_2) \\
& + c_2 d(O_{1t_1}, O_{2t_2}), D(t_1, t_2 - 1) \\
& + c_3 d(O_{1t_1}, O_{2t_2}) \}
\end{aligned} \tag{27}$$

To weight the diagonal more, we set

$$c_1 = 2, c_2 = c_3 = 1 \tag{28}$$

And hence the new calculation becomes

$$\begin{aligned}
D(t_1, t_2) = & \\
\min \{ & D(t_1 - 1, t_2 - 1) + 2d(O_{1t_1}, O_{2t_2}), D(t_1 - \\
& 1, t_2) + d(O_{1t_1}, O_{2t_2}), D(t_1, t_2 - 1) + \\
& d(O_{1t_1}, O_{2t_2}) \}
\end{aligned} \tag{29}$$

4.3.1 Warping function restrictions

The above algorithm searches through all pairs of indexes to find the optimum warping path. However, it is reasonable and more probable to assume that the warping path will be closer to the diagonal. By such an assumption, the number of calculations can be drastically reduced, and the finding of illogical

warping paths, such as a completely vertical then horizontal path (as Figure 11), can be avoided. Too steep a gradient can result in an unreasonable and unrealistic warping path between a short time sequence and a long time sequence.

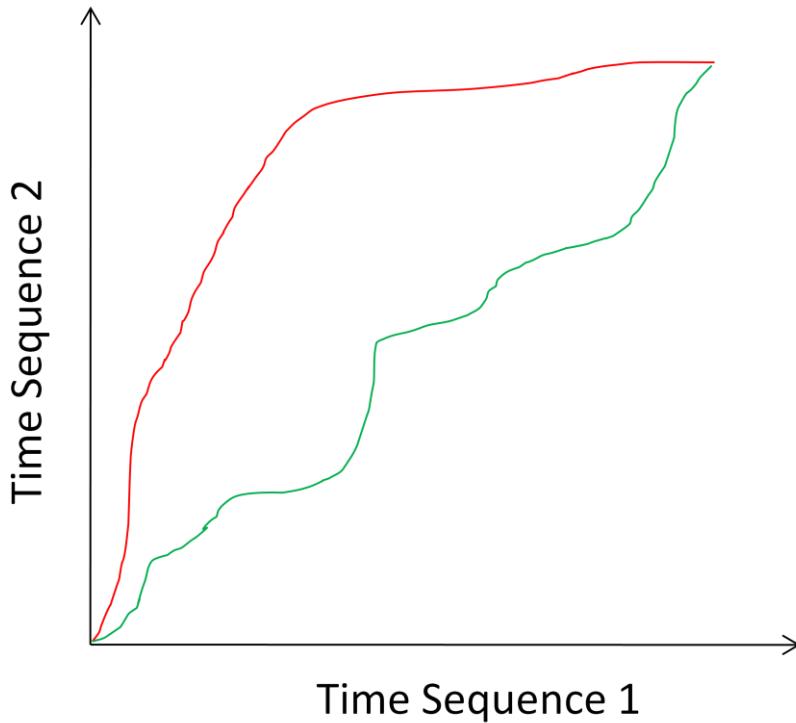


FIGURE 11 ILLOGICAL RED PATH VS. MORE PROBABLE GREEN PATH

4.3.1.1 Maximum difference window

To prevent the possibility of a situation whereby the index pair is too large in difference, calculations for the accumulation matrix D are limited to index pairs with differences not larger than a certain limit.

4.3.1.2 Maximum slope

To limit the slope of the warping path, we limit the number of times a warping path can move either in a vertical or horizontal direction before having to take a diagonal direction. Initially in the original DTW algorithm, there was no

such limit. Therefore each point can be reached by a diagonal, a horizontal, or a vertical path, as seen in Figure 12.

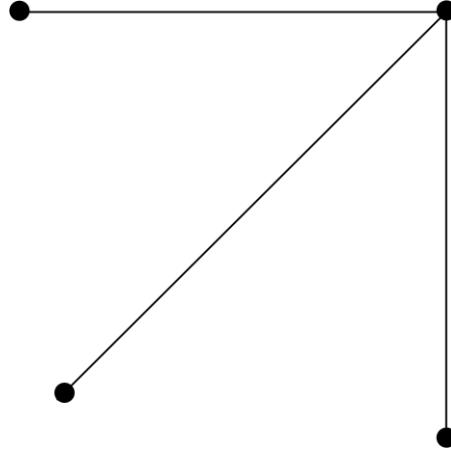


FIGURE 12 DTW WITH 0 SLOPE CONSTRAINTS

Defining the number of times that a warping path can go horizontally or vertically as k times before the warping path has to proceed diagonally l times, the slope constraint is defined as

$$P = \frac{l}{k} \quad (30)$$

A slope constraint of $P = 0$ indicates the entire freedom for the warping path to proceed either horizontally, vertically or diagonally without any restrictions on the path. Accordingly, a slope constraint of $P = 1$ is a restriction on the slope to move at least once diagonally for every time the warping path takes a horizontal route or vertical route. This is shown in Figure 13.

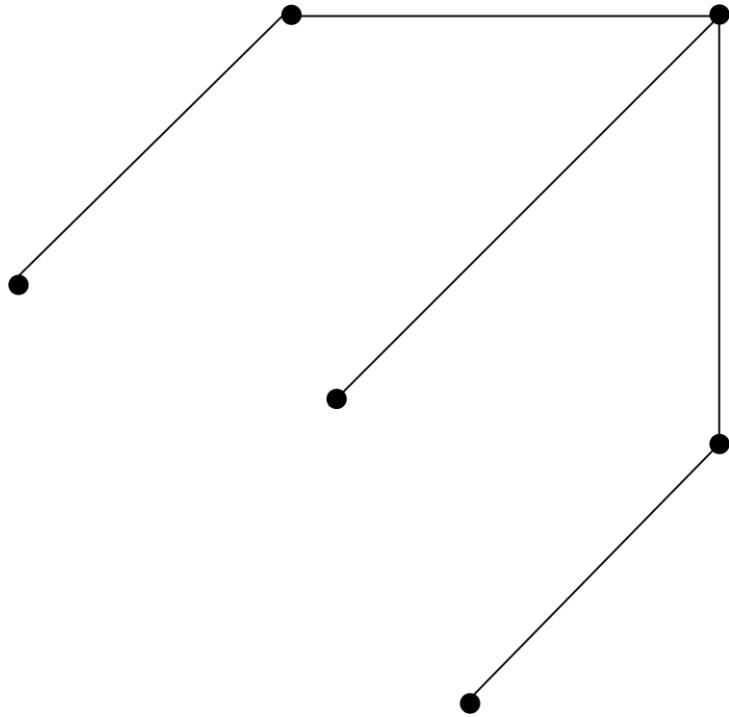


FIGURE 13 DTW WITH P=1

The calculation for the accumulation matrix D changes as follows

$$\begin{aligned}
 D(t_1, t_2) = & \\
 \min \{ & D(t_1 - 1, t_2 - 1) + 2d(O_{1t_1}, O_{2t_2}), \\
 & D(t_1 - 1, t_2 - 2) + 2d(O_{1t_1}, O_{2t_2-1}) \\
 & + d(O_{1t_1}, O_{2t_2}), \\
 & D(t_1 - 2, t_2 - 1) + 2d(O_{1t_1-1}, O_{2t_2}) \\
 & + d(O_{1t_1}, O_{2t_2}) \} \tag{31}
 \end{aligned}$$

These restrictions on the warping function F result in a zone as follows in

Figure 14.

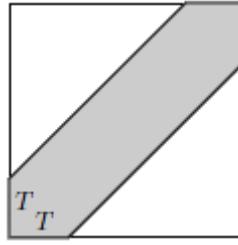


FIGURE 14 ZONE OF WARPING FUNCTION

4.4 Dynamic Time Warping with Windowing

We propose here a method to further limit the number of calculations involved for the accumulated matrix D . In the context of gesture recognition, gestures as a whole have much bigger inter-class variance. For example, nodding the head is a very short gesture, while more complicated gestures such as shaking hands are longer gestures. Given a head nodding of 150 sample length, and a hand shaking gesture of 400 length and a window length of 50, these two gestures will not be compared against each other. Hence, while comparing gesture templates against input, by rejecting input with lengths of too great difference from a template, the number of calculations can be decreased.

4.5 Overall Dynamic Time Warping Algorithm

1. Initialise $D(1,1) = d(O_{11}, O_{21})$
2. Initialise $D(T_1, T_2) = 9999$ (arbitrary large number)
3. If $\text{length}(O_1) \gg \text{length}(O_2)$ or $\text{length}(O_1) \ll \text{length}(O_2)$, skip.
4. Calculate

$$D(t_1, t_2) = \min \{ D(t_1 - 1, t_2 - 1) + 2d(O_{1t_1}, O_{2t_2}), \quad (32)$$

$$\begin{aligned}
& D(t_1 - 1, t_2 - 2) + 2d(O_{1t_1}, O_{2t_2-1}) \\
& \quad + d(O_{1t_1}, O_{2t_2}), \\
& D(t_1 - 2, t_2 - 1) + 2d(O_{1t_1-1}, O_{2t_2}) \\
& \quad + d(O_{1t_1}, O_{2t_2}) \}
\end{aligned}$$

4.6 Complexity of Dynamic Time Warping

As can be seen from equation 32, the dynamic time warping algorithm has a complexity on the order of kNM , where N and M are the respective lengths of two gestures to be compared against each other, and k is the number of classes of gestures. On the other hand, the complexity of the Hidden Markov Model is on the order of N^2T , where N is the number of classes being tested and T is the length of the gesture. Here, we see the advantage of HMM over DTW, with HMM being linear in time, while DTW is quadratic in time. However, it is to be pointed out that DTW requires vastly lesser number of training samples, and do not require the determination of the number of states for the gestures model. Moreover, with the windowing method, we can reduce k , the number of classes to be tested, even with a large gesture library.

Chapter 5 Experiment Details

5.1 Body Sensor Network

7 inertial micro sensors are worn on various parts of the body. Figure 15 shows the positioning of the sensors on the body.

1. Head (sensor under cap)
2. Left upper arm
3. Left lower arm
4. Left hand
5. Right upper arm
6. Right lower arm
7. Right hand

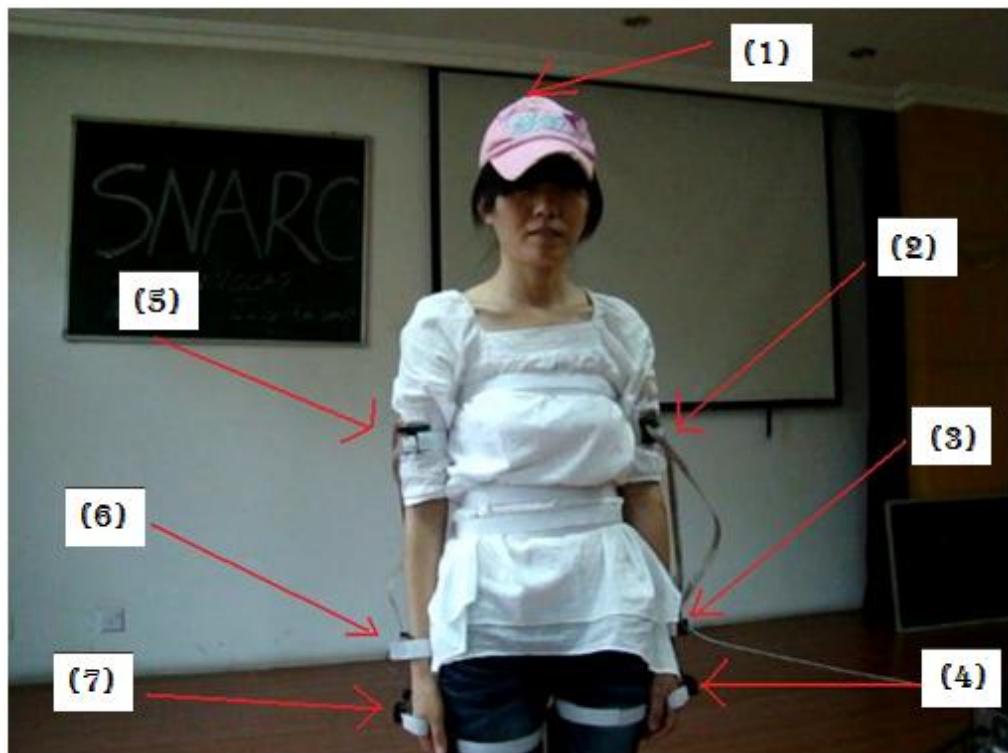


FIGURE 15 BODY SENSOR NETWORK

Motion data is sampled at a rate of 50Hz and transmitted by wires to be stored in the PC in the format of text files. Accelerometer, gyroscope, and magnetometer readings are recorded, and quaternions representing rotational orientation are also generated from these readings. These quaternions represent the orientation of body parts with the lower back as a reference point.

1	-0.16317	-0.97902	-9.75757	-0.0100967	0.00432405	0.00825104	-0.8	20.1	-39.85	0.000221439	0.0043831	0.00549603	0.999975
2	-0.130536	-0.946386	-9.75757	-0.0100967	0.00868738	0.0126144	-0.8	20.1	-39.85	-0.00272644	0.00410151	0.00367068	0.999981
3	-0.097902	-0.946386	-9.75757	-0.00924206	0.012178	0.0178504	-0.75	20.1	-39.85	-0.00191944	0.00587179	0.00342822	0.999975
4	-0.097902	-0.946386	-9.75757	-0.00747874	0.014796	0.0222137	-0.75	20.1	-39.85	-0.00175279	0.00633093	0.00300833	0.999974
5	-0.065268	-0.946386	-9.75757	-0.00573341	0.014796	0.026577	-0.75	20.1	-39.85	-0.00174411	0.00689647	0.0020082	0.999973
6	-0.032634	-0.946386	-9.75757	-0.00398808	0.0130507	0.0309403	-0.7	20.1	-39.85	-0.00176554	0.00792078	0.00106451	0.999967
7	0	-0.913752	-9.75757	-0.00311541	0.00956004	0.0335583	-0.7	20.05	-39.85	-0.0014674	0.00875053	-0.000356791	0.999961
8	0	-0.913752	-9.75757	-0.000497419	0.00519672	0.0353036	-0.7	20.05	-39.85	-0.00143512	0.00928868	-0.00144302	0.999955
9	0.032634	-0.913752	-9.75757	0.00124791	-0.0009111935	0.0353036	-0.7	20.05	-39.85	-0.00145925	0.0100175	-0.00284766	0.999945
10	0.032634	-0.913752	-9.75757	0.00299324	-0.00876592	0.034431	-0.65	20.1	-39.85	-0.0018711	0.0108698	-0.00356569	0.999933
11	0.032634	-0.913752	-9.75757	0.00473857	-0.0157472	0.031813	-0.65	20.1	-39.85	-0.00195462	0.0112761	-0.00425015	0.999925
12	0.032634	-0.913752	-9.75757	0.00561123	-0.0236012	0.0274497	-0.65	20.1	-39.85	-0.00197757	0.0115478	-0.00480981	0.99992
...

FIGURE 16 EXAMPLE OF SENSOR DATA

5.2 Scenario

To determine the type of gestures to use to test the gesture recognition algorithm, a scenario is chosen for the choosing of gestures that will be used in that scenario.

Here, we decide upon a scenario of a hotel reception. In a hotel reception, the receptionist has to interact with customers regularly, and body language is an important part of understanding what the customer is feeling and expressing without the customer actually having to express it in words. During the interaction between the receptionist and the customers, various gestures are used, such as motioning for staff, or directing the customers to their room. Affirmations and negations to questions asked may also be used, and any dissatisfaction may be shown by the customer in his body language, such as

folding of arms. We determine hence 8 gestures which we wish to recognise in this context.

Initial position of gesture is as follows.



FIGURE 17 INITIAL POSTURE FOR EACH GESTURE

1. Shaking head is shown in Figure 18.



FIGURE 18 SHAKING HEAD

2. Nodding is shown in Figure 19.

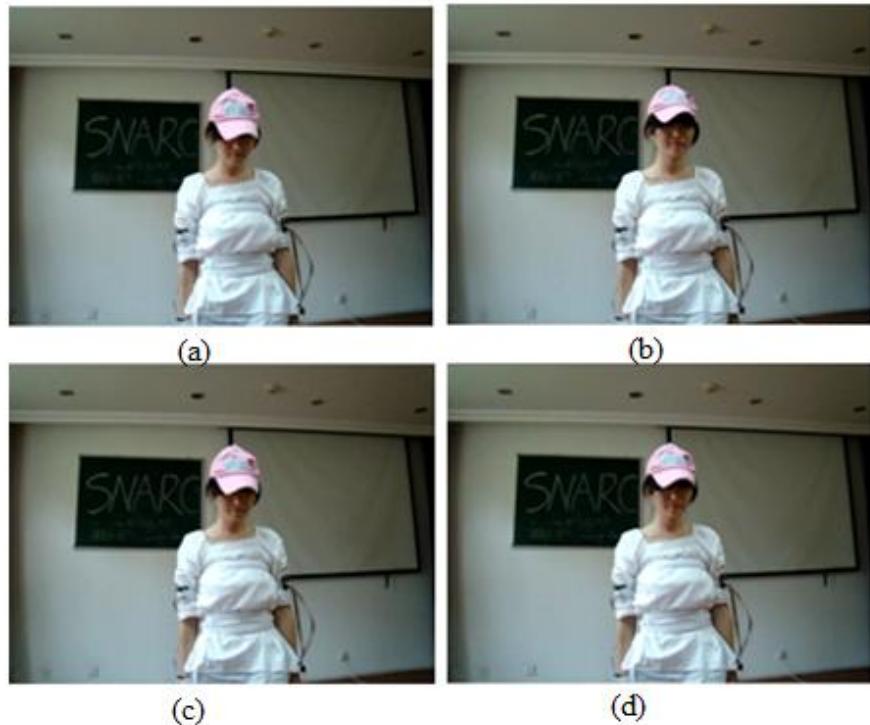


FIGURE 19 NODDING

3. Thinking (hand to head) is shown in Figure 20.

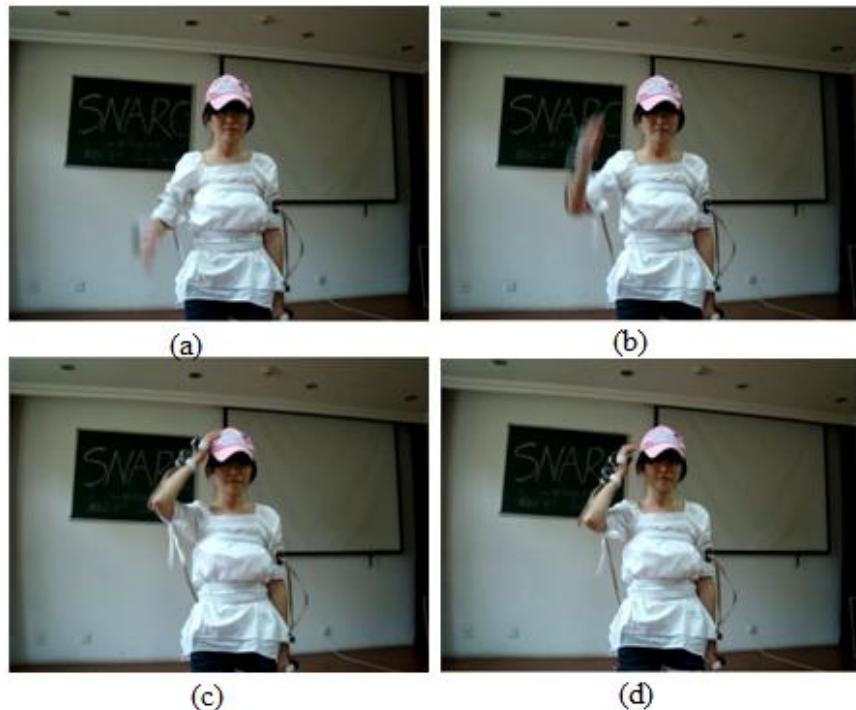


FIGURE 20 THINKING (HEAD SCRATCHING)

4. Beckoning is shown in Figure 21.

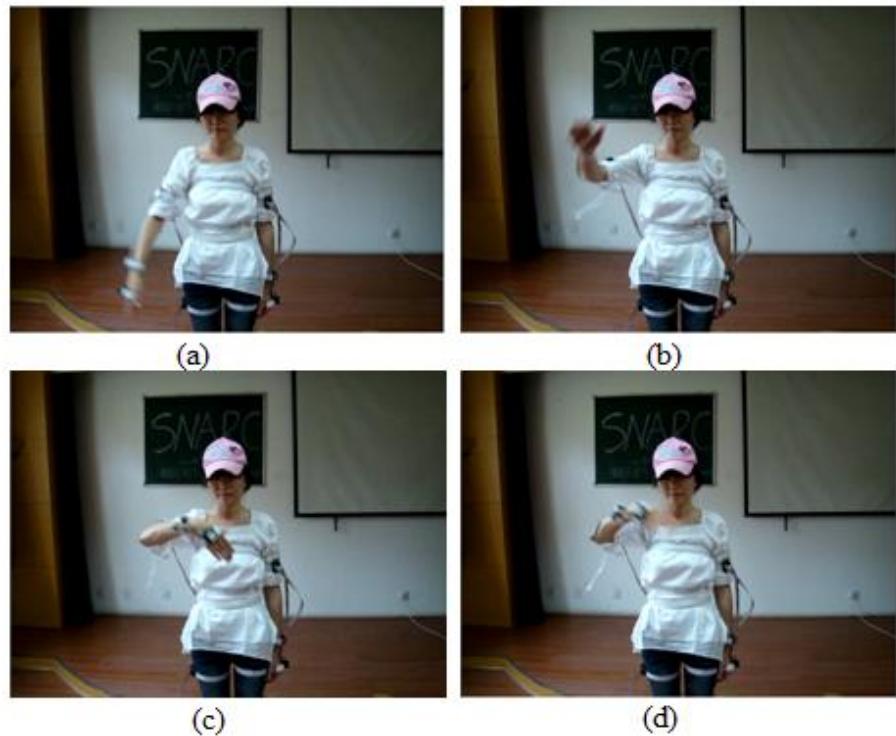


FIGURE 21 BECKON

5. Unhappiness (fold arms) is shown in Figure 22.

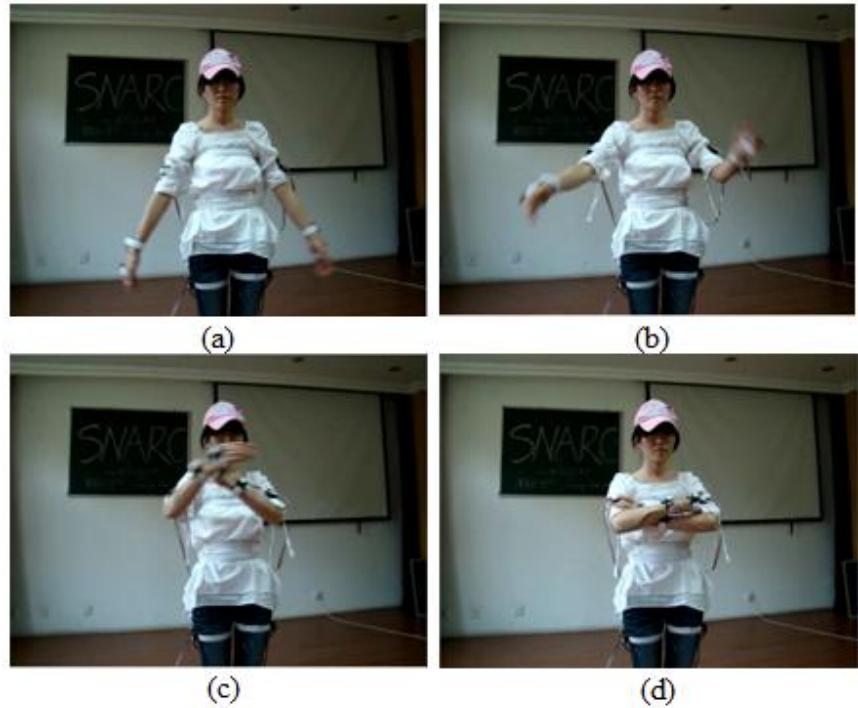


FIGURE 22 FOLDING ARMS

6. Welcome is shown in Figure 23.

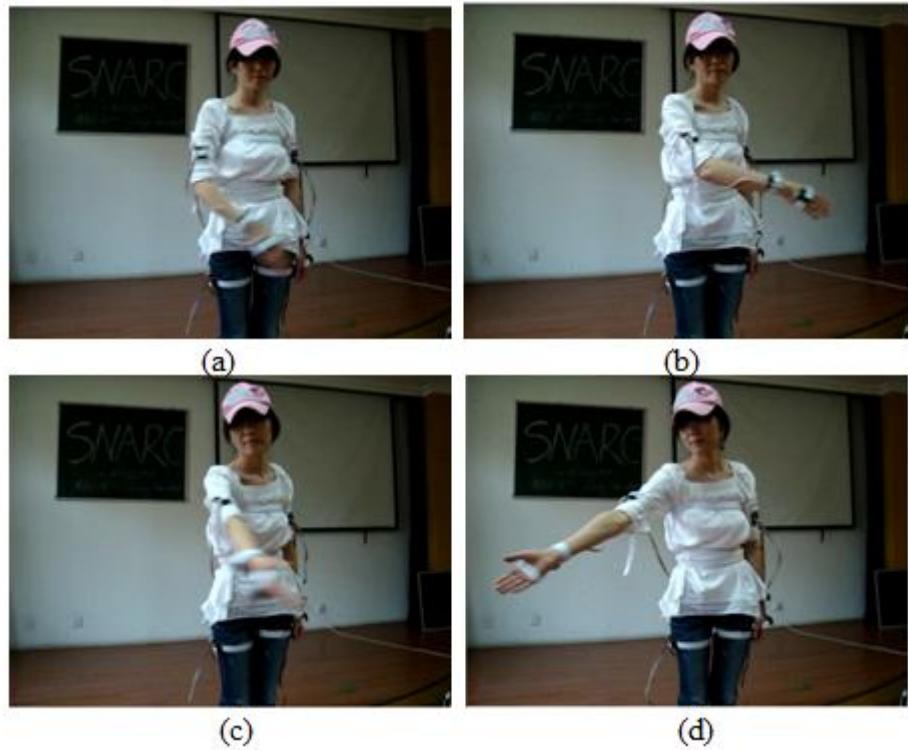


FIGURE 23 WELCOME

7. Wave is shown in Figure 24.

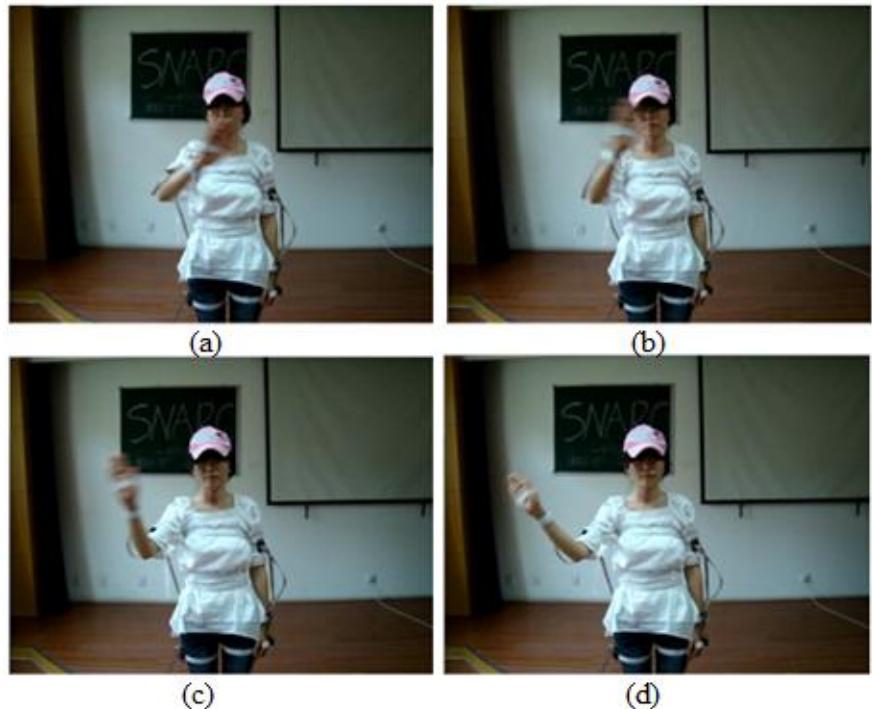


FIGURE 24 WAVING GESTURE

8. Hand shaking is shown in Figure 25.

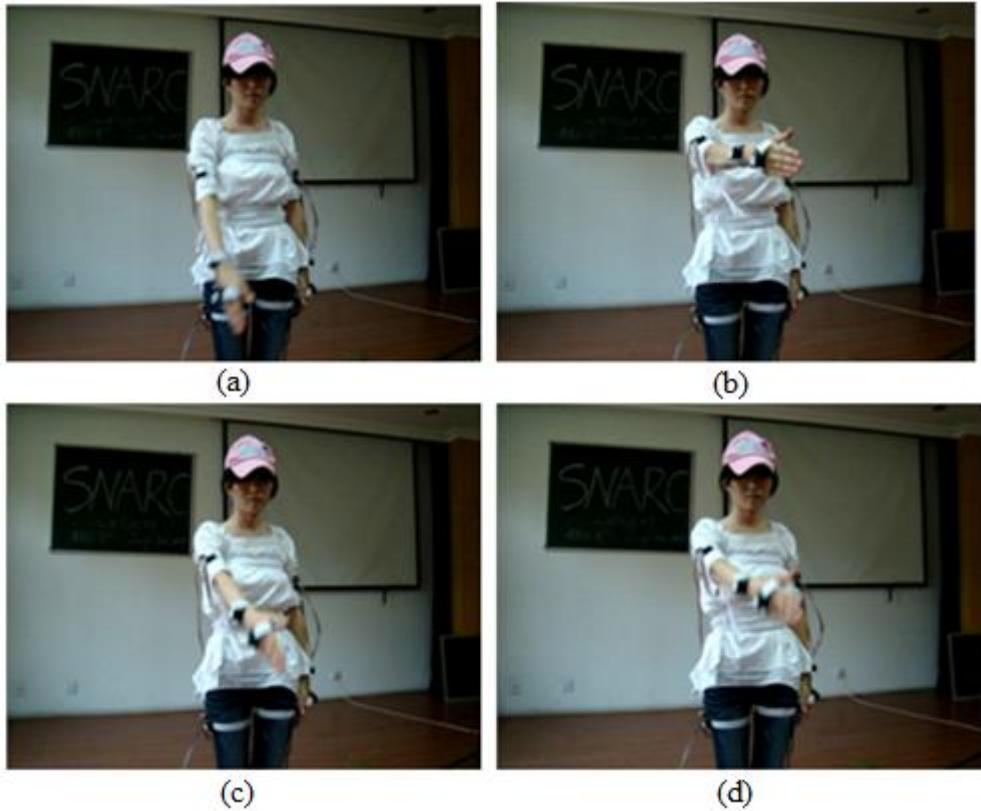


FIGURE 25 HAND SHAKING

5.3 Collection of data samples

Initially, a small set of data was collected for the purpose of processing and experimenting with the DTW algorithm. 15 samples for each gesture were collected, making a total of 90 samples. Due to limitations of equipment, the data was collected continuously with pauses in-between the gestures. Segmentation of the data was done post-data collection by hand. Graphs of accelerations or angular velocity were plotted in order to observe the starts and ends of gestures, the choice of body part being dependant on the gesture being plotted. For example, for a gesture of head shaking, the angular velocity of the x-axis of the head sensor data is plotted to segment the data.

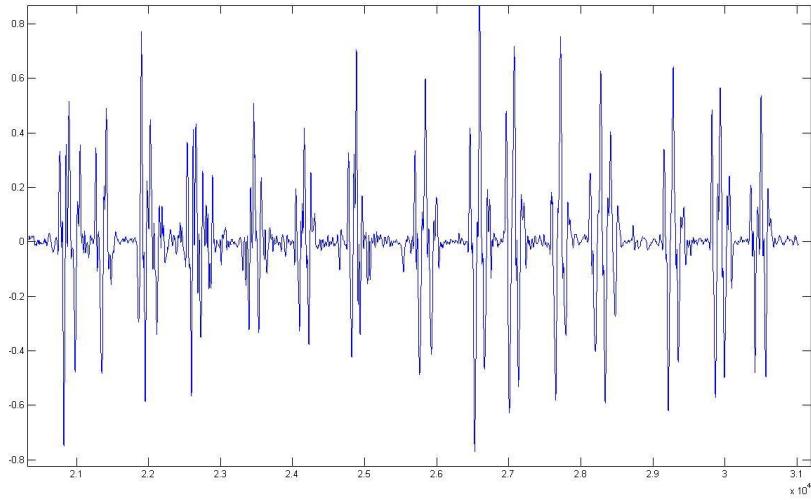


FIGURE 26 ANGULAR VELOCITY ALONG X AXIS FOR HEAD SHAKING

TABLE 1 MEAN AND STANDARD DEVIATION OF LENGTHS OF GESTURES (NO. OF SAMPLES PER GESTURE)

Gesture	Mean	Std
beckon	243.0667	21.7008
fold	548.8667	87.999
no	374.2667	93.833
nod	384.7059	65.2416
shake hands	410.6	36.3137
think	367.625	53.0935
wave	327.2	55.3033
welcome	322	39.8882

Dynamic time warping was then applied to this set of data using the “Leave one out” method, where each sample is removed and compared to the entire training set. We then proceed to apply the window method mentioned above to this training set to verify our theory of simplifying the number of calculations and check its accuracy.

Subsequently, another new set of 50 samples per gestures was recorded, for the purpose of separating the training set from the evaluation set. The first five samples from each gesture set was extracted and used to form the training set. This time, instead of using all 5 samples of the training set, we choose 2 best performing samples from each sample set of 5 to form the new training set for the rest of the gesture recognition.

Gesture recognition with dynamic time warping was then again performed on the remaining 45 samples per gestures, hence generating 720 comparisons. The 1-Nearest Neighbour classification method was used to classify each gesture.

5.3.1 Feature Vectors

Quaternions are used to represent the rotational orientation of the body parts; hence the rest of the information is discarded. The feature vector was formed by concatenating the 7 quaternions of the respective body parts to form a column vector of 28 elements.

5.3.2 Distance metric

The dynamic time warping algorithm chooses a warping path through the warping plane of the function F by matching similar vectors together. A measure of similarity is to calculate the distance between two feature vectors. Intuitively, a smaller distance indicates high similarity between two feature vectors, and vice versa. Although the feature vector is a vector of 28 elements, it will be split up into its individual quaternions for metric calculation. The final distance will be the sum of the distance between the 7 pairs of quaternions.

It is not trivial to just calculate the Euclidean distance of the two quaternions, as unit quaternions have two representations for each orientation. In the rotational $SO(3)$ space, the negative of a quaternion q is equivalent to q , i.e. they represent the same rotation.

$$q' = -q \Rightarrow q' \equiv q \quad (33)$$

Hence the usual equation used for the calculation of Euclidean distance has to be modified to take into account the non-uniqueness of rotational representation. Instead of

$$q_1 = (w_1, x_1, y_1, z_1), q_2 = (w_2, x_2, y_2, z_2) \quad (34)$$

$$\begin{aligned} d \\ = \sqrt{(w_1 - w_2)^2 + (x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2} \end{aligned} \quad (35)$$

We have

$$\begin{aligned} d = \\ \min (\sqrt{(w_1 - w_2)^2 + (x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}, \quad (36) \\ \sqrt{(w_1 + w_2)^2 + (x_1 + x_2)^2 + (y_1 + y_2)^2 + (z_1 + z_2)^2}) \end{aligned}$$

5.3.3 1-Nearest Neighbour Classification

This method of classification is deterministic, where the class of the closest neighbour to a test sample will be adopted by the test sample to be its class. This makes use of the property that similar gestures will be closer – smaller distance – in the metric space.

Chapter 6 Results

6.1 Initial Training set

There are altogether 8 gestures, and in the initial training set, there are 15 samples per gesture. “Leave one out” test is performed on this set of data, with the dynamic time warping algorithm and slope constraint 1. To “leave one out” is to test each sample against all the remaining samples.

6.1.1 Results of Classic Dynamic Time Warping with Slope Constraint 1

In the series of figures below, the mean lengths for each comparison per class is shown for each gesture prototype.

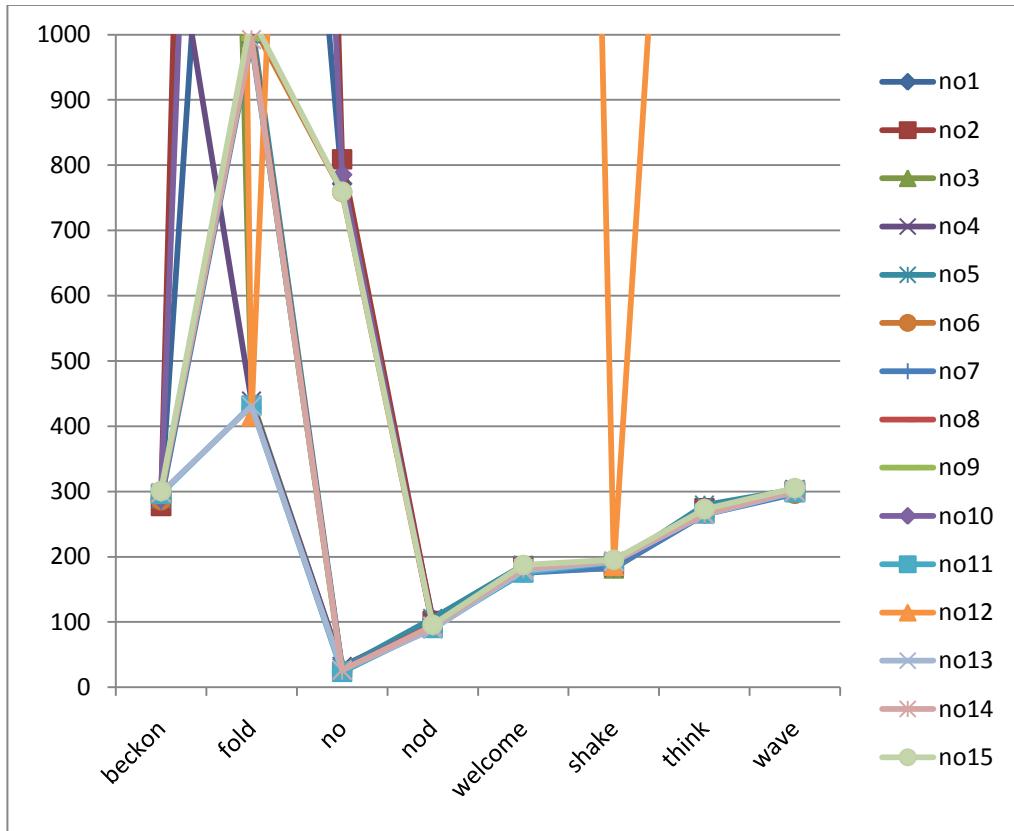


FIGURE 27 GRAPH OF AVERAGE DISTANCES OF HEAD SHAKING VS. OTHERS

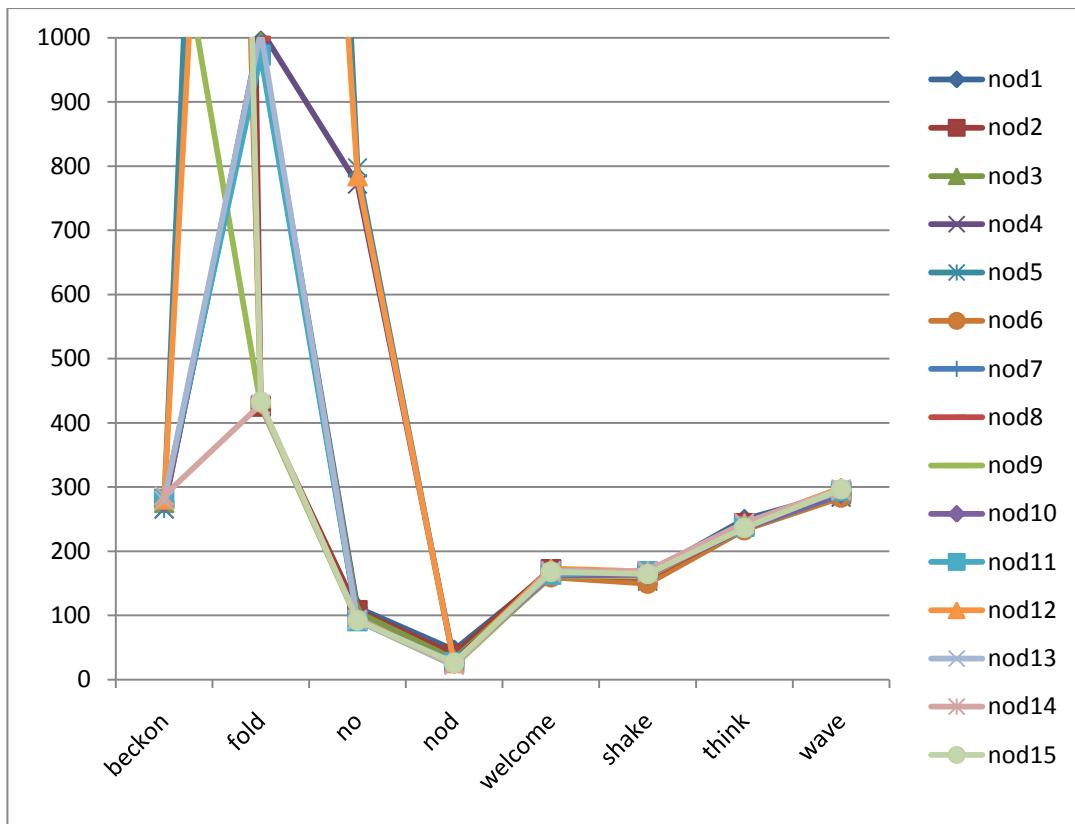


FIGURE 28 GRAPH OF AVERAGE DISTANCES OF NODDING VS. OTHERS

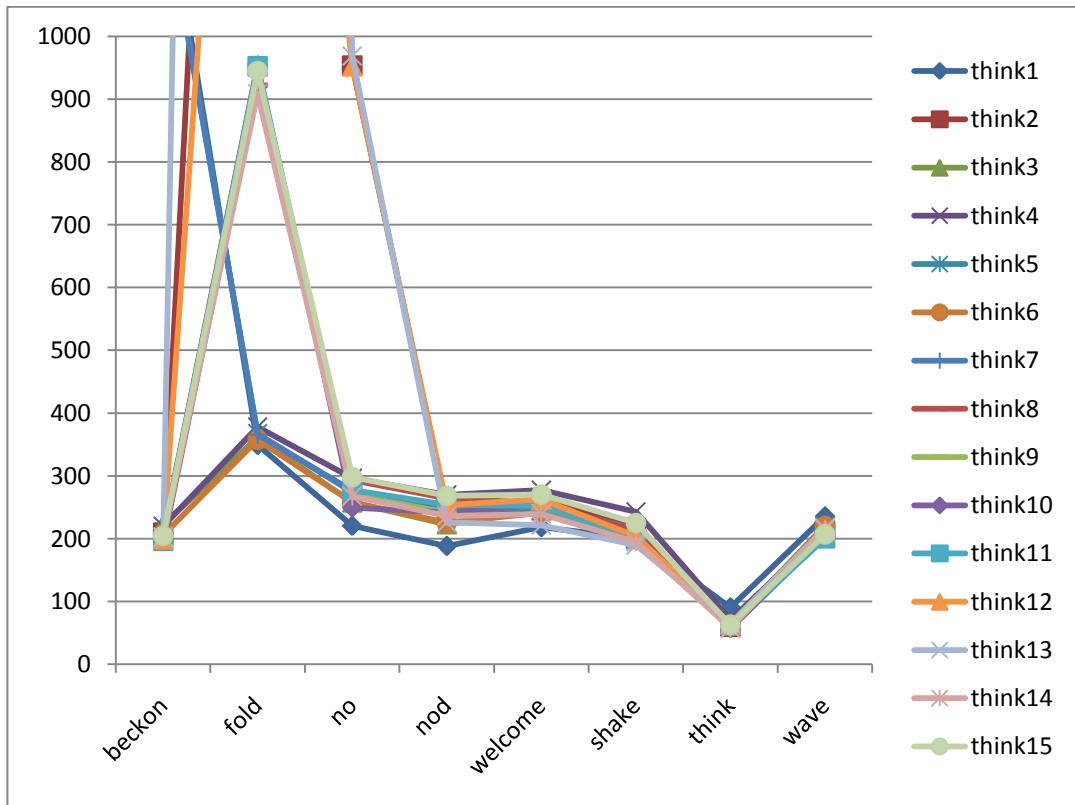


FIGURE 29 GRAPH OF AVERAGE DISTANCES OF THINK VS. OTHERS

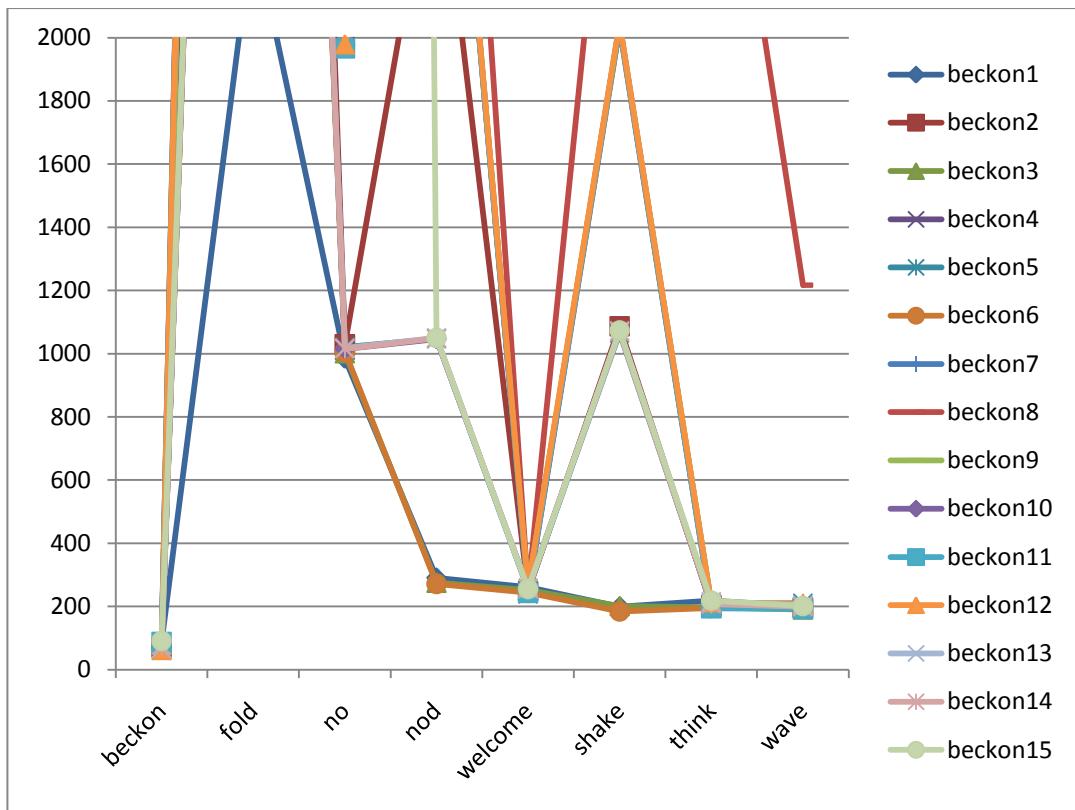


FIGURE 30 GRAPH OF AVERAGE DISTANCES OF BECKON VS. OTHERS

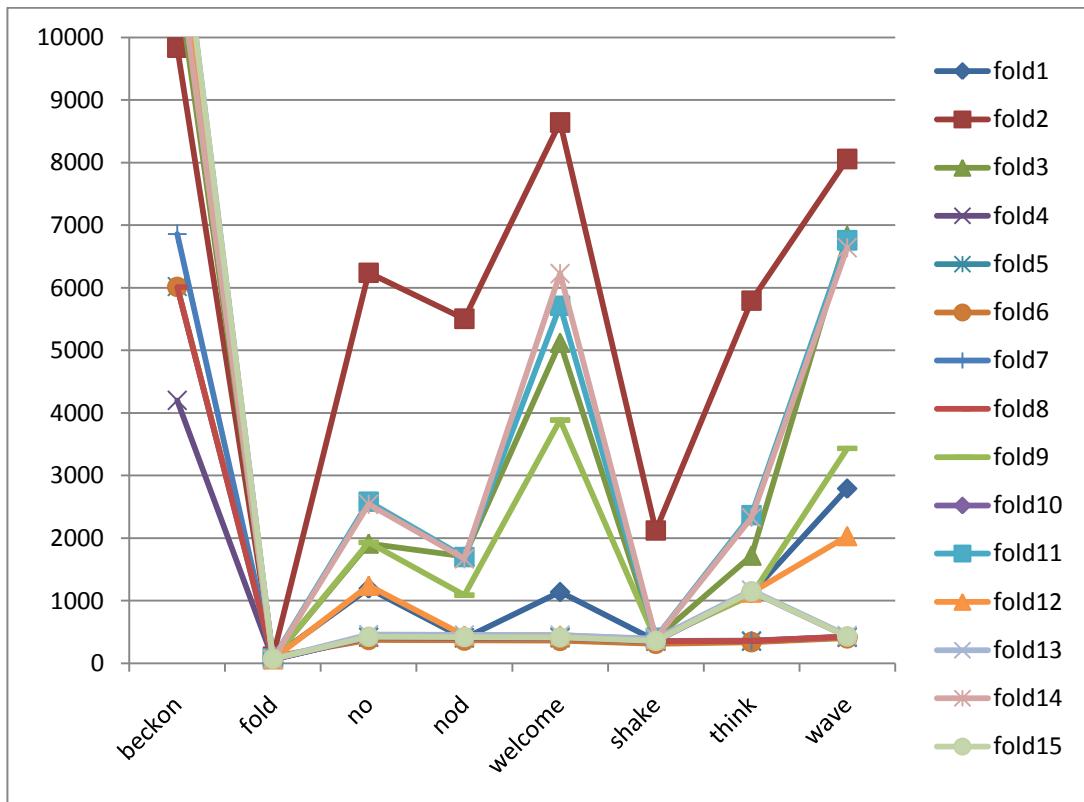


FIGURE 31 GRAPH OF AVERAGE DISTANCES OF UNHAPPY VS. OTHERS

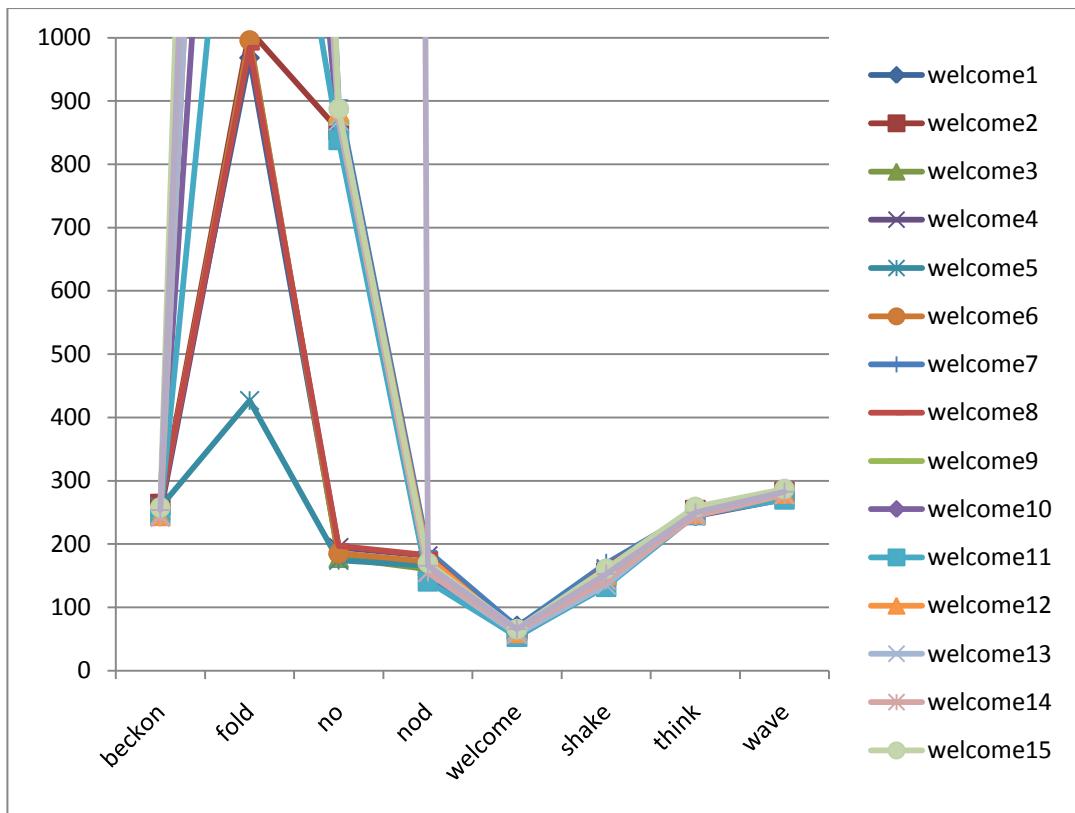


FIGURE 32 GRAPH OF AVERAGE DISTANCES OF WELCOME VS. OTHERS

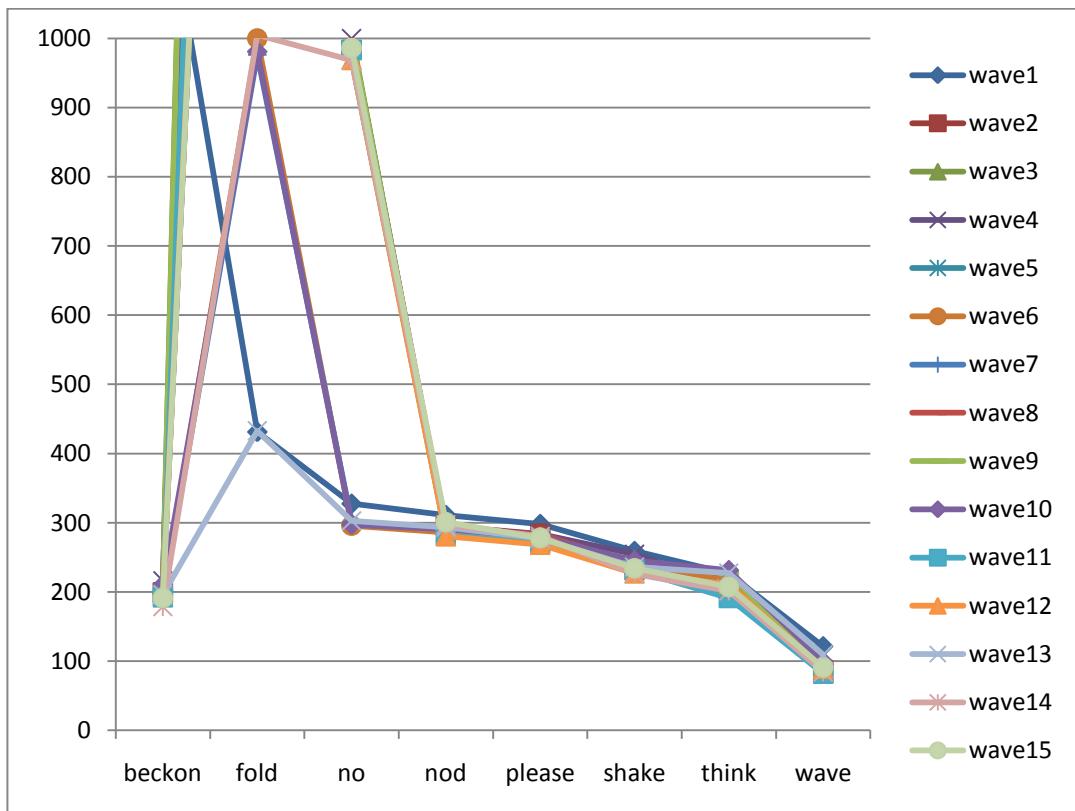


FIGURE 33 GRAPH OF AVERAGE DISTANCES OF WAVE VS. OTHERS

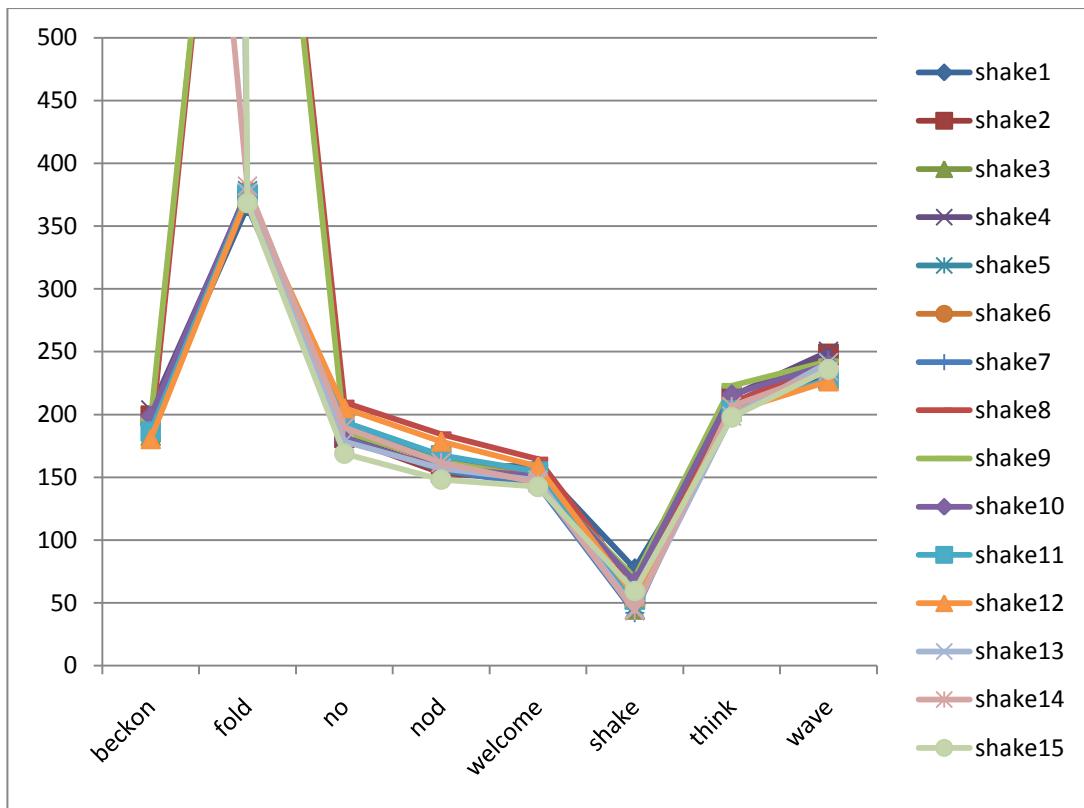


FIGURE 34 GRAPH OF AVERAGE DISTANCES OF HANDSHAKING VS. OTHERS

6.1.1.1 Wave 1 results

TABLE 2 WAVE 1 DISTANCES TABLE PART I

	beckon	fold	no	nod
wave1				
	217.84	430.01	334.644	305.773
	230.245	472.195	334.562	298.365
	208.204	429.25	327.287	306.283
	229.918	424.708	335.044	307.604
	231.727	431.915	333.042	312.184
	216.639	406.321	327.666	305.314
	235.789	425.508	324.372	311.336
	15337.5	435.044	325.324	313.146
	241.681	431.838	323.744	314.98
	215.358	416.786	326.419	312.976
	234.117	444.868	322.002	314.951
	240.828	426.108	321.142	317.82
	231.589	430.454	323.868	315.831
	229.54	448.166	323.535	319.434
	226.672	416.88	329.822	311.565

TABLE 3 WAVE 1 DISTANCES TABLE PART II

	welcome	shake	think	wave
Wave 1				
	305.399	242.449	264.333	
	301.629	267.475	218.593	108.666
	296.112	254.816	236.602	142.592
	291.038	270.785	217.093	136.929
	301.143	256.543	245.802	135.552
	297.635	253.284	232.311	105.383
	300.911	268.211	230.047	84.8704
	295.088	265.323	208.546	136.105
	299.198	265.332	215.149	148.962
	297.901	263.641	225.445	102.699
	290.95	252.337	203.853	127.591
	299.859	255.929	224.498	139.668
	296.116	256.36	237.793	97.6436
	297.417	265.166	222.664	121.448
	301.916	248.853	213.623	109.654
AVG	298.154133	259.100267	226.4234667	121.268786
MIN	290.95	242.449	203.853	84.8704

The tables above show the mean distance between samples calculated when using the dynamic time warping algorithm.

6.1.1.2 Wave 1 results interpretation

We attach the distances table for the wave gesture, first sample, for reference.

As can be seen from the table, “wave 1” was classified easily as a “wave” gesture, no matter if we use the minimum (nearest neighbour) as our classification criteria or the average distance.

Notably, if the algorithm is unable to find a warping path from the beginning point $c(1) = (1,1)$ to the ending points, the distance found will be more than 9999. This happens when the lengths of the comparing pair of feature vector sequences are too large.

Wave is a movement of the right hand to the level of the shoulder and then moving left to right. As can be seen from the distances table, gestures which are more similar to the waving gesture, such as beckoning, shaking, and thinking (all of them right arm movements) have distances which are closer to wave 1. The folding arms gesture has the highest distance from waving, followed by nodding and shaking head. This is correct, as folding arms involves large movement of the left arm too, and nodding and shaking head are motions that involve the head instead of the right arm. The dynamic time warping algorithm is effective in differentiating motions that involve the same body part but that are part of different gestures.

6.1.1.3 Head Shaking 4 results

TABLE 4 NO 4 DISTANCES TABLE PART I

	Beckon	Fold	No	Nod
no4				
	310.159	394.454	40.2513	113.225
	302.918	524.535	38.7817	111.801
	289.681	460.651	41.2052	108.624
	290.593	444.427		93.9818
	305.257	430.857	32.1711	94.1384
	292.749	388.259	27.6402	97.7083
	302.787	437.66	18.8694	95.2252
	15220.8	436.966	33.4938	94.6133
	303.198	432.24	27.5418	96.8917
	292.655	397.931	37.7711	97.1945
	285.072	466.937	28.002	96.6567
	302.003	436.293	30.3687	97.642
	298.134	449.992	27.6107	94.5358
	298.429	462.429	26.7416	98.6292
	287.839	411.088	39.2081	95.8977
AVG	1292.152	438.3146	32.11834	99.22901
MIN	285.072	388.259	18.8694	93.9818

TABLE 5 NO 4 DISTANCES TABLE PART II

	Welcome	Shake	Think	Wave
No4				
	171.651	191.994	229.912	335.044
	174.485	175.233	277.622	307.353
	168.316	188.9	252.71	298.575
	179.994	175.127	298.043	302.846
	170.624	186.955	292.594	293.542
	173.43	182.005	252.052	293.213
	203.268	176.912	283.198	297.61
	183.851	200.514	285.41	299.26
	170.191	177.332	265.677	298.389
	166.037	176.769	241.325	296.152
	159.808	188.594	271.18	291.889
	196.108	201.127	278.25	287.126
	176.738	180.323	266.134	300.598
	177.307	189.046	255.959	303.408
	186.748	165.076	291.424	308.948
	185.961		271.85	
AVG	177.7823	183.7271	269.5838	300.9302
MIN	159.808	165.076	229.912	287.126

As can be seen from the table above, for head shaking gestures, the distance vector is much lower than the others, with an average of 32 and a minimum of 18. There is no problem of recognizing a “head shaking” from the other possible gestures. Moreover, since head nodding and head shaking are very similar in nature, with small movements of the head, we will have guessed that there will be problems separating the two gestures. However, the minimum distance and average distance from the 4th sample of head shaking is around 100, far from the 18 and 32 respectively. Hence, it is shown that using

quaternions, the effect of rotational orientations allow us to track motion more effectively via angles, even when the motion is small.

6.1.1.4 Summary of Results for DTW with slope constraint 1

TABLE 6 DTW WITH SLOPE CONSTRAINT 1 CONFUSION MATRIX

	wave	nod	no	beckon	please	fold	shake	thinking
wave	15	0	0	0	0	0	0	0
nod	0	15	0	0	0	0	0	0
no	0	0	15	0	0	0	0	0
beckon	0	0	0	15	0	0	0	0
please	0	0	0	0	15	0	0	0
fold	0	0	0	0	0	15	0	0
shake	0	0	0	0	0	0	15	0
thinking	0	0	0	0	0	0	0	15

From the table above, we can see that an accuracy of 100% for gesture recognition was achieved with these 8 gestures. However, running times for each comparison can be long, up to 4 minutes. Hence, this “Leave one out” comparison can only be performed offline. The distinction between the classes for classification is high; hence this algorithm is highly accurate and suited for gesture recognition on feature vectors formed with quaternions.

6.2 Testing set

To substantiate our results, a separate set of test data containing 45 samples per gesture was recorded. This gives a total of 360 testing samples. A separate training set was recorded, with a size of 5 samples per gesture. The template set will be obtained from this training set for further gesture recognition purposes.

6.2.1 Establishing a template

In our initial set of tests, the testing set was also used as the training set, due to its small sample size. To ensure complete independence of training set from the testing set, we re-recorded a separate training set and testing set. The training set consists of 5 samples per gesture, from which templates are to be chosen for the purpose of comparing against by the dynamic time warping algorithm. Instead of using all 5 samples as templates, we opt to use only 2 out of the 5 samples, to increase the gesture recognition efficiency. This is done by performing again a “Leave one out” test on the 5 samples in each gesture. The two gestures with the two smallest average gesture distances are chosen as the two templates for its class.

TABLE 7 DISTANCES MATRIX FOR SHAKING HEAD

	no1	no2	no3	no4	no5
		16.7333	21.3194	21.8274	28.8988
	16.7333		11.3752	11.8051	28.6835
	21.3194	11.3752		14.0128	16.3125
	21.8274	11.8051	14.0128		14.148
	28.8988	28.6835	16.3125	14.148	
AVG	22.19473	17.14928	15.75498	15.44833	22.0107
MIN	16.7333	11.3752	11.3752	11.8051	14.148

In this “shaking head” gesture example given above, no3 and no4 has the two lowest mean distances when compared to other similar samples. Therefore these two are used as templates for the “shaking head” gesture class.

6.2.2 Gesture Recognition with DTW and slope constraint 1

Similarly for the figures below, it is a comparison for each gesture sample against the templates in the different classes. There are 46 samples per class for comparison purposes.

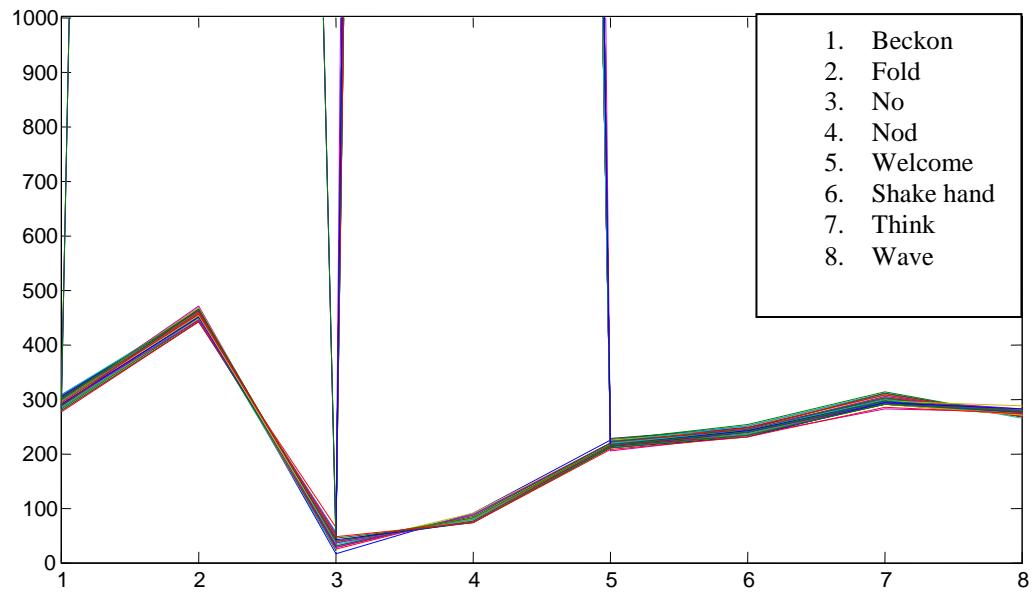


FIGURE 35 GRAPH OF MIN DIST BETWEEN "SHAKE HEAD" AND EACH CLASS'S TEMPLATES

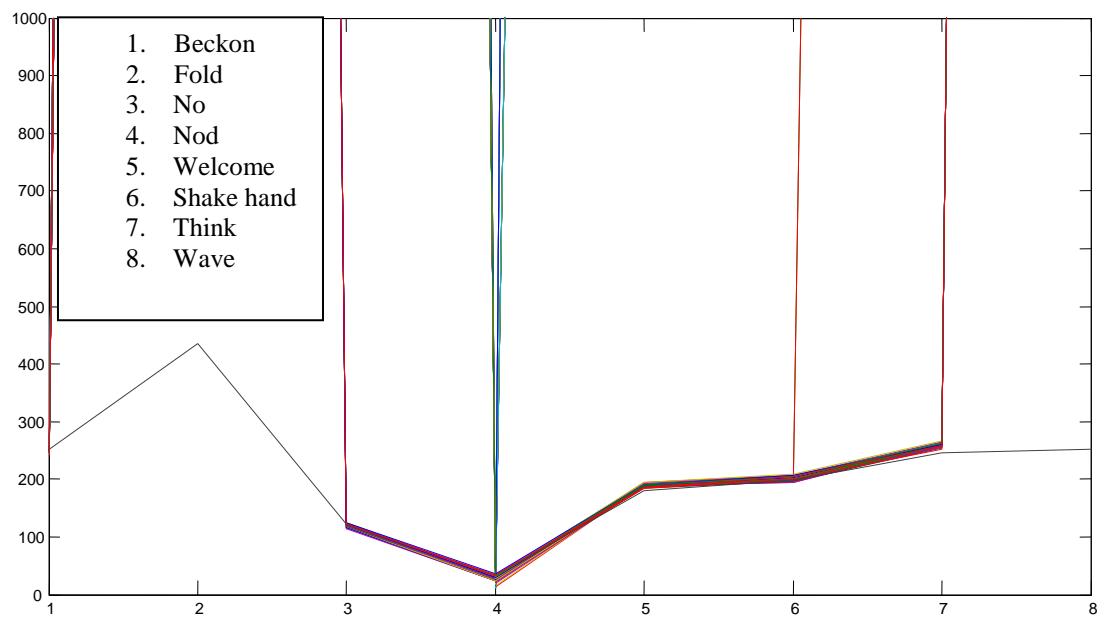


FIGURE 36 GRAPH OF MIN DIST BETWEEN "NOD" AND EACH CLASS'S TEMPLATES

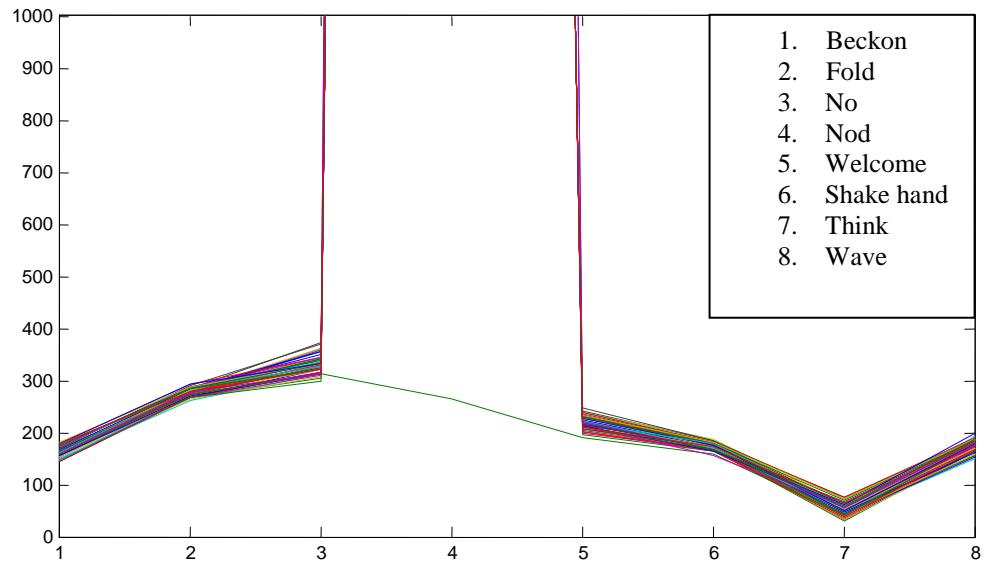


FIGURE 37 GRAPH OF MIN DIST BETWEEN "THINK" AND EACH CLASS'S TEMPLATES

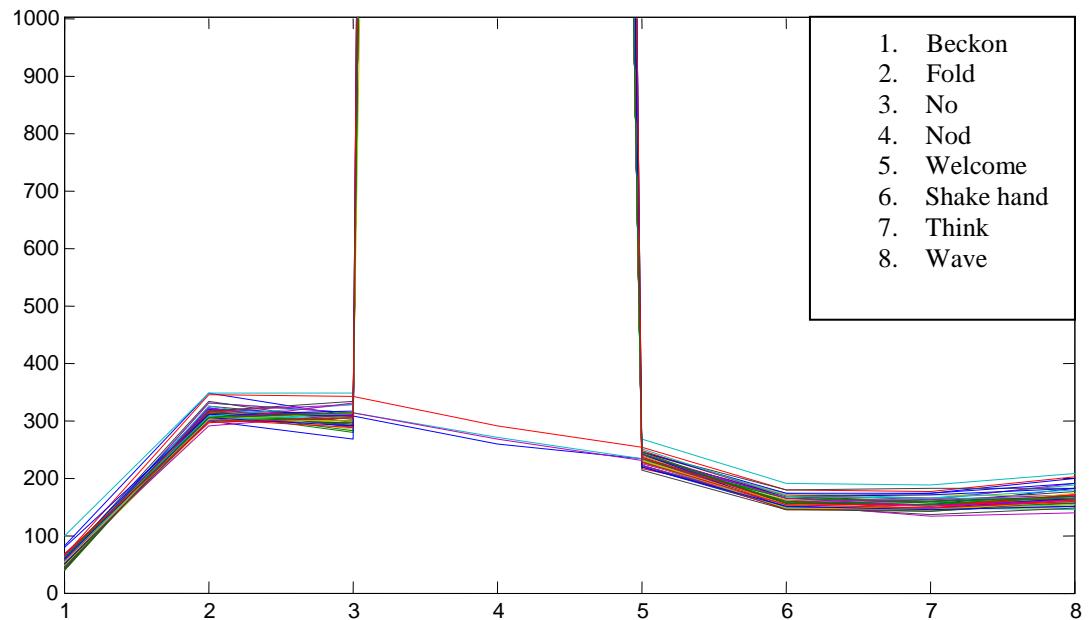


FIGURE 38 GRAPH OF MIN DIST BETWEEN "BECKON" AND EACH CLASS'S TEMPLATES

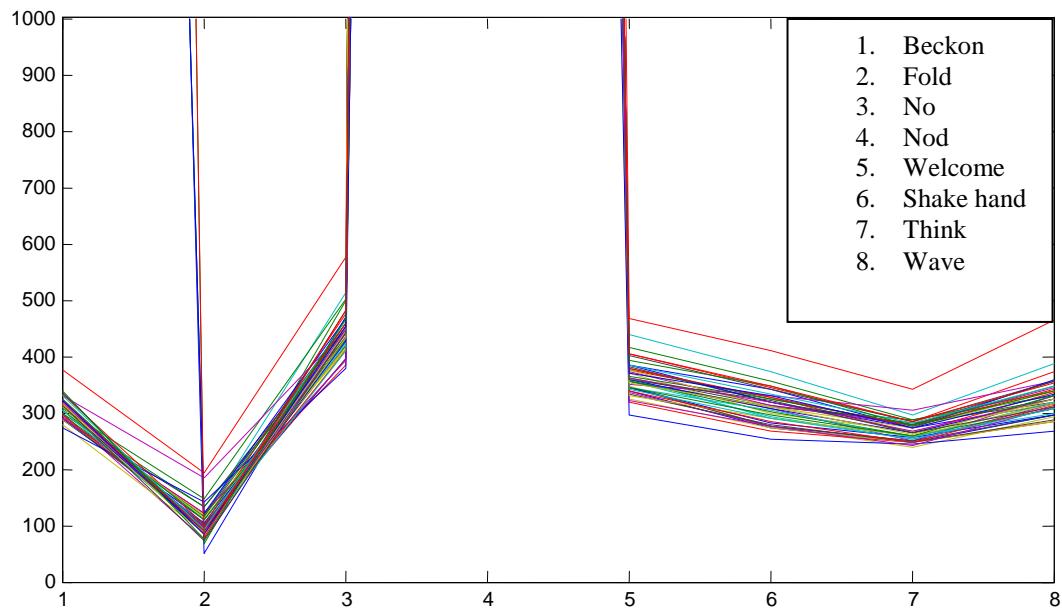


FIGURE 39 GRAPH OF MIN DIST BETWEEN "UNHAPPY" AND EACH CLASS'S TEMPLATES

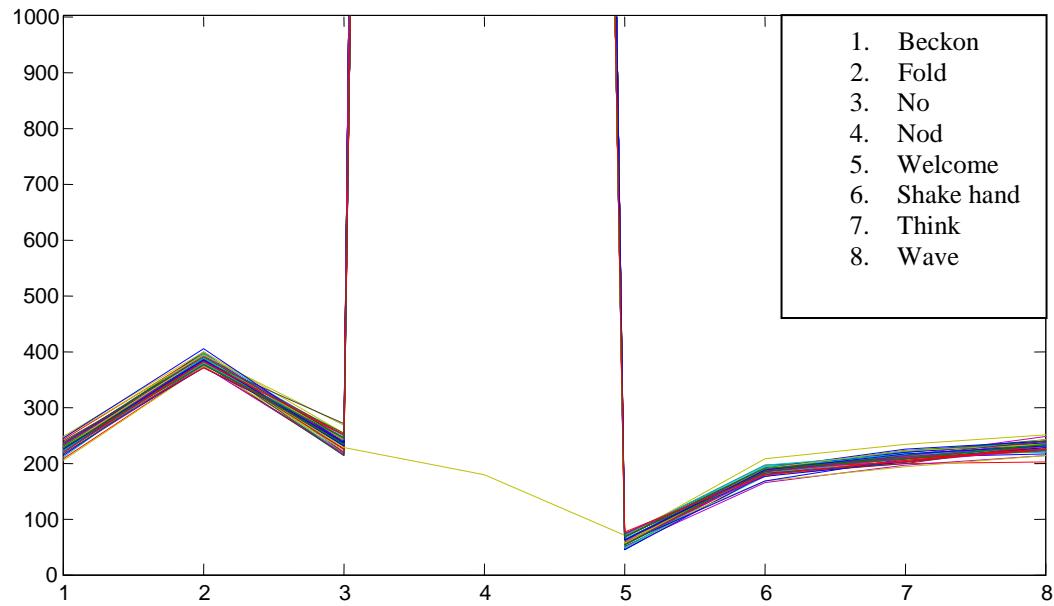


FIGURE 40 GRAPH OF MIN DIST BETWEEN "WELCOME" AND EACH CLASS'S TEMPLATES

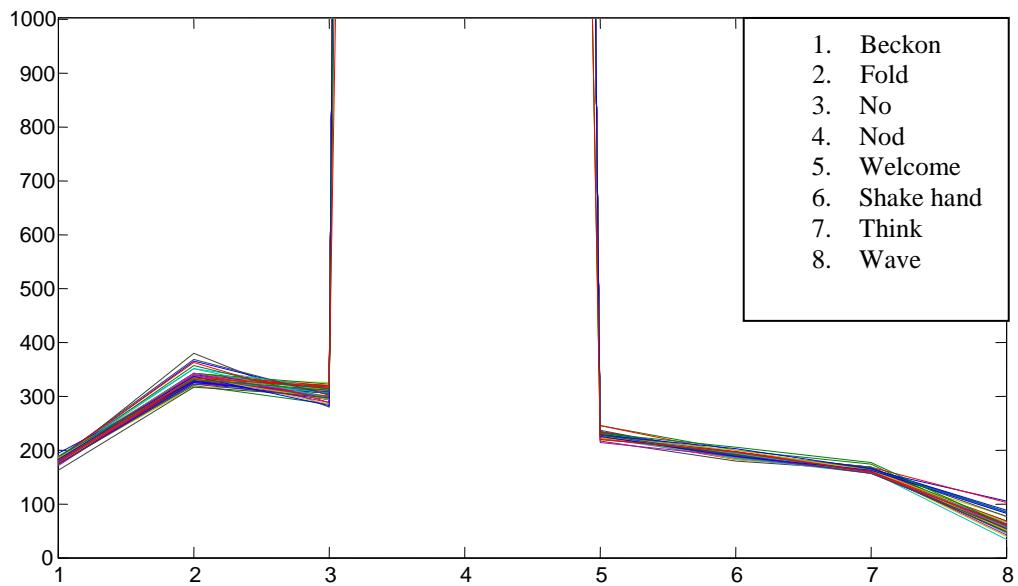


FIGURE 41 GRAPH OF MIN DIST BETWEEN "WAVE" AND EACH CLASS'S TEMPLATES

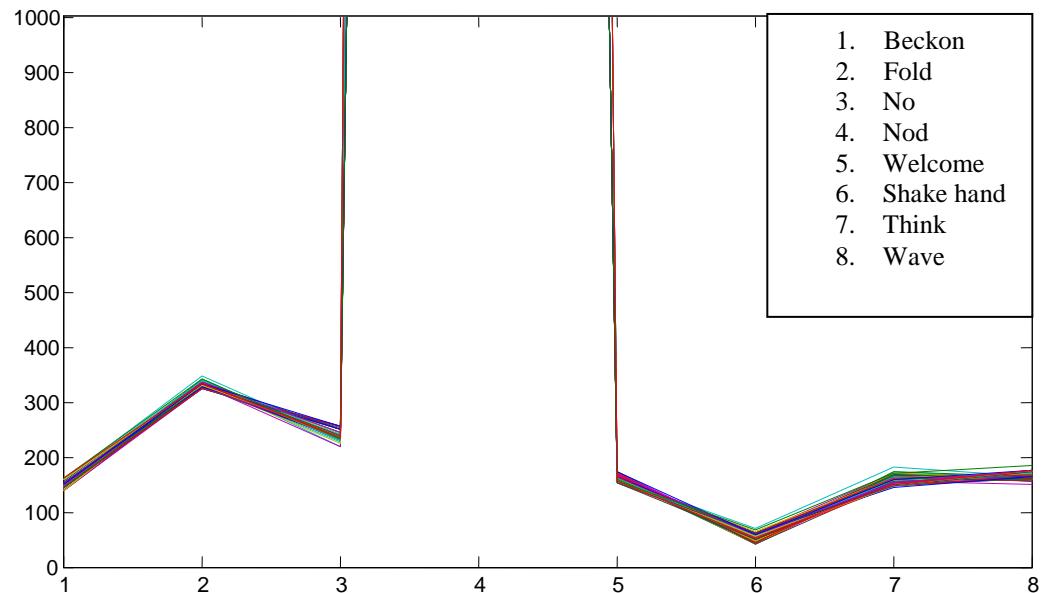


FIGURE 42 GRAPH OF MIN DIST BETWEEN "HANDSHAKE" AND EACH CLASS'S TEMPLATES

TABLE 8 CONFUSION MATRIX FOR DTW WITH 2 TEMPLATE CLASSES

	wave	nod	no	beckon	please	fold	shake	thinking
wave	45	0	0	0	0	0	0	0
nod	0	45	0	0	0	0	0	0
no	0	0	45	0	0	0	0	0
beckon	0	0	0	45	0	0	0	0
please	0	0	0	0	45	0	0	0
fold	0	0	0	0	0	45	0	0
shake	0	0	0	0	0	0	45	0
thinking	0	0	0	0	0	0	0	45

As shown in the graphs, the 45 samples in each graph were classified correctly, again with an accuracy of 100%. It is shown that a reduced size template can still allow us to achieve a high accuracy rate.

However, even with a reduced template size of 2, with 8 classes, the comparison time for each sample is still relatively long at around 10 seconds. The duration of comparisons are show in Figure 43 and Figure 44. Figure 43 is a graph of each comparison for the class of “Wave”, while Figure 44 is a graph of the mean comparison times for each class.

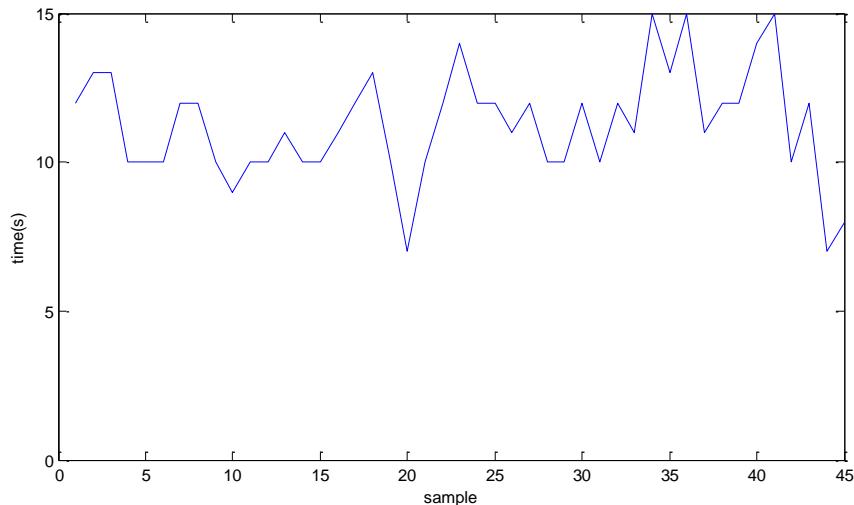


FIGURE 43 DURATION OF COMPARISON FOR WAVE

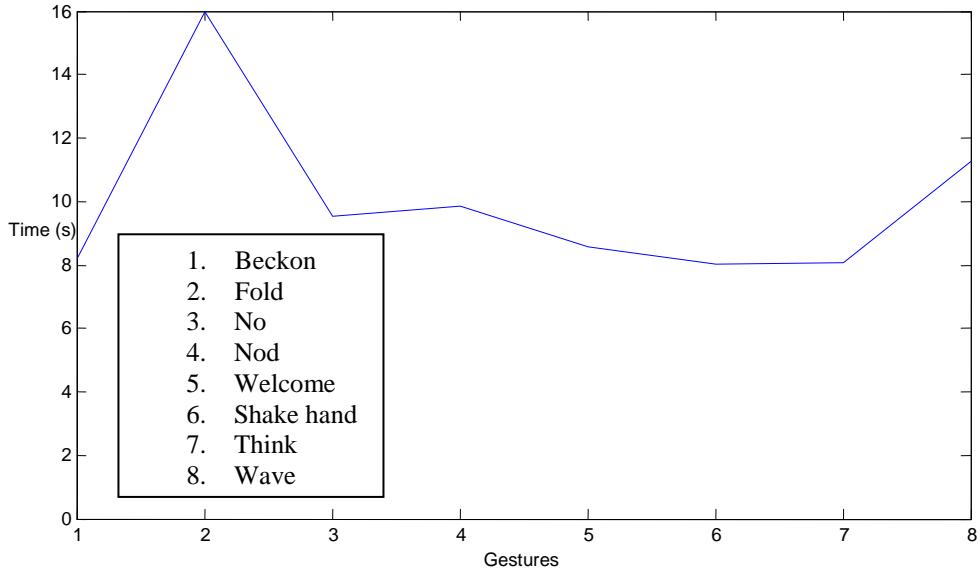


FIGURE 44 GRAPH OF AVERAGE RUNNING TIME VS. GESTURE

6.2.3 Gesture Recognition with DTW and slope constraint 1 with Windowing

Gestures, different from articulated syllables in speech, have a stricter time window, i.e. similar gestures are closer in length than vastly different gestures, and gestures in the same class do not differ as much in length. Hence, to make use of this property, we incorporate the comparison of length into each sample comparison before proceeding with the DTW algorithm.

6.2.3.1 Window of 50 (1 second)

In this part, calculations for sample lengths more than 50 samples apart (1 second) will not be performed. Accordingly, the mean time duration for calculations was vastly reduced to about 2 seconds.

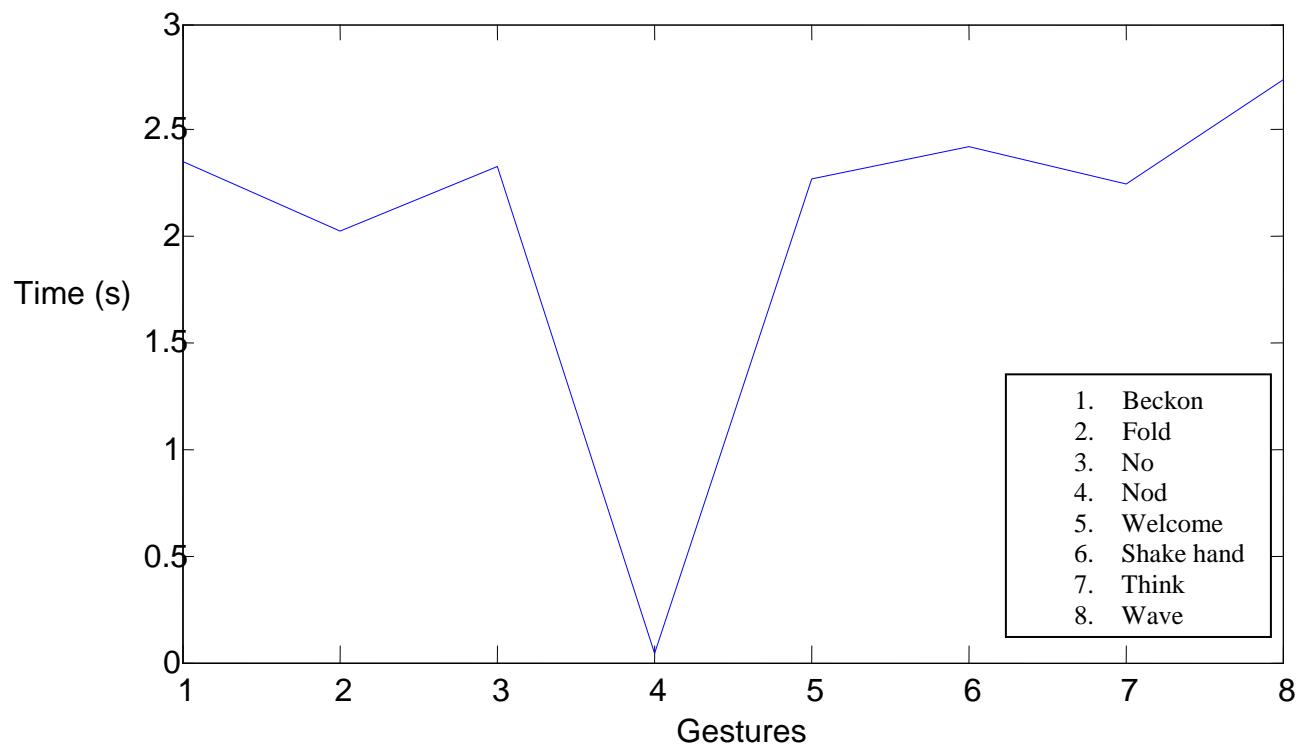


FIGURE 45 GRAPH OF TIME VS. GESTURES WITH WINDOW 50

However, accuracy has dropped with the application of the window.

TABLE 9 CONFUSION MATRIX FOR 2 TEMPLATES PER CLASS AND WINDOW 50

	Beckon	Unhappy	No	Nod	Welcome	Handshake	Think	Wave
Beckon	40	0	0	0	0	0	0	0
Unhappy	4	35	0	0	0	0	6	0
No	0	0	22	8	15	0	0	0
Nod	0	0	0	45	0	0	0	0
Welcome	0	0	0	0	45	0	0	0
Handshake	0	0	0	0	0	45	0	0
Think	0	0	0	0	0	0	45	0
Wave	0	0	0	0	0	0	2	43

Accuracy rate is down to 88.9%, with an error rate of 11.1%. The worst performing classes were “Unhappy” and “No” gestures. This may be accorded to the higher variance of lengths of the “Unhappy” (folding arms) and “No” (shaking head) gestures.

6.2.3.2 Window of 70 (1.4 second)

The window was enlarged by 0.4 seconds, or length 20 (at 50Hz).

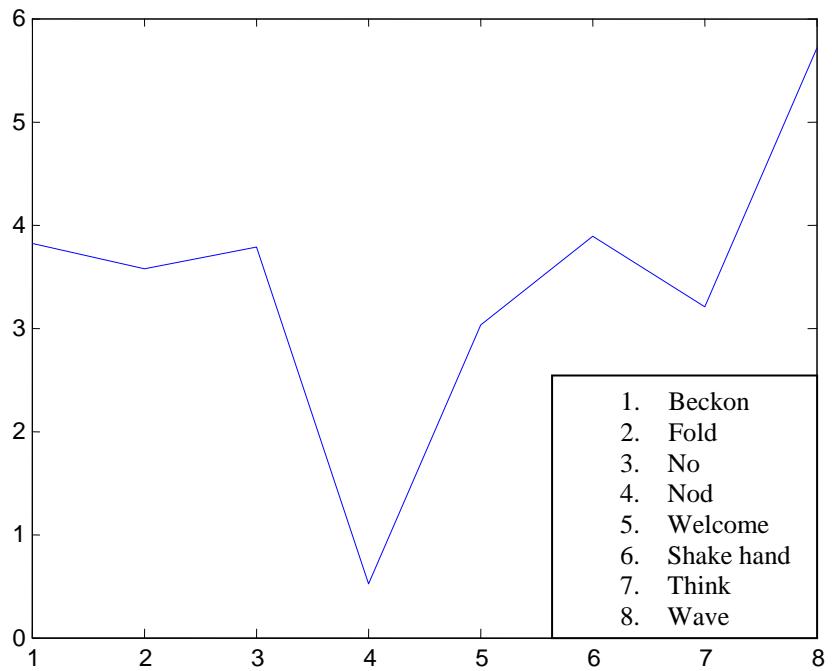


FIGURE 46 GRAPH OF TIME VS. GESTURES WITH WINDOW 70

TABLE 10 CONFUSION MATRIX FOR DTW WITH 2 TEMPLATES PER CLASS AND WINDOW 70

	Beckon	Unhappy	No	Nod	Welcome	Handshake	Think	Wave
Beckon	44	0	0	0	0	0	1	0
Unhappy	1	42	0	0	0	0	2	0
No	0	0	40	1	0	0	2	0
Nod	0	0	0	45	0	0	0	0
Welcome	0	0	0	0	45	0	0	0
Handshake	0	0	0	0	0	45	0	0
Think	0	0	0	0	0	0	45	0
Wave	0	0	0	0	0	0	0	45

With the window increased to a length of 70, the accuracy rate has now increased to 97.5%. Individually, class accuracy rate is lowest at 88.9%. As we look at the time needed to perform DTW for comparing samples, the time

has increased to about 4 seconds. However, this is still only half of the lowest time used to run DTW without any windowing.

Chapter 7 Conclusion

7.1 Conclusion

We started by listing 8 gestures which we wish to recognise, in a scenario of the hotel reception. These 8 gestures involve movements of different parts of the body, and hence, we wish to collect motion information on the motion by inertial micro sensors placed on 7 parts of the body.

Information gathered from the micro sensors were in the form of acceleration along the 3 axis, angular velocity along the 3 axis, and magnetic field readings along the 3 axis. This information was processed by a Kalman filter to produce quaternions, a form of rotational representation.

The advantages of using quaternions to represent rotations were discussed, and these quaternions could fully capture the motion information of the body parts and be used in the formation of feature vectors for the purpose of gesture recognition.

Consequently, dynamic time warping with slope constraint of 1 was applied to an initial gesture set of 120 samples, with 15 samples per gesture. Each sample was of different lengths, and dynamic time warping was well suited to perform distance analysis on varying length time sequences. Accuracy rate was at 100%.

The sample set size was then enlarged, so as to construct a more sturdy study of the accuracy of dynamic time warping on quaternions. This time, 360 samples, 45 samples per gesture, were recorded to form the testing set.

Another 40 samples, 5 samples per gesture, were recorded to form the training set. For increasing efficiency, 2 gestures out of 5 were chosen for each gesture class to act as templates for its class for performing gesture recognition. They were chosen on the criteria of having the lowest average distance among the class itself. Further tests show an accuracy of 100% again using entire sample sequences, with a running time of about 10 seconds. This was definitely not suitable for online gesture recognition itself.

We introduce from here a windowing technique for dynamic time warping. This technique compares the length of gesture before calculating the distance matrix of each gesture pair. If the lengths of a pair of gestures to be compared differ too greatly, this comparison will be skipped, and an arbitrary large number is assigned as the distance between these two gesture sequences. We show that with a small window of 50 (1 second), running time was reduced by about a factor of 5 from 10 seconds to 2 seconds. However, accuracy rate dropped to only about 90%, with the class of “No” and “Unhappy” being misclassified. To take into account of the larger variances of classes, the window is increased to 70. Accuracy rate rose to 97%, close to 100%, and the average time needed to run the dynamic time warping is still about half of that without windowing. Therefore, windowing is successful in increasing the efficiency of the dynamic time warping algorithm on gesture recognition, yet also able to provide a high accuracy.

7.2 Future work to be done

What is being done in this thesis is currently only offline, isolated gesture recognition. With the increasing in efficiency of dynamic time warping, the

next step will be to optimise the coding of the algorithm to further provide real-time gesture recognition. Latency issues will be an important factor in enabling the recognition algorithm to be used in real-time applications. Furthermore, it is desirable if a generic dictionary can be used for gesture recognitions, to facilitate the use of real-time applications such that each user does not have to retrain the program for his/her personal use.

With the improvement of the gesture recognition algorithm, it will also open up a lot of research opportunities in its application. Most notably, it has the potential to radically change the current HCI platforms.

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Appendix A Code Listing

```
/*
 * File: main.cpp
 * Author: HCJ
 *
 * Created on December 10, 2009, 10:26 AM
 *
 * Main file created to run the code
 */

#include <stdlib.h>
#include <stdio.h>
#include <string>
#include <fstream>
#include <iostream>
#include <ctime>
//#include "DTW_1/DTW_1_0.h"
#include "DTW/DTW_1.h"
#include "QuatImporter/QuatImporter.h"

#define CFG_DIRECTORY "cfg/"

using namespace std;

/*
 *
 */
int main(int argc, char** argv) {

    // initialisation of variables
    QuatImporter *Beckon, *Nod, *Test, *Wave, *No, *Fold, *Shake, *Think,
    *Please;
    DTW_1    *Beckon_DTW,   *Nod_DTW,   *Wave_DTW,   *No_DTW,
    *Fold_DTW, *Shake_DTW,
                *Think_DTW, *Please_DTW;
    double *test_data;
    string filename;
    int test_size;
    char input;
    char index[6];
    ofstream outputFile;
    clock_t start, end;

    cout << "start" << endl;
```

```

// initialisation of templates
filename = "beckon_cfg_1.txt";
filename = CFG_DIRECTORY + filename;
Beckon = new QuatImporter(filename);
Beckon->process_data();
Beckon_DTW = new DTW_1(Beckon, "Beckon");

filename = "fold_cfg_1.txt";
filename = CFG_DIRECTORY + filename;
Fold = new QuatImporter(filename);
Fold->process_data();
Fold_DTW = new DTW_1(Fold, "Fold");

filename = "nod_cfg_1.txt";
filename = CFG_DIRECTORY + filename;
Nod = new QuatImporter(filename);
Nod->process_data();
Nod_DTW = new DTW_1(Nod, "Nod");

filename = "no_cfg_1.txt";
filename = CFG_DIRECTORY + filename;
No = new QuatImporter(filename);
No->process_data();
No_DTW = new DTW_1(No, "No");

filename = "please_cfg_1.txt";
filename = CFG_DIRECTORY + filename;
Please = new QuatImporter(filename);
Please->process_data();
Please_DTW = new DTW_1(Please, "Please");

filename = "shake_cfg_1.txt";
filename = CFG_DIRECTORY + filename;
Shake = new QuatImporter(filename);
Shake->process_data();
Shake_DTW = new DTW_1(Shake, "Shake");

filename = "think_cfg_1.txt";
filename = CFG_DIRECTORY + filename;
Think = new QuatImporter(filename);
Think->process_data();
Think_DTW = new DTW_1(Think, "Think");

filename = "wave_cfg_1.txt";
filename = CFG_DIRECTORY + filename;
Wave = new QuatImporter(filename);
Wave->process_data();
Wave_DTW = new DTW_1(Wave, "Wave");

```

```

// opening a file for output
outputFile.open("output.txt");

for (int i = 1; i <= 400; i++) {

    // reading in of test samples
    cout << "sample " << i << endl;
    filename = "test_cfg_";
    sprintf(index, "%d", i);
    filename = CFG_DIRECTORY + filename;
    filename = filename + index + ".txt";

    Test = new QuatImporter(filename);
    Test->process_data();
    test_data = Test->getTransitionalQuatData();
    test_size = Test->getTotNoOfLines();

    start = clock(); // clocking time needed to run
    outputFile << i << " ";
    outputFile << Beckon_DTW->getDistance(test_data, test_size) << " ";
    outputFile << Fold_DTW->getDistance(test_data, test_size) << " ";
    outputFile << No_DTW->getDistance(test_data, test_size) << " ";
    outputFile << Nod_DTW->getDistance(test_data, test_size) << " ";
    outputFile << Please_DTW->getDistance(test_data, test_size) << " ";
    outputFile << Shake_DTW->getDistance(test_data, test_size) << " ";
    outputFile << Think_DTW->getDistance(test_data, test_size) << " ";
    outputFile << Wave_DTW->getDistance(test_data, test_size) << " ";
    end = clock();
    outputFile << (end - start) / CLOCKS_PER_SEC;
    outputFile << endl;

    delete Test;
    // } while (input != 'N');

}

outputFile.close();

return (EXIT_SUCCESS);
}

```

```

/*
 * File: QuatImporter.h
 * Author: HCJ
 *
 * Created on December 10, 2009, 10:30 AM
 *
 * This module imports quaternions from the input config file containing
 * quaternions for each body part. The number of sensors and body parts
 * are read in from a config file, hence allowing it to be scalable.
 */

#ifndef _QUATIMPORTER_H
#define _QUATIMPORTER_H
#include <iostream>
#include <fstream>
#include <string>
#include "../Quaternion_r/Quat.h"
//#include "../Debugging.h"

#define MAX_NO_OF_SAMPLES 130
#define MAX_NO_OF_SENSORS 10
#define MAX_SAMPLE_SIZE 1000
#define INDIV_DIMENSION 4
//#define DATA_DIRECTORY "actions_data/"
#define DATA_DIRECTORY "test/"
#define R_UPPERARM 1
#define R_LOWERARM 2
#define R_HAND 3
#define L_UPPERARM 4
#define L_LOWERARM 5
#define L_HAND 6

using namespace std;

class QuatImporter {
public:
    QuatImporter();
    QuatImporter(string file); // file imported will be the settings file
    virtual ~QuatImporter();
    Quat *getAbsQuatData();
    double *getAxisData();
    int getDimension(); // returns number of dimensions of feature vector
    int getNoOfSamples(); // returns total number of samples
    int *getSample_t();
    int getSizeOfSample(int index); // returns size of sample for a certain index
    int getTotNoOfLines(); // returns total number of feature vectors
    bool dataProcessed();
    void process_data(); // processes data into feature vectors
}

```

```
double *getTransitionalQuatData(); // returns the processed feature vector

private:
    Quat *quaternion_data;
    int    *size_of_sample,   *sample_t,   no_of_samples,   no_of_sensors,
total_no_of_lines;
    bool f_data;
    double *data; // convert quaternion array to data array
    string name;
};

#endif /* _QUATIMPORTER_H */
```

```

/*
 * File: QuatImporter.cpp
 * Author: HCJ
 *
 * Created on December 10, 2009, 10:30 AM
 */

#include <math.h>

#include "QuatImporter.h"

QuatImporter::QuatImporter() {
}

<**
 * string file will contain the config file
 */
QuatImporter::QuatImporter(string file) {
    // variables
    double temp[4];
    string files[MAX_NO_OF_SENSORS];
    int no_of_lines = 0;
    double temp_no_of_lines = 0;
    ifstream sensorFiles[MAX_NO_OF_SENSORS], inputFile;
    Quat tempQuat, previousQuat[MAX_NO_OF_SENSORS];

#ifdef DEBUG
    ofstream testOutput;
#endif

    f_data = false;
    name = file;
    total_no_of_lines = 0;
    inputFile.open(file.c_str());

#ifdef DEBUG
    name = name + "_output.txt";
    testOutput.open(name.c_str());
#endif

    inputFile >> no_of_samples >> no_of_sensors;
    // hardcoded max size
    quaternion_data = new Quat[MAX_SAMPLE_SIZE]      *
MAX_NO_OF_SAMPLES * MAX_NO_OF_SENSORS;
    size_of_sample = new int[no_of_samples];

#ifdef DEBUG
    cout << no_of_samples << endl;
    cout << no_of_sensors << endl;
#endif
}

```

```

for (int i = 0; i < no_of_samples; i++) { // iterating thru all samples
    for (int j = 0; j < no_of_sensors; j++) { // extracting file names
        inputFile >> files[j];
        files[j] = DATA_DIRECTORY + files[j] + ".txt";
        sensorFiles[j].open(files[j].c_str());
        sensorFiles[j] >> temp_no_of_lines;
    }
    no_of_lines = (int) temp_no_of_lines;
    if (no_of_lines != temp_no_of_lines) no_of_lines++;
    size_of_sample[i] = no_of_lines - 1;
    total_no_of_lines += no_of_lines - 1;
}

#ifndef DEBUG
    if (no_of_lines != temp_no_of_lines) cout << "bad conversion" << endl;
    testOutput << files[0] << endl;
    testOutput << no_of_lines << endl;
#endif
// removal of first line of sensor data
for (int j = 0; j < no_of_sensors; j++) { // reiterate through the sensors
    sensorFiles[j] >> temp[0] >> temp[1] >> temp[2] >> temp[3];
    tempQuat.setQuat(temp);
    previousQuat[j] = tempQuat;
}
for (int j = 0; j < no_of_lines - 1; j++) { // iterating thru all lines

    for (int k = 0; k < no_of_sensors; k++) { // and constructing feature
vectors
        sensorFiles[k] >> temp[0] >> temp[1] >> temp[2] >> temp[3];
        tempQuat.setQuat(temp);

        // quaternions from various sensors are stored sequentially
        quaternion_data[i * MAX_SAMPLE_SIZE * MAX_NO_OF_SENSORS
+ j * MAX_NO_OF_SENSORS + k] = tempQuat;

#ifndef DEBUG
    testOutput << quaternion_data[i * MAX_SAMPLE_SIZE * MAX_NO_OF_SENSORS
+ j * MAX_NO_OF_SENSORS + k].get_q1() << " "
    << quaternion_data[i * MAX_SAMPLE_SIZE * MAX_NO_OF_SENSORS
+ j * MAX_NO_OF_SENSORS + k].get_q2() << " "
    << quaternion_data[i * MAX_SAMPLE_SIZE * MAX_NO_OF_SENSORS
+ j * MAX_NO_OF_SENSORS + k].get_q3() << " "
    << quaternion_data[i * MAX_SAMPLE_SIZE * MAX_NO_OF_SENSORS
+ j * MAX_NO_OF_SENSORS + k].get_q4() << " ";
#endif
}

```

```

        } // end of feature vector construction
#endif DEBUG
    testOutput << endl;
#endif
} // end of iteration thru all lines
for (int j = 0; j < no_of_sensors; j++) {
    sensorFiles[j].close();
}
} // end of iteration thru all samples
#endif DEBUG
testOutput.close();
#endif
}

QuatImporter::~QuatImporter() {
    delete [] quaternion_data;
    delete [] size_of_sample;
    delete [] sample_t;
    delete [] data;
}

Quat* QuatImporter::getAbsQuatData() {
    return quaternion_data;
}

double* QuatImporter::getAxisData() {
    double *axisData = new double[total_no_of_lines * 3];
    double *axisAngle;
    for (int i = 0; i < total_no_of_lines; i++) {
        axisAngle = quaternion_data[i].getAxisAngle();
        for (int j = 0; j < 3; j++) {
            axisData[3 * i + j] = axisAngle[j];
        }
    }
    return axisData;
}

int QuatImporter::getDimension() {
    return no_of_sensors*INDIV_DIMENSION;
}

int QuatImporter::getNoOfSamples() {
    return no_of_samples;
}

int *QuatImporter::getSample_t() {
    return sample_t;
}

int QuatImporter::getSizeOfSample(int index) {

```

```

        return size_of_sample[index];
    }

int QuatImporter::getTotNoOfLines() {
    return total_no_of_lines;
}

bool QuatImporter::dataProcessed() {
    return f_data;
}

void QuatImporter::process_data() {
    // variables
    int temp = total_no_of_lines * no_of_sensors * 4;
    data = new double[temp];

#ifdef DEBUG
    ofstream outputFile;
    outputFile.open("test.txt");
#endif

    sample_t = new int[no_of_samples];
    for (int i = 0; i < no_of_samples; i++) {
        sample_t[i] = 0;
    }

    for (int i = 0; i < no_of_samples; i++) {
        // keeps an index of the starting points of each index, so that the fixed
        limits
        // do not need to be used and saves memory
        if (i == 0) sample_t[i] = 0;
        else sample_t[i] += sample_t[i - 1] + size_of_sample[i - 1];

        // converts quaternion data to array form
        for (int j = 0; j < size_of_sample[i]; j++) {
            for (int k = 0; k < no_of_sensors; k++) {
                data[sample_t[i] * no_of_sensors * 4 + j * no_of_sensors * 4 + k *
4] =
                    quaternion_data[i      *      MAX_SAMPLE_SIZE      *
MAX_NO_OF_SENSORS
                        + j * MAX_NO_OF_SENSORS + k].get_q1();
                data[sample_t[i] * no_of_sensors * 4 + j * no_of_sensors * 4 + k * 4
+ 1] =
                    quaternion_data[i      *      MAX_SAMPLE_SIZE      *
MAX_NO_OF_SENSORS
                        + j * MAX_NO_OF_SENSORS + k].get_q2();
                data[sample_t[i] * no_of_sensors * 4 + j * no_of_sensors * 4 + k * 4
+ 2] =
                    quaternion_data[i      *      MAX_SAMPLE_SIZE      *
MAX_NO_OF_SENSORS

```

```

        + j * MAX_NO_OF_SENSORS + k].get_q3();
        data[sample_t[i] * no_of_sensors * 4 + j * no_of_sensors * 4 + k * 4
+ 3] =
            quaternion_data[i      *      MAX_SAMPLE_SIZE      *
MAX_NO_OF_SENSORS
            + j * MAX_NO_OF_SENSORS + k].get_q4();
#endif DEBUG
        outputFile << data[sample_t[i] * no_of_sensors * 4 + j * no_of_sensors * 4 + k * 4] << " "
            << data[sample_t[i] * no_of_sensors * 4 + j * no_of_sensors * 4 + k * 4 + 1] << " "
            << data[sample_t[i] * no_of_sensors * 4 + j * no_of_sensors * 4 + k * 4 + 2] << " "
            << data[sample_t[i] * no_of_sensors * 4 + j * no_of_sensors * 4 + k * 4 + 3] << " "
            << endl;
#endif
}

}

#endif DEBUG
outputFile.close();
#endif
f_data = true;
}

double* QuatImporter::getTransitionalQuatData() {
    if (!dataProcessed()) {
        cout << "data not processed" << endl;
        return 0;
    }
    return data;
}

```

```

/*
 * File: DTW_1.h
 * Author: hame
 *
 * Created on December 14, 2009, 3:29 PM
 */

#ifndef _DTW_1_H
#define _DTW_1_H

#include "../QuatImporter/QuatImporter.h"
#include "../Distance/Distance.h"
//#include "../Debugging.h"

#include <string>

#define MAX_LENGTH_OF_INPUT 1000
#define MAX_LENGTH_OF_DATA 1000
#define MIN_WINDOW 0
#define MAX_WINDOW 70

class DTW_1 {
public:
    DTW_1();
    DTW_1(QuatImporter *q, string name); // takes sample data from a
    quatimporter
    DTW_1(double *data, int *sample_t, int no_of_samples, int dimension, int
    no_of_lines, string name); // data is feature vectors, sample_t records size of
    each sample
    DTW_1(const DTW_1& orig);
    virtual ~DTW_1();
    double getDistance(double *input, int size);

private:
    double minVal(double val1, double val2);
    double maxVal(double val1, double val2);
    int minVal_int(int val1, int val2);
    int maxVal_int(int val1, int val2);
    double *data;
    int *sample_t, no_of_lines, dimension, no_of_samples;
    string name;
};

#endif /* _DTW_1_H */

```

```

/*
 * File: DTW_1.cpp
 * Author: hame
 *
 * Created on December 14, 2009, 3:29 PM
 */

#include "DTW_1.h"

DTW_1::DTW_1() {
}

DTW_1::DTW_1(QuatImporter* q, string name) {
    double *temp;
    int *temp_int;

    this->no_of_lines = q->getTotNoOfLines();
    this->no_of_samples = q->getNoOfSamples();
    this->dimension = q->getDimension();
    this->data = new double[no_of_lines * dimension];
    this->sample_t = new int[no_of_samples];
    this->name = name;

    temp = q->getTransitionalQuatData();
    for (int i = 0; i < no_of_lines * dimension; i++) {
        this->data[i] = temp[i];
    }
    temp_int = q->getSample_t();
    for (int i = 0; i < no_of_samples; i++) {
        this->sample_t[i] = temp_int[i];
    }
}

DTW_1::DTW_1(double* data, int* sample_t, int no_of_samples, int
dimension, int no_of_lines, string name) {
    this->data = new double[no_of_lines * dimension];
    this->no_of_lines = no_of_lines;
    this->dimension = dimension;
    this->no_of_samples = no_of_samples;
    this->sample_t = new int[no_of_lines];
    this->name = name;

    for (int i = 0; i < no_of_lines * dimension; i++) {
        this->data[i] = data[i];
    }

    for (int i = 0; i < no_of_lines; i++) {
        this->sample_t[i] = sample_t[i];
    }
}

```

```

}

DTW_1::DTW_1(const DTW_1& orig) {

}

DTW_1::~DTW_1() {
    delete[] data;
    delete[] sample_t;
}

double DTW_1::getDistance(double* input, int size) {
    double distance, minDistance = 99999, avgDistance = 0;
    int temp = 0;
    int window = 0;
    double *temp_array;
    double options[3];
    string temp_filename;
    temp_array = new double[MAX_LENGTH_OF_DATA * MAX_LENGTH_OF_INPUT];

#ifdef DEBUG
    ofstream outputFile;
    temp_filename = name + "_DTW_1_dist.txt";
    outputFile.open(temp_filename.c_str());
#endif

    for (int i = 0; i < no_of_samples; i++) {
        // distance between first 2 initial vectors
        temp_array[0] = 2 * Distance::QuatDist(&data[sample_t[i]] * dimension,
                                               input, dimension);

        if (i == no_of_samples - 1) temp = no_of_lines;
        else temp = sample_t[i + 1];

        if (size > (temp - sample_t[i])) window = size - (temp - sample_t[i]) + MIN_WINDOW;
        else window = (temp - sample_t[i]) - size + MIN_WINDOW;
        if (window > MAX_WINDOW) continue;
        // window = MAX_WINDOW;

        for (int j = 1; j < temp - sample_t[i]; j++) {
            temp_array[j * MAX_LENGTH_OF_INPUT] = 99999;
        }

        for (int j = 1; j < size; j++) {
            temp_array[j] = 99999;
        }

        for (int j = 1; j < temp - sample_t[i]; j++) {

```

```

        for (int k = maxVal_int(1, j - window); k < minVal_int(size, j +
window + 1); k++) {
            distance = Distance::QuatDist(&data[(j + sample_t[i]) * dimension],
&input[k * dimension],
dimension);
#endif DEBUG
/*
        outputFile << i << ":" << j << " " << k << " " << distance << endl;
        outputFile << "-----" <<
            distance           +           minVal(temp_array[j]           *
MAX_LENGTH_OF_INPUT + k - 1],
            minVal(temp_array[(j - 1) * MAX_LENGTH_OF_INPUT + k -
1] + distance,
            temp_array[(j - 1) * MAX_LENGTH_OF_INPUT + k])) <<
            "-----" << endl;
        for (int z = 0; z < dimension; z++) {
            outputFile << data[(j + sample_t[i]) * dimension + z] << " ";
        }
        outputFile << endl;
        for (int z = 0; z < dimension; z++) {
            outputFile << input[k * dimension + z] << " ";
        }
        outputFile << endl;
    */
#endif
if (k - 2 < 0 || (j - 1) - (k - 2) > window || (k - 2) - (j - 1) > window)
    options[0] = 99999;
else {
    options[0] = temp_array[(j - 1) * MAX_LENGTH_OF_INPUT +
k - 2]
        + 2 * Distance::QuatDist(&data[((j) + sample_t[i]) *
dimension],
&input[(k - 1) * dimension], dimension);
}
options[1] = temp_array[(j - 1) * MAX_LENGTH_OF_INPUT + k -
1] + distance;
if (j - 2 < 0 || (j - 2) - (k - 1) > window || (k - 1) - (j - 2) > window)
    options[2] = 99999;
else {
    options[2] = temp_array[(j - 2) * MAX_LENGTH_OF_INPUT +
k - 1]
        + 2 * Distance::QuatDist(&data[((j - 1) + sample_t[i]) *
dimension],
&input[(k) * dimension], dimension);
}
temp_array[j * MAX_LENGTH_OF_INPUT + k] =
    distance + minVal(options[0],
minVal(options[1],
options[2]));

```

```

        }
    }

#endif DEBUG
    outputFile
        << 100 * temp_array[(temp - (sample_t[i] + 1)) *
MAX_LENGTH_OF_INPUT + size - 1] / (temp - sample_t[i] + size)
        << endl;
#endif
    if (temp_array[(temp - (sample_t[i] + 1)) * MAX_LENGTH_OF_INPUT
+ size - 1] != 0)
        minDistance = minVal(minDistance,
            100 * temp_array[(temp - (sample_t[i] + 1)) *
MAX_LENGTH_OF_INPUT + size - 1]
            / (temp - sample_t[i] + size)
            );
    avgDistance += 100 * temp_array[(temp - (sample_t[i] + 1)) *
MAX_LENGTH_OF_INPUT + size - 1]
            / (temp - sample_t[i] + size);
}
#endif DEBUG
outputFile << "Min Distance : " << minDistance;
outputFile.close();
#endif
delete[] temp_array;
//return minDistance;
avgDistance /= no_of_samples;
return minDistance;
}

double DTW_1::maxVal(double val1, double val2) {
    return val1 > val2 ? val1 : val2;
}

double DTW_1::minVal(double val1, double val2) {
    return val1 < val2 ? val1 : val2;
}

int DTW_1::maxVal_int(int val1, int val2) {
    return val1 > val2 ? val1 : val2;
}

int DTW_1::minVal_int(int val1, int val2) {
    return val1 < val2 ? val1 : val2;
}

```

```

/*
* Quat.h
*
* Created on: Oct 12, 2009
* Author: G0800508
*
* q1 x
* q2 y
* q3 z
* q4 w
*/
#endif QUAT_H_
#define QUAT_H_

#include <iostream>

using namespace std;

class Quat {
public:
    Quat();
    Quat(Quat &dup);
    Quat(double q1, double q2, double q3, double q4);
    virtual ~Quat();
    Quat & operator=(const Quat &rhs); // does a deep copy to a new Quat
    Quat & operator+=(const Quat &rhs);
    Quat & operator-=(const Quat &rhs);
    Quat & operator*=(const Quat &rhs);
    const Quat & operator*(const Quat &rhs);
    const Quat & operator+(const Quat &rhs);
    const Quat & operator-(const Quat &rhs);
    double get_q1() const;
    double get_q2() const;
    double get_q3() const;
    double get_q4() const;
    double *getAxisAngle();
    void setQuat(double q1, double q2, double q3, double q4);
    void setQuat(double quat[]);
    void toUpperHemi();
    void printQuat();
    bool isnormq();
    void qnorm();
    Quat &qconj();
private:
    double q1;
    double q2;
    double q3;
    double q4;
};

```

```
#endif /* QUAT_H_ */
```

```

/*
 * Quat.cpp
 *
 * Created on: Oct 12, 2009
 * Author: G0800508
 */

#include "Quat.h"
#include <iostream>
#include <cmath>

using namespace std;

Quat::Quat() {
    // creates a default 1 quat
    this->q1 = 0;
    this->q2 = 0;
    this->q3 = 0;
    this->q4 = 1;
}

Quat::Quat(Quat &dup) {
    // creates a duplicate
    this->q1 = dup.get_q1();
    this->q2 = dup.get_q2();
    this->q3 = dup.get_q3();
    this->q4 = dup.get_q4();
}

Quat::Quat(double q1, double q2, double q3, double q4) {
    this->q1 = q1;
    this->q2 = q2;
    this->q3 = q3;
    this->q4 = q4;

    //toUpperHemi();
}

Quat::~Quat() {

}

Quat & Quat::operator =(const Quat & rhs) {
    if (this == &rhs) return *this;
    this->q1 = rhs.get_q1();
    this->q2 = rhs.get_q2();
    this->q3 = rhs.get_q3();
    this->q4 = rhs.get_q4();
}

```

```

//toUpperHemi();

    return (*this);
}

Quat & Quat::operator +=(const Quat & rhs) {
    this->q1 += rhs.q1;
    this->q2 += rhs.q2;
    this->q3 += rhs.q3;
    this->q4 += rhs.q4;

    //toUpperHemi();

    return *this;
}

Quat & Quat::operator -=(const Quat & rhs) {
    this->q1 -= rhs.q1;
    this->q2 -= rhs.q2;
    this->q3 -= rhs.q3;
    this->q4 -= rhs.q4;

    //toUpperHemi();

    return *this;
}

Quat & Quat::operator *=(const Quat & rhs) {
    double q1_1, q1_2, q1_3, q1_4, q2_1, q2_2, q2_3, q2_4;

    q1_1 = this->q1;
    q1_2 = this->q2;
    q1_3 = this->q3;
    q1_4 = this->q4;

    q2_1 = rhs.q1;
    q2_2 = rhs.q2;
    q2_3 = rhs.q3;
    q2_4 = rhs.q4;

    this->q1 = (q1_1 * q2_4) + (q1_2 * q2_3) - (q1_3 * q2_2) + (q1_4 * q2_1);
    this->q2 = -(q1_1 * q2_3) + (q1_2 * q2_4) + (q1_3 * q2_1) + (q1_4 *
    q2_2);
    this->q3 = (q1_1 * q2_2) - (q1_2 * q2_1) + (q1_3 * q2_4) + (q1_4 * q2_3);
    this->q4 = -(q1_1 * q2_1) - (q1_2 * q2_2) - (q1_3 * q2_3) + (q1_4 * q2_4);

    //toUpperHemi();

    return *this;
}

```

```

}

const Quat & Quat::operator *(const Quat & rhs) {
    return Quat(*this) *= rhs;
}

const Quat & Quat::operator +(const Quat & rhs) {
    return Quat(*this) += rhs;
}

const Quat & Quat::operator -(const Quat & rhs) {
    return Quat(*this) -= rhs;
}

double Quat::get_q1() const {
    return this->q1;
}

double Quat::get_q2() const {
    return this->q2;
}

double Quat::get_q3() const {
    return this->q3;
}

double Quat::get_q4() const {
    return this->q4;
}

double* Quat::getAxisAngle() {
    double *AxisAngle; // angle x y z
    AxisAngle = new double[4];
    AxisAngle[0] = 2 * acos(q4);
    AxisAngle[1] = q1 / sqrt(1 - q4 * q4);
    AxisAngle[2] = q2 / sqrt(1 - q4 * q4);
    AxisAngle[3] = q3 / sqrt(1 - q4 * q4);

    return AxisAngle;
}

void Quat::setQuat(double q1, double q2, double q3, double q4) {
    this->q1 = q1;
    this->q2 = q2;
    this->q3 = q3;
    this->q4 = q4;
    //toUpperHemi();
}

void Quat::setQuat(double quat[]) {

```

```

this->q1 = quat[0];
this->q2 = quat[1];
this->q3 = quat[2];
this->q4 = quat[3];
//toUpperHemi();
}

void Quat::toUpperHemi() {
    if (q2<0) {
        q1 = -q1;
        q2 = -q2;
        q3 = -q3;
        q4 = -q4;
    }
}

void Quat::printQuat() {
    cout << "Quat" << " (q1, q2, q3, q4): ";
    cout << this->get_q1() << " ";
    cout << this->get_q2() << " ";
    cout << this->get_q3() << " ";
    cout << this->get_q4() << " ";
    cout << endl;
}

void Quat::qnorm() {
    double norm = 1;
    if (this->isnormq()) return;
    norm = sqrt(pow((*this).q1, 2) + pow((*this).q2, 2) + pow((*this).q3, 2) +
    pow((*this).q4, 2));
    (*this).q1 /= norm;
    (*this).q2 /= norm;
    (*this).q3 /= norm;
    (*this).q4 /= norm;
}

Quat &Quat::qconj() {
    return *(new Quat(-(*this).q1, -(*this).q2, -(*this).q3, (*this).q4));
}

bool Quat::isnormq() {
    double norm = sqrt(pow((*this).q1, 2) + pow((*this).q2, 2) +
    pow((*this).q3, 2) + pow((*this).q4, 2));
    return (abs(norm - 1) < 1e-9);
}

```

```

/*
 * File: Distance.h
 * Author: HCJ
 *
 * static distance for calculating distance
 *
 * Created on December 3, 2009, 5:10 PM
 */

#ifndef _DISTANCE_H
#define _DISTANCE_H

#include <math.h>
#include <iostream>

using namespace std;

class Distance {
public:
    Distance();
    Distance(const Distance& orig);
    virtual ~Distance();
    static double mahalanobisDist(double *c1, double *c2, int dimension);
    static double minkowskiDist(double *c1, double *c2, int dimension);
    static double EucDist(double *c1, double *c2, int dimension);
    static double QuatDist(double *c1, double *c2, int dimension);
private:
};

#endif /* _DISTANCE_H */

```

```

/*
 * File: Distance.cpp
 * Author: HCJ
 *
 * Created on December 3, 2009, 5:10 PM
 */

#include "Distance.h"

Distance::Distance() {
}

Distance::Distance(const Distance& orig) {
}

Distance::~Distance() {
}

double Distance::mahalanobisDist(double* c1, double* c2, int dimension) {
    //TODO mahalanobis dist
    return EucDist(c1, c2, dimension);
}

double Distance::EucDist(double* c1, double* c2, int dimension) {
    double total = 0;
    for (int i = 0; i < dimension; i++) {

        total += pow((100 * c1[i] - 100 * c2[i]), 2);
    }

    //return total;
    return sqrt(total);
}

double Distance::minkowskiDist(double* c1, double* c2, int dimension) {
    double total = 0;
    for (int i = 0; i < dimension; i++) {
        total += pow(fabs(c1[i] - c2[i]), dimension);
    }
    return pow(total, 1 / dimension);
}

double Distance::QuatDist(double* c1, double* c2, int dimension) {
    double total = 0;
    double temp_total[2];

    for (int i = 0; i < dimension / 4; i++) {
        temp_total[0] = 0;
        temp_total[1] = 0;
        for (int j = 0; j < 4; j++) {

```

```
    temp_total[0] += pow(fabs(c1[i*4+j] - c2[i*4+j]), 2);
    temp_total[1] += pow(fabs(c1[i*4+j] + c2[i*4+j]), 2);
}
if (sqrt(temp_total[0]) > sqrt(temp_total[1])) total += sqrt(temp_total[1]);
else total += sqrt(temp_total[0]);
}
return total;
}
```

Appendix B Dynamic Time Warping Results

Below are distance measures for dynamic time warping with slope constraint 1.

	beckon	fold	no	nod	please	shake	think	wave
wave1								
	217.84	430.01	334.644	305.773	305.399	242.449	264.333	
	230.245	472.195	334.562	298.365	301.629	267.475	218.593	108.666
	208.204	429.25	327.287	306.283	296.112	254.816	236.602	142.592
	229.918	424.708	335.044	307.604	291.038	270.785	217.093	136.929
	231.727	431.915	333.042	312.184	301.143	256.543	245.802	135.552
	216.639	406.321	327.666	305.314	297.635	253.284	232.311	105.383
	235.789	425.508	324.372	311.336	300.911	268.211	230.047	84.8704
	15337.5	435.044	325.324	313.146	295.088	265.323	208.546	136.105
	241.681	431.838	323.744	314.98	299.198	265.332	215.149	148.962
	215.358	416.786	326.419	312.976	297.901	263.641	225.445	102.699
	234.117	444.868	322.002	314.951	290.95	252.337	203.853	127.591
	240.828	426.108	321.142	317.82	299.859	255.929	224.498	139.668
	231.589	430.454	323.868	315.831	296.116	256.36	237.793	97.6436
	229.54	448.166	323.535	319.434	297.417	265.166	222.664	121.448
	226.672	416.88	329.822	311.565	301.916	248.853	213.623	109.654
AVG	1235.176467	431.3367333	327.4982	311.1708	298.154133	259.100267	226.4234667	121.268786
MIN	208.204	406.321	321.142	298.365	290.95	242.449	203.853	84.8704

	beckon	fold	no	nod	please	shake	think	wave
wave2								
	201.452	445.847	314.169	288.612	284.731	229.066	229.575	108.666
	193.255	9267.88	306.788	293.102	288	248.535	214.863	
	190.062	10905.2	309.246	290.085	280.642	234.081	210.922	53.2833
	203.601	406.574	307.353	287.329	274.089	248.857	204.022	55.4591
	207.391	420.241	310.283	297.207	280.658	235.877	215.347	84.5284
	201.316	399.941	300.914	289.336	279.32	233.616	207.833	95.7071
	200.282	424.053	302.798	291.421	285.495	242.907	202.919	89.4429
	209.547	426.361	303.536	292.99	281.869	238.728	195.946	130.682
	205.969	444.17	304.88	295.203	283.283	242.432	191.103	67.8283
	193.92	426.193	306.488	294.842	293.019	241.752	198.849	104.72
	184.108	10775.9	304.61	297.486	274.976	227.134	189.643	53.4982
	205.667	438.326	10460.3	310.285	288.784	224.461	206.521	70.7673
	202.813	439.987	302.796	297.528	288.508	243.605	201.177	112.339
	194.763	10582	305.445	301.861	283.02	236.293	200.342	55.1074
	200.795	424.761	309.1	301.525	291.718	239.448	197.428	72.9092
AVG	199.6627333	3081.828933	983.247067	295.2541333	283.874133	237.786133	204.4326667	82.4955857
MIN	184.108	399.941	300.914	287.329	274.089	224.461	189.643	53.2833

	beckon	fold	no	nod	please	shake	think	wave
wave3								
	199.815	12285.1	295.398	288.483	283.132	239.603	240.608	142.592
	202.564	9652.55	296.112	291.413	278.78	256.775	191.69	53.2833
	205.039	11441.7	298.191	284.97	271.766	240.372	213.817	
	205.753	422.464	302.846	280.206	269.597	258.687	203.101	33.4372
	222.74	435.805	297.376	282.847	279.245	244.079	213.379	43.9908
	206.199	420.714	289.634	283.146	275.098	242.791	212.189	107.084
	208.493	437.2	291.001	283.49	278.237	251.641	208.318	113.717
	213.825	436.635	293.374	285.068	279.358	248.271	199.29	63.9735
	216.676	11792.5	294.17	287.833	271.519	244.164	190.971	58.7834
	200.992	441.173	287.809	285.35	274.993	247.595	198.754	110.889
	185.229	11299.5	293.88	289.25	267.347	237.358	193.4	58.5705
	215.048	12422.4	10952.9	289.896	275.883	237.419	199.955	77.2628
	218.756	456.14	293.461	288.894	274.713	251.162	221.935	151.628
	213.462	11086.5	293.058	293.928	274.649	241.401	209.696	66.7213
	217.166	443.384	296.318	295.041	284.693	248.27	199.789	76.0619
AVG	208.7838	5564.917667	1005.0352	287.321	275.934	245.972533	206.4594667	82.7139071
MIN	185.229	420.714	287.809	280.206	267.347	237.358	190.971	33.4372

	beckon	fold	no	nod	please	shake	think	wave
wave4								
	208.641	12106.6	301.982	296.551	290.654	247.232	237.065	136.929
	209.589	9542.03	309.265	296.113	287.427	266.261	193.97	55.4591
	202.452	11286.7	303.326	291.02	278.744	249.773	212.352	33.4372
	212.329	424.89	302.846	287.807	276.219	268.348	203.782	
	229.671	438.118	302.148	291.033	285.176	252.925	213.346	47.306
	212.623	416.425	294.079	289.019	283.988	251.163	214.905	114.189
	217.525	439.537	295.67	289.014	289.168	259.996	210.738	112.211
	223.309	438.78	296.728	291.134	284.018	257.061	203.649	73.3648
	225.667	11627.9	296.895	291.94	279.027	253.097	193.093	75.0764
	210.009	442.737	294.166	289.531	281.837	258.479	202.168	113.917
	193.983	11148.3	296.351	292.987	273.418	244.124	200.192	62.5339
	224.508	454.347	10810.8	293.628	282.681	246.729	204.509	89.0301
	227.579	456.373	297.024	292.767	280.093	258.792	214.628	152.234
	221.82	10941	295.798	297.317	282.862	249.567	214.232	70.8517
	223.101	443.562	298.668	297.662	299.622	252.747	202.413	80.7819
AVG	216.1870667	4707.153267	999.7164	292.5015333	283.662267	254.4196	208.0694667	86.9515071
MIN	193.983	416.425	294.079	287.807	273.418	244.124	193.093	33.4372

	beckon	fold	no	nod	please	shake	think	wave
wave5								
	209.238	437.884	300.71	280.178	278.982	229.506	233.435	135.552
	195.203	9250.75	289.928	286.917	282.078	246.109	221.563	84.5284
	180.93	10881.4	292.436	278.581	274.709	231.793	214.371	43.9908
	201.368	404.283	293.542	274.59	267.548	246.473	207.701	47.306
	208.663	415.613	295.539	283.969	268.973	234.999	213.636	
	195.827	394.221	288.654	277.4	274.848	231.134	213.919	86.2415
	198.738	421.18	288.69	278.408	279.478	241.005	206.771	107.865
	203.238	424.286	291.608	278.595	276.272	238.593	204.428	94.3069
	202.566	438.573	293.11	285.428	273.29	237.465	204.407	59.0799
	196.14	424.554	292.87	283.092	287.45	237.184	207.139	94.6622
	178.073	10752.7	292.272	286.209	270.704	227.089	199.568	63.5637
	202.875	435.978	10438.5	298.492	281.23	225.916	210.747	82.5679
	196.009	439.101	290.621	285.107	278.297	238.723	201.781	94.673
	190.449	10559.7	292.962	289.609	273.801	232.241	206.094	78.9771
	194.929	422.616	297.894	290.546	284.193	233.909	206.251	106.33
AVG	196.9497333	3073.5226	969.289067	283.8080667	276.7902	235.475933	210.1207333	84.2603143
MIN	178.073	394.221	288.654	274.59	267.548	225.916	199.568	43.9908

	beckon	fold	no	nod	please	shake	think	wave
wave6								
	199.253	439.409	296.237	293.386	282.826	225.709	234.025	105.383
	195.179	8920.66	293.022	284.25	285.446	239.466	217.573	95.7071
	185.791	456.805	293.434	287.703	282.146	237.135	220.418	107.084
	197.938	409.988	293.213	279.385	275.072	241.668	219.02	114.189
	205.975	416.293	300.794	280.561	276.222	227.453	221.761	86.2415
	195.699	389.852	293.055	275.494	285.408	224.978	215.376	
	196.775	419.635	292.611	283.491	279.17	234.232	213.189	65.4192
	207.935	423.397	304.918	288.992	288.817	232.977	210.927	68.7059
	204.175	448.473	296.138	282.857	271.143	233.189	227.175	93.3875
	189.167	420.639	292.91	284.89	274.384	230.88	240.531	56.9538
	197.576	471.232	291.29	287.197	273.391	215.441	220.923	107.492
	204.193	438.914	298.742	291.759	276.798	215.835	222.46	88.9354
	197.87	441.266	292.333	292.453	273.271	231.63	228.244	78.9872
	196.598	480.138	297.637	289.179	275.542	224.312	217.732	129.042
	190.455	421.874	301.788	290.14	287.076	227.611	216.172	108.222
AVG	197.6386	999.905	295.8748	286.1158	279.114133	229.501067	221.7017333	93.2678286
MIN	185.791	389.852	291.29	275.494	271.143	215.441	210.927	56.9538

	beckon	fold	no	nod	please	shake	think	wave
wave7								
	188.902	436.336	301.876	294.55	290.181	225.896	222.047	84.8704
	187.975	8635.63	298.634	289.305	277.47	238.834	200.279	89.4429
	181.965	440.719	295.416	291.841	273.568	230.528	210.144	113.717
	191.208	412.697	297.61	283.887	271.381	242.767	202.193	112.211
	199.144	417.452	303.432	286.865	273.549	229.212	203.828	107.865
	188.16	385.997	298.134	279.665	276.458	236.33	215.323	65.4192
	189.733	422.408	297.501	289.88	279.876	231.382	201.254	
	209.191	425.223	301.767	289.979	279.31	239.318	215.297	104.138
	199.354	438.521	304.056	287.509	271.504	240.959	195.773	114.324
	181.17	418.466	299.544	292.41	273.144	234.128	208.649	115.774
	197.488	454.362	301.564	298.743	269.376	216.222	188.096	103.206
	199.552	438.375	302.021	297.548	275.256	207.423	202.698	102.798
	192.271	441.258	301.719	295.685	272.874	228.18	211.491	81.317
	190.637	459.076	305.035	294.218	274.347	219.339	234.614	86.5185
	190.082	418.301	307.877	294.39	283.967	225.069	196.431	96.8693
AVG	192.4554667	976.3214	301.079067	291.0983333	276.150733	229.7058	207.2078	98.4621643
MIN	181.17	385.997	295.416	279.665	269.376	207.423	188.096	65.4192

	beckon	fold	no	nod	please	shake	think	wave
wave8								
	211.949	454.228	296.655	288.075	284.859	236.641	237.917	136.105
	202.703	9302.36	295.032	292.187	286.586	249.688	234.133	130.682
	193.973	10952.9	298.337	286.329	279.724	239.574	229.347	63.9735
	207.591	410.285	299.26	279.289	274.358	250.948	225.009	73.3648
	215.576	419.432	299.531	289.951	279.635	239.845	235.227	94.3069
	204.011	396.819	293.052	281.195	280.329	234.407	232.573	68.7059
	205.033	423.369	295.874	285.422	290.596	244.981	225.518	104.138
	212.443	427.408	298.336	285.962	275.168	241.908	220.418	
	210.423	461.938	298.991	290.338	286.473	245.436	218.162	51.2062
	202.214	426.823	299.013	288.243	285.825	239.777	222.519	77.7346
	192.198	10822.5	297.735	291.861	275.34	230.363	213.731	90.2762
	210.781	455.655	10504.2	300.49	289.247	229.429	227.265	132.113
	204.078	449.7	298.714	293.279	291.363	247.402	225.765	98.419
	200.362	10627	301.112	296.549	285.351	240.646	223.096	109.601
	202.141	430.519	302.853	297.38	292.09	243.274	220.261	137.549
AVG	205.0317333	3097.395733	978.579667	289.77	283.796267	240.9546	226.0627333	97.7267929
MIN	192.198	396.819	293.052	279.289	274.358	229.429	213.731	51.2062

	beckon	fold	no	nod	please	shake	think	wave
wave9								
	192.086	12195.2	294.14	289.331	275.077	236.713	246.799	148.962
	195.674	9596.98	299.654	294.227	275.164	249.458	219.101	67.8283
	197.972	11363.7	298.275	286.467	268.325	236.817	235.395	58.7834
	203.764	428.157	298.389	280.093	265.751	250.277	228.699	75.0764
	214.252	445.197	296.253	282.244	272.653	237.287	234.325	59.0799
	203.147	430.507	290.011	281.494	270.454	234.865	232.8	93.3875
	202.204	448.846	292.996	283.695	276.564	241.33	229.785	114.324
	206.714	449.58	296.642	284.963	274.899	241.179	219.881	51.2062
	211.371	11709.6	297.927	287.836	263.831	239.915	213.759	
	197.828	452.078	292.295	286.352	267.197	236.205	221.343	101.005
	185.341	11223.4	296.462	290.669	259.633	227.733	214.171	75.4875
	211.447	12330.5	10881.4	291.042	269.118	227.069	220.979	64.9171
	212.486	468.216	298.804	289.925	266.066	245.602	233.485	148.135
	209.074	11013.3	299.368	294.867	269.379	235.048	227.605	80.091
	210.187	453.647	301.555	296.422	282.784	239.526	224.143	81.6081
AVG	203.5698	5533.9272	1002.27807	287.9751333	270.459667	238.6016	226.818	87.1351
MIN	185.341	428.157	290.011	280.093	259.633	227.069	213.759	51.2062

	beckon	fold	no	nod	please	shake	think	wave
wave10								
	210.698	440.726	302.203	295.246	295.538	237.064	229.999	102.699
	204.948	8620.73	300.919	287.738	278.404	251.57	224.546	104.72
	193.056	452.172	294.449	291.166	274.52	247.682	235.014	110.889
	210.099	412.29	296.152	286.217	282.459	255.53	222.084	113.917
	219.995	422.553	301.216	289.497	282.571	243.701	227.968	94.6622
	208.365	396.505	293.829	281.64	278.83	248.636	239.948	56.9538
	210.402	425.503	296.254	289.842	286.11	245.419	220.224	115.774
	222.743	426.825	297.683	291.238	282.829	258.452	236.847	77.7346
	216.946	446.564	297.961	287.661	269.227	260.544	225.159	101.005
	201.575	424.587	295.217	291.027	275.11	245.865	236.866	
	212.043	459.726	295.669	296.292	266.927	232.026	220.365	114.171
	217.41	437.786	293.613	295.252	277.765	232.775	231.65	90.4831
	212.41	442.353	295.997	293.77	273.879	244.641	240.507	78.0555
	210.372	475.314	298.411	294.074	277.106	238.916	253.901	110.839
	200.16	425.896	299.79	291.376	282.415	237.444	224.323	114.775
AVG	210.0814667	980.6353333	297.290867	290.8024	278.912667	245.351	231.2934	99.0484429
MIN	193.056	396.505	293.613	281.64	266.927	232.026	220.224	56.9538

	beckon	fold	no	nod	please	shake	think	wave
wave11								
	187.496	437.541	290.738	282.118	273.511	226.32	218.612	127.591
	182.902	9442.91	294.014	286.996	271.824	242.964	183.729	53.4982
	182.591	11148.3	293.538	279.096	263.634	228.416	199.913	58.5705
	191.622	406.488	291.889	273.889	260.409	243.824	190.43	62.5339
	204.661	421.458	291.469	286.644	268.161	229.13	201.436	63.5637
	190.044	401.934	284.706	277.103	268.909	227.179	198.02	107.492
	188.91	424.163	284.818	277.116	285.318	235.654	195.675	103.206
	197.494	423.923	287.961	278.122	269.314	230.909	184.919	90.2762
	197.098	11481.1	288.517	280.637	272.602	234.392	174.027	75.4875
	190.736	426.92	296.434	278.875	264.676	234.641	185.147	114.171
	173.778	11013.3	287.674	282.718	257.546	220.644	178.965	
	198.98	436.089	10683.8	284.199	266.038	219.225	189.655	62.7581
	199.197	438.965	288.835	281.774	270.574	238.291	192.597	122.536
	192.224	10810.8	288.847	286.915	281.3	228.189	190.729	57.3113
	204.672	425.204	292.035	288.759	282.402	232.251	185.421	49.5943
AVG	192.1603333	3875.939667	983.018333	281.6640667	270.414533	231.4686	191.285	82.0421214
MIN	173.778	401.934	284.706	273.889	257.546	219.225	174.027	49.5943

	beckon	fold	no	nod	please	shake	think	wave
wave12								
	206.558	446.766	290.418	280.712	268.105	221.891	224.542	139.668
	190.006	9293.72	286.783	283.337	271.089	236.781	224.342	70.7673
	194.98	10941	287.223	278.92	265.699	224.993	219.861	77.2628
	199.026	400.763	287.126	272.622	260.964	238.762	211.29	89.0301
	206.543	416.314	290.095	279.586	263.853	223.643	219.508	82.5679
	199.999	398.369	282.179	273.015	266.367	223.013	216.312	88.9354
	195.08	423.481	283.592	276.154	275.998	230.578	210.735	102.798
	201.938	422.094	289.563	277.286	270.104	226.525	203.454	132.113
	201.652	448.506	289.818	278.164	261.819	231.438	198.661	64.9171
	190.686	430.504	290.127	277.826	273.69	226.39	205.43	90.4831
	185.524	10810.9	286.451	282.008	256.016	215.382	197.163	62.7581
	204.394	448.392	10493.2	291.999	278.667	213.884	216.908	
	200.026	450.961	288.095	283.183	273.3	236.404	213.759	111.407
	193.909	10615.8	290.426	284.931	265.938	226.692	205.97	66.8882
	199.89	433.93	295.345	286.423	272.404	226.647	207.879	68.1065
AVG	198.0140667	3092.1	968.696067	280.4110667	268.267533	226.8682	211.7209333	89.1216071
MIN	185.524	398.369	282.179	272.622	256.016	213.884	197.163	62.7581

	beckon	fold	no	nod	please	shake	think	wave
wave13								
	200.547	435.937	303.652	296.862	284.674	235.522	248.715	97.6436
	195.948	487.224	302.119	292.031	277.39	246.255	218.791	112.339
	182.779	439.019	294.118	293.236	273.097	232.067	253.856	151.628
	196.655	415.675	300.598	285.86	269.555	250.522	234.724	152.234
	198.915	420.373	304.189	289.45	293.801	235.888	220.202	94.673
	188.226	387.383	300.469	282.13	275.776	231.616	252.791	78.9872
	193.681	422.388	298.119	291.302	283.722	249.253	231.852	81.317
	220.477	427.691	304.272	291.252	276.945	239.346	213.115	98.419
	200.025	441.33	303.704	292.488	271.241	239.483	214.048	148.135
	181.217	418.325	303.859	293.736	272.017	235.915	227.054	78.0555
	217.687	448.803	302.459	298.271	269.491	231.299	205.991	122.536
	203.8	434.558	300.242	299.18	273.678	230.168	219.134	111.407
	187.323	439.121	305.475	297.305	272.941	230.725	231.897	
	191.406	459.803	305.529	304.746	277.689	226.869	223.661	89.9912
	181.144	415.265	310.176	295.622	285.734	224.95	213.852	111.31
AVG	195.9886667	432.8596667	302.598667	293.5647333	277.1834	235.991867	227.3122	109.191107
MIN	181.144	387.383	294.118	282.13	269.491	224.95	205.991	78.0555

	beckon	fold	no	nod	please	shake	think	wave
wave14								
	183.263	441.78	306.125	295.525	278.059	224.193	235.785	121.448
	176.809	9090.97	297.516	298.284	294.19	236.245	197.502	55.1074
	172.962	434.441	302.717	294.304	283.892	222.953	209.497	66.7213
	184.117	399.028	303.408	295.789	267.195	237.267	199.568	70.8517
	185.729	411.712	313.151	291.892	269.878	224.62	209.976	78.9771
	180.361	392.362	309.721	286.337	282.882	223.01	203.86	129.042
	181.628	415.002	300.297	291.067	284.919	231.879	195.392	86.5185
	188.427	417.419	307.287	292.652	283.72	223.497	189.098	109.601
	182.347	440.283	306.45	295.978	274.572	229.643	201.796	80.091
	172.929	419.467	305.598	295.865	280.554	228.205	204.935	110.839
	163.564	459.576	305.885	299.654	282.487	215.73	194.941	57.3113
	184.395	435.821	10235.5	305.871	278.282	211.608	196.216	66.8882
	177.508	435.883	304.645	305.482	278.046	230.349	196.744	89.9912
	169.014	459.266	307.766	302.276	278.009	223.568	194.091	
	178.359	420.68	320.538	303.319	289.924	227.385	191.941	59.4608
AVG	178.7608	1004.912667	968.440267	296.953	280.4406	226.010133	201.4228	84.4891786
MIN	163.564	392.362	297.516	286.337	267.195	211.608	189.098	55.1074

	beckon	fold	no	nod	please	shake	think	wave
wave15								
	195.923	453.142	312.954	301.806	275.843	232.664	229.747	109.654
	180.457	9267.88	307.861	305.092	283.985	246.312	230.362	72.9092
	183.669	10905.2	309.1	299.46	275.032	232.548	212.956	76.0619
	194.02	411.739	308.948	291.788	261.899	248.549	201.857	80.7819
	198.248	426.304	309.213	298.744	269.302	231.363	216.795	106.33
	189.904	409.662	303.827	293.123	275.886	231.002	215.121	108.222
	187.677	429.897	303.187	294.935	282.536	238.768	206.138	96.8693
	197.878	430.988	308.7	296.576	279.253	233.693	190.523	137.549
	196.953	451.151	309.438	299.866	275.776	238.321	195.768	81.6081
	187.766	432.423	309.5	298.697	290.417	237.448	208.105	114.775
	178.587	10775.9	308.02	303.354	271.131	221.813	185.61	49.5943
	199.666	448.764	10460.3	315.172	282.631	219.882	216.366	68.1065
	193.881	446.392	310.383	302.225	283.25	240.381	198.341	111.31
	186.941	10582	311.02	305.254	277.419	230.481	198.312	59.4608
	198.106	432.116	316.159	307.93	284.467	231.753	202.281	
AVG	191.3117333	3086.903867	985.907333	300.9348	277.9218	234.331867	207.2188	90.9451429
MIN	178.587	409.662	303.187	291.788	261.899	219.882	185.61	49.5943

	beckon	fold	no	nod	please	shake	think	wave
beckon1								
	401.81	310.317	288.052	268.296	198.689	245.596	217.84	
	63.8432	9242.23	298.328	295.024	271.75	204.68	234.523	201.452
	100.473	417.467	307.71	286.29	258.076	193.134	230.164	199.815
	89.7465	383.988	310.159	280.702	247.877	210.561	225.985	208.641
	75.5474	388.953	308.734	281.447	260.174	198.531	226.274	209.238
	104.706	372.309	306.586	280.009	263.258	198.64	215.724	199.253
	65.0511	390.068	303.058	283.958	263.707	204.224	211.854	188.902
	64.6524	390.194	313.043	283.978	261.42	191.117	202.605	211.949
	75.8875	406.882	312.229	289.101	262.065	203.265	217.185	192.086
	100.632	389.008	309.319	287.913	267.44	205.786	225.592	210.698
	98.8902	10741.2	312.255	293.006	254.393	190.282	205.011	187.496
	77.5029	400.729	10427.6	305.187	255.418	182.434	221.96	206.558
	85.9105	398.663	311.091	294.198	255.264	202.899	204.312	200.547
	88.4099	10548.6	313.115	296.458	253.216	194.577	210.806	183.263
	109.56	385.617	320.513	297.876	268.755	212.925	216.156	195.923
AVG	85.77233	2350.515	984.2705	289.5466	260.7406	199.4496	219.5831	200.9107
MIN	63.8432	372.309	298.328	280.009	247.877	182.434	202.605	183.263

	beckon	fold	no	nod	please	shake	think	wave
beckon2								
	63.8432	12690.4	289.855	279.051	264.01	191.917	234.583	230.245
		9901.05	284.362	13513.6	258.835	198.979	201.269	193.255
	53.8704	11792.5	302.366	276.335	247.318	184.522	220.285	202.564
	62.7021	379.561	302.918	266.576	240.787	205.014	215.331	209.589
	46.864	387.114	293.865	267.608	252.983	192.26	220.099	195.203
	50.9607	361.93	291.819	278.872	252.839	191.038	205.182	195.179
	57.0196	14084.6	291.208	273.75	246.259	200.92	198.65	187.975
	50.2583	388.847	301.024	272.641	252.14	184.835	185.986	202.703
	71.2975	12165.5	301.001	282.642	245.271	200.864	202.035	195.674
	82.0444	13262.7	294.146	277.944	242.359	199.89	210.148	204.948
	80.107	11641.5	301.106	283.183	241.573	184.952	189.792	182.902
	76.1713	12837	11274	281.544	239.562	181.192	194.956	190.006
	82.9961	13333.4	303.549	280.943	241.362	207.924	191.091	195.948
	88.8054	11415.6	303.392	288.367	237.974	193.735	201.2	176.809
	112.49	13298	305.856	13986.1	251.443	13587	197.945	180.457
AVG	69.95929	9195.98	1029.364	2073.944	247.6477	1087.003	204.5701	196.2305
MIN	46.864	361.93	284.362	266.576	237.974	181.192	185.986	176.809

	beckon	fold	no	nod	please	shake	think	wave
beckon3								
	100.473	12361	280.002	276.037	264.561	197.213	229.584	208.204
	53.8704	9699.39	278.456	291.795	262.061	208.488	194.767	190.062
		11507.5	291.286	271.575	251.207	190.258	215.993	205.039
	58.1572	372.308	289.681	261.717	244.781	210.82	207.075	202.452
	63.8175	379.183	282.898	263.002	254.469	198.955	209.466	180.93
	85.6038	363.594	279.754	270.278	257.231	197.799	194.375	185.791
	63.5094	386.556	282.09	267.254	258.26	205.068	189.049	181.965
	73.9001	383.801	287.574	266.934	256.577	190.855	179.404	193.973
	71.6528	11862.5	288.902	274.358	250.818	203.673	196.55	197.972
	79.2334	12903.3	282.377	271.129	246.54	206.849	201.97	193.056
	85.3896	11363.7	289.056	276.155	244.455	193.147	185.321	182.591
	71.33	12500.1	11013.3	274.742	245.567	188.698	179.801	194.98
	69.179	12970.3	290.128	273.251	245.965	208.745	210.305	182.779
	92.1327	11148.3	290.75	280.141	242.964	197.486	196.478	172.962
	92.5504	12936.7	291.996	284.783	254.519	222.113	189.732	183.669
AVG	75.77138	8075.882	1001.217	273.5434	251.9983	201.3445	198.658	190.4283
MIN	53.8704	363.594	278.456	261.717	242.964	188.698	179.404	172.962

	beckon	fold	no	nod	please	shake	think	wave
beckon4								
	89.7465	12820.6	275.041	265.141	257.089	177.052	231.021	229.918
	62.7021	9980.09	266.939	13661.3	253.31	186.649	197.426	203.601
	58.1572	11904.8	14513.8	262.409	243.034	166.623	216.132	205.753
		14620	290.593	252.887	235.819	192.733	209.542	212.329
	50.423	14430.1	281.66	252.779	246.16	176.081	213.576	201.368
	40.9586	14450.9	276.9	14556.1	245.836	178.578	197.421	197.938
	66.3227	14245.1	275.919	260.09	236.542	187.864	191.654	191.208
	51.8454	14409.3	288.234	259.227	247.679	167.877	180.323	207.591
	80.1578	12285	288.546	269.896	237.025	185.649	196.317	203.764
	58.6997	13404.9	280.414	263.896	234.376	188.662	201.673	210.099
	103.826	11750.9	288.37	269.13	232.986	172.031	183.09	191.622
	88.8879	12970.2	11376.6	267.521	230.901	165.751	186.29	199.026
	85.2965	13477.2	289.405	267.028	232.833	14409.3	183.881	196.655
	91.4295	11520.8	289.281	275.989	226.998	182.645	194.921	184.117
	98.4039	13440.9	291.99	14144.3	244.583	13736.3	193.57	194.02
AVG	73.34691	13047.39	1971.579	3035.18	240.3447	2031.586	198.4558	201.9339
MIN	40.9586	9980.09	266.939	252.779	226.998	165.751	180.323	184.117

	beckon	fold	no	nod	please	shake	think	wave
beckon5								
	75.5474	12468.9	291.969	280.101	267.827	191.364	242.472	231.727
	46.864	9765.68	288.293	13262.7	265.147	195.767	210.601	207.391
	63.8175	11601	304.72	278.807	253.466	180.67	222.376	222.74
	50.423	373.592	305.257	269.878	247.142	198.686	220.253	229.671
		378.833	296.852	271.236	257.704	189.948	217.87	208.663
	63.6731	360.023	295.742	279.073	259.95	191.542	207.807	205.975
	42.5561	385.425	294.261	276.991	249.753	194.734	200.717	199.144
	45.4689	380.747	304.791	275.831	260.018	174.61	191.196	215.576
	39.588	11961.8	304.638	283.796	250.754	194.014	209.123	214.252
	68.1584	13020.9	299.891	281.382	245.75	197.897	214.097	219.995
	79.938	11454.8	303.902	286.185	245.694	184.095	195.367	204.661
	43.7555	12610.4	11098.9	285.989	241.789	176.963	198.446	206.543
	53.931	13089.1	306.242	284.795	244.953	199.136	205.036	198.915
	85.5509	11236	306.756	290.808	243.381	189.046	202.086	185.729
	96.094	13054.9	309.534	298.255	258.603	13333.4	204.068	198.248
AVG	61.09756	8142.807	1020.783	1147.055	252.7954	1066.125	209.4343	209.9487
MIN	39.588	360.023	288.293	269.878	241.789	174.61	191.196	185.729

	beckon	fold	no	nod	please	shake	think	wave
beckon6								
	104.706	12407	279.886	271.371	261.971	182.488	229.087	216.639
	50.9607	9727.68	275.91	287.021	253.9	189.673	197.017	201.316
	85.6038	11547.4	292.2	267.033	246.063	170.444	210.714	206.199
	40.9586	370.923	292.749	256.265	239.35	193.099	206.143	212.623
	63.6731	375.039	286.154	257.718	249.218	180.61	204.064	195.827
		354.125	281.099	265.739	248.919	183.571	190.11	195.699
	48.9915	381.666	281.007	264.257	241.43	187.106	187.126	188.16
	53.2378	377.766	292.451	262.943	247.81	169.825	179.989	204.011
	53.2351	11904.8	292.072	271.653	240.801	183.936	196.228	203.147
	51.3107	12953.4	284.882	267.405	235.151	191.721	195.525	208.365
	73.4992	11402.6	292.603	272.246	235.478	176.044	180.481	190.044
	61.3591	12547.1	11049.8	272.417	230.682	169.124	182.354	199.999
	74.7701	13020.9	291.266	270.899	235.152	190.919	202.096	188.226
	101.042	11185.7	291.746	278.12	231.664	182.059	188.058	180.361
	95.5685	12987.1	295.205	285.104	250.345	208.156	193.91	189.904
AVG	68.49401	8102.88	1005.269	270.0127	243.1956	183.9183	196.1935	198.7013
MIN	40.9586	354.125	275.91	256.265	230.682	169.124	179.989	180.361

	beckon	fold	no	nod	please	shake	think	wave
beckon7								
	65.0511	12787.8	287.391	283.698	271.71	197.71	237.414	235.789
	57.0196	9960.22	279.608	13624.1	267.985	204.458	211.384	200.282
	63.5094	11876.5	14471.8	278.288	254.767	186.808	225.308	208.493
	66.3227	391.558	302.787	268.252	247.23	209.178	223.371	217.525
	42.5561	14388.6	292.088	267.575	257.836	194.505	223.604	198.738
	48.9915	14409.3	288.724	14513.9	260.002	196.451	209.875	196.775
		14204.6	288.999	274.142	249.627	202.513	205.002	189.733
	36.2432	14367.9	299.852	272.941	258.47	186.703	196.748	205.033
	49.8742	12255	300.302	283.724	250.565	201.035	210.397	202.204
	57.3033	13369.1	291.794	277.514	246.332	206.189	211.915	210.402
	103.655	11723.4	299.933	282.731	246.297	189.856	198.527	188.91
	52.6916	12936.7	11350.8	280.904	245.174	183.523	204.563	195.08
	60.2027	13441	302.129	280.482	245.058	14367.9	200.445	193.681
	70.2202	11494.3	301.509	289.404	243.173	198.875	205.571	181.628
	82.6897	13404.9	303.587	14104.5	257.811	13698.7	208.074	187.677
AVG	61.16645	12067.39	1977.42	3038.81	253.4691	2041.627	211.4799	200.7967
MIN	36.2432	391.558	279.608	267.575	243.173	183.523	196.748	181.628

	beckon	fold	no	nod	please	shake	think	wave
beckon8								
	64.6524	13072	286.931	280.387	268.957	198.075	15674.1	15337.5
	50.2583	10131.8	277.666	13947.1	262.35	202.973	223.395	209.547
	73.9001	12121.3	14836.9	276.798	249.089	183.899	237.331	213.825
	51.8454	14947.8	15220.8	266.517	242.41	207.85	238.468	223.309
	45.4689	14749.4	292.278	265.439	261.674	194.785	15290.6	203.238
	53.2378	14771.1	288.847	14881	255.078	198.365	220.292	207.935
	36.2432	14556.1	289.776	273.165	251.316	204.057	15649.5	209.191
		14727.6	300.464	271.919	255.564	180.921	210.682	212.443
	47.234	12515.7	302.327	15674.1	243.896	198.543	218.576	206.714
	67.7645	13680	291.832	277.928	241.01	203.575	221.776	222.743
	83.9539	11961.8	301.002	284.221	241.113	192.576	209.337	197.494
	54.7396	13227.6	11574.1	280.45	240.988	185.561	214.285	201.938
	59.2219	13755.3	304.962	279.963	238.758	14727.6	205.886	220.477
	67.9813	11723.4	303.734	290.983	237.921	15503.9	215.756	188.427
	85.6141	13717.5	303.761	14450.9	251.266	14025.3	221.146	197.878
AVG	60.1511	13310.56	3011.692	4133.391	249.426	3107.199	3283.409	1216.844
MIN	36.2432	10131.8	277.666	265.439	237.921	180.921	205.886	188.427

	beckon	fold	no	nod	please	shake	think	wave
beckon9								
	75.8875	12771.6	288.542	285.099	271.951	196.773	245.446	241.681
	71.2975	9950.41	281.314	13605.6	268.163	200.932	212.896	205.969
	71.6528	11862.6	14451.1	282.15	260.771	186.689	228.938	216.676
	80.1578	389.838	303.198	271.528	255.19	206.23	225.378	225.667
	39.588	14368.1	293.423	271.488	264.418	195.607	224.233	202.566
	53.2351	14388.7	291.321	14493	265.957	196.911	210.608	204.175
	49.8742	14184.6	291.262	277.792	254.564	201.957	207.855	199.354
	47.234	14347.4	301.96	276.797	267.925	180.44	200.16	210.423
		12240.1	301.806	287.092	255.275	197.236	212.375	211.371
	45.6752	13351.4	294.4	282.511	251.97	201.004	215.924	216.946
	90.8614	11709.8	301.727	287.474	251.102	190.941	204.707	197.098
	30.8609	12920.1	11338	285.917	253.051	183.625	205.962	201.652
	36.5998	13423.1	303.61	284.882	252.101	14347.4	206.446	200.025
	50.8879	11481.2	303.89	292.619	247.99	196.567	209.565	182.347
	69.5171	13387.1	306.027	14084.7	265.67	13680.1	208.26	196.953
AVG	58.09494	12051.74	1976.772	3037.91	259.0732	2037.494	214.5835	207.5269
MIN	30.8609	389.838	281.314	271.488	247.99	180.44	200.16	182.347

	beckon	fold	no	nod	please	shake	think	wave
beckon10								
	100.632	12594.6	279.799	273.646	270.288	184.153	239.798	215.358
	82.0444	9842.6	273.09	13404.9	265.29	195.364	204.772	193.92
	79.2334	11709.7	290.687	269.547	261.275	178.862	220.433	200.992
	58.6997	391.21	292.655	261.344	258.895	201.965	215.889	210.009
	68.1584	397.958	284.182	260.361	267.374	188.344	216.039	196.14
	51.3107	373.314	281.954	270.245	263.548	191.315	206.594	189.167
	57.3033	401.966	281.194	266.323	254.803	197.131	198.663	181.17
	67.7645	399.093	291.4	265.925	267.258	174.842	191.228	202.214
	45.6752	12077.4	290.445	274.67	250.162	189.199	205.803	197.828
		13158	285.957	270.948	247.881	194.828	209.96	201.575
	86.6993	11560.8	290.838	275.922	246.442	184.042	195.405	190.736
	52.6304	12738.9	11198.3	274.143	245.812	177.49	194.096	190.686
	82.0658	13227.6	293.236	272.911	247.768	199.357	203.216	181.217
	87.0753	11337.9	293.487	279.887	241.738	190.514	203.452	172.929
	91.855	13192.7	295.069	286.964	265.079	13477.2	199.754	187.766
AVG	72.22481	8226.916	1014.82	1147.182	256.9075	1074.974	207.0068	194.1138
MIN	45.6752	373.314	273.09	260.361	241.738	174.842	191.228	172.929

	beckon	fold	no	nod	please	shake	think	wave
beckon11								
	98.8902	12837	263.879	262.907	256.949	187.697	224.81	234.117
	80.107	9990.05	255.244	13679.9	250.946	196.862	193.623	184.108
	85.3896	11919	14534.9	260.519	244.13	176.925	208.77	185.229
	103.826	14641.4	285.072	249.066	241.981	201.467	210.539	193.983
	79.938	14450.9	269.718	248.653	251.07	186.182	211.123	178.073
	73.4992	14471.8	269.338	14577.3	249.114	188.187	188.226	197.576
	103.655	14265.4	270.888	255.453	244.737	195.679	191.655	197.488
	83.9539	14430.1	278.538	254.772	252.764	173.028	185.932	192.198
	90.8614	12300.2	277.817	267.876	238.685	189.004	191.573	185.341
	86.6993	13422.9	269.876	261.049	235.782	195.89	193.455	212.043
		11764.8	279.838	266.26	237.346	182.273	185.256	173.778
	103.896	12987	11389.6	262.849	236.077	176.125	183.818	185.524
	77.8962	13495.4	282.279	262.508	235.384	14430.1	177.019	217.687
	67.3279	11534.1	281.363	272.634	230.478	189.795	187.968	163.564
	96.174	13459	282.921	14164.3	248.932	13755.2	195.648	178.587
AVG	88.00812	13064.6	1966.085	3036.403	243.625	2041.628	195.2943	191.9531
MIN	67.3279	9990.05	255.244	248.653	230.478	173.028	177.019	163.564

	beckon	fold	no	nod	please	shake	think	wave
beckon12								
	77.5029	12804.3	285.535	286.727	276.212	201.598	246.155	240.828
	76.1713	9970.25	278.029	13642.8	274.013	205.752	211.695	205.667
	71.33	11890.8	14493	283.681	264.391	191.863	228.244	215.048
	88.8879	14598.8	302.003	272.917	258.628	209.975	225.926	224.508
	43.7555	14409.4	291.013	272.779	268.476	200.522	224.498	202.875
	61.3591	14430.2	290.018	14535.1	267.723	202.029	208.561	204.193
	52.6916	14225	289.528	278.989	255.684	206.154	205.487	199.552
	54.7396	14388.7	299.723	278.591	270.656	186.772	198.277	210.781
	30.8609	12270.1	299.335	289.214	257.92	203.095	212.959	211.447
	52.6304	13387.1	291.951	284.161	254.538	205.499	215.087	217.41
	103.896	11737.3	300.246	289.056	253.797	197.087	203.83	198.98
		12953.5	11363.8	287.704	255.004	190.711	204.18	204.394
	42.7715	13459.2	301.971	286.559	255.037	14388.7	206.313	203.8
	51.6693	11507.6	302.175	295.037	249.838	202.624	208.493	184.395
	63.5143	13423	304.394	14124.5	267.009	13717.6	206.416	199.666
AVG	62.27002	13030.35	1979.515	3047.188	261.9284	2047.332	213.7414	208.2363
MIN	30.8609	9970.25	278.029	272.779	249.838	186.772	198.277	184.395

	beckon	fold	no	nod	please	shake	think	wave
beckon13								
	85.9105	12531.4	284.36	281.281	267.672	193.978	245.905	231.589
	82.9961	9804	279.467	13333.4	265.515	199.102	217.942	202.813
	69.179	11655.1	297.306	280.231	257.601	183.155	229.839	218.756
	85.2965	380.375	298.134	268.986	252.039	202.798	225.559	227.579
	53.931	387.066	289.413	270.135	260	192.151	223.427	196.009
	74.7701	364.519	288.077	278.619	263.103	191.695	212.068	197.87
	60.2027	393.628	287.668	275.504	260.838	196.527	207.924	192.271
	59.2219	388.763	298.194	274.62	264.036	177.394	206.324	204.078
	36.5998	12019.3	298.239	283.927	250.574	192.741	213.831	212.486
	82.0658	13089.1	292.697	281.014	247.89	195.558	216.108	212.41
	77.8962	11507.6	297.953	285.721	246.971	186.778	206.004	199.197
	42.7715	12674.3	11148.4	284.423	247.99	180.208	208.128	200.026
		13158	299.669	283.029	248.577	201.658	209.864	187.323
	47.7962	11286.8	300.362	289.763	245.528	192.082	209.852	177.508
	93.8548	13123.4	302.737	297.194	259.406	13404.9	213.929	193.881
AVG	68.03515	8184.223	1017.512	1151.19	255.8493	1072.715	216.4469	203.5864
MIN	36.5998	364.519	279.467	268.986	245.528	177.394	206.004	177.508

	beckon	fold	no	nod	please	shake	think	wave
beckon14								
	88.4099	12468.9	284.338	283.11	270.418	194.06	239.769	229.54
	88.8054	9765.69	279.937	13262.7	269.246	200.525	209.171	194.763
	92.1327	11601	297.001	282.909	260.34	185.907	221.426	213.462
	91.4295	368.939	298.429	272.086	254.854	204.634	216.717	221.82
	85.5509	374.244	289.538	274.082	261.539	192.696	216.003	190.449
	101.042	357.509	288.775	281.412	263.412	194.7	201.298	196.598
	70.2202	379.581	287.804	278.213	257.755	199.537	198.56	190.637
	67.9813	376.325	298.387	277.817	265.191	179.943	194.51	200.362
	50.8879	11961.8	298.601	286.94	255.167	196.064	206.429	209.074
	87.0753	13020.9	294.327	284.214	251.337	198.217	209.053	210.372
	67.3279	11454.8	298.81	288.948	252.241	188.122	198.175	192.224
	51.6693	12610.4	11098.9	288.417	250.623	183.026	199.48	193.909
	47.7962	13089.1	300.078	286.505	252.153	202.019	203.963	191.406
		11236	300.868	292.924	249.3	193.828	199.961	169.014
	83.2489	13054.9	304	299.73	263.54	13333.4	204.474	186.941
AVG	76.6841	8141.339	1014.653	1149.334	258.4744	1069.779	207.9326	199.3714
MIN	47.7962	357.509	279.937	272.086	249.3	179.943	194.51	169.014

	beckon	fold	no	nod	please	shake	think	wave
beckon15								
	109.56	12547.1	35971.9	279.318	263.513	194.033	246.811	226.672
	112.49	9813.61	35971.4	13351.2	262.376	197.79	219.128	200.795
	92.5504	11668.7	34602.2	279.183	256.932	185.66	228.758	217.166
	98.4039	397.612	34722.4	266.975	253.766	199.051	229.91	223.101
	96.094	404.619	35842.4	268.051	258.931	189.608	225.559	194.929
	95.5685	370.473	35587.3	276.825	259.542	191.207	217.809	190.455
	82.6897	409.29	36630.2	273.687	253.586	194.106	212.508	190.082
	85.6141	406.623	34843.4	273.295	263.096	181.859	206.194	202.141
	69.5171	12033.7	35842.5	282.182	249.173	194.21	220.299	210.187
	91.855	13106.2	36232	278.753	248.265	191.547	220.277	200.16
	96.174	11520.8	35842.4	283.335	246.31	184.657	209.746	204.672
	63.5143	12690.4	32573.8	282.479	250.227	183.133	210.342	199.89
	93.8548	13175.3	35587.8	281.292	249.835	199.686	215.251	181.144
	83.2489	11299.5	35842.9	288.653	248.107	191.811	211.373	178.359
		13140.7	36232.5	295.349	259.548	13422.9	214.809	198.106
AVG	90.79534	8198.975	35488.34	1150.705	254.8805	1073.417	219.2516	201.1906
MIN	63.5143	370.473	32573.8	266.975	246.31	181.859	206.194	178.359

	beckon	fold	no	nod	please	shake	think	wave
think1								
	245.596	340.652	236.048	199.914	208.666	192.598	83.8835	264.333
	234.583	432.517	243.51	172.383	216.508	205.143	73.6529	229.575
	229.584	347.959	218.693	188.76	211.425	203.291	131.13	240.608
	231.021	336.869	229.912	196.066	219.54	207.138	115.58	237.065
	242.472	333.855	231.832	202.592	236.236	201.364	78.0542	233.435
	229.087	308.34	221.031	186.801	216.122	200.306	144.006	234.025
	237.414	341.484	213.919	186.43	227.669	204.275	87.0817	222.047
	15674.1	335.985	214.285	190.782	215.94	202.601	76.6693	237.917
	245.446	339.598	212.634	211.975	217.398	207.588	60.4846	246.799
	239.798	336.432	222.424	179.895	214.379	205.377	85.1436	229.999
	224.81	369.869	215.264	179.358	205.591	197.289	105.787	218.612
	246.155	351.797	203.632	189.524	222.901	204.12	74.3712	224.542
	245.905	363.943	217.568	184.072	219.064	186.834	68.2892	248.715
	239.769	366.601	210.596	202.724	216.321	207.361	97.1924	235.785
	246.811	336.16	217.291	167.462	229.572	182.529	75.2999	229.747
AVG	1267.503	349.4707	220.5759	189.2492	218.4888	200.5209	90.4417	235.5469
MIN	224.81	308.34	203.632	167.462	205.591	182.529	60.4846	218.612

	beckon	fold	no	nod	please	shake	think	wave
think2								
	234.523	386.634	295.327	250.152	245.993	209.202	83.8835	218.593
	201.269	9267.87	280.778	261.712	259.23	221.661		214.863
	194.767	10905.1	280.427	241.368	251.269	213.106	55.4954	191.69
	197.426	362.928	277.622	247.426	251.747	222.116	54.6821	193.97
	210.601	371.156	280.263	256.847	260.851	216.115	70.7956	221.563
	197.017	357.458	272.454	249.919	249.702	207.968	56.5021	217.573
	211.384	373.918	265.341	236.888	267.376	219.434	45.4724	200.279
	223.395	372.032	265.772	239.673	252.535	218.928	56.5777	234.133
	212.896	386.012	265.773	244.42	274.048	232.457	50.395	219.101
	204.772	372.445	276.762	236.178	274.783	215.547	47.9392	224.546
	193.623	10775.9	265.547	239.382	256.098	206.898	61.3888	183.729
	211.695	386.304	10460.3	271.53	270.908	211.318	58.5069	224.342
	217.942	392.403	264.378	243.567	276.148	218.76	81.7091	218.791
	209.171	10582	265.532	245.574	264.062	222.076	64.6383	197.502
	219.128	375.535	280.096	255.59	277.865	221.517	52.6226	230.362
AVG	209.3073	3044.513	953.0915	248.0151	262.1743	217.1402	60.04348	212.7358
MIN	193.623	357.458	264.378	236.178	245.993	206.898	45.4724	183.729

	beckon	fold	no	nod	please	shake	think	wave
think3								
	230.164	360.735	264.254	230.678	247.132	202.84	73.6529	236.602
	220.285	416.735	269.256	216.35	244.498	218.312	55.4954	210.922
	215.993	358.305	247.616	222.001	241.124	203.433		213.817
	216.132	344.156	298.043	224.72	248.323	219.02	81.1841	212.352
	222.376	347.978	261.634	229.652	259.681	208.838	45.7846	214.371
	210.714	331.188	251.858	213.233	242.927	206.946	65.4802	220.418
	225.308	351.189	248.303	220.249	245.909	211.945	81.7998	210.144
	237.331	349.103	247.089	220.692	244.948	205.751	58.0456	229.347
	228.938	359.889	249.185	229.052	243.912	225.499	58.3863	235.395
	220.433	350.042	254.412	217.187	239.863	221.713	57.0324	235.014
	208.77	379.066	259.867	223.532	235.284	212.646	69.2519	199.913
	228.244	364.27	249.959	221.883	240.026	208.051	69.6918	219.861
	229.839	370.853	262.806	217.012	243.261	188.811	66.2491	253.856
	221.426	376.104	247.918	246.525	239.084	199.131	60.0789	209.497
	228.758	352.12	252.417	205.822	254.528	182.649	61.3084	212.9
AVG	222.9807	360.7822	257.6411	222.5725	244.7	207.7057	64.53153	220.9606
MIN	208.77	331.188	247.089	205.822	235.284	182.649	45.7846	199.913

	beckon	fold	no	nod	please	shake	think	wave
think4								
	225.985	385.449	304.466	278.293	281.327	236.235	131.13	217.093
	215.331	400.288	308.71	268.009	278.54	256.985	54.6821	204.022
	207.075	372.963	295.278	268.104	276.255	233.229	81.1841	203.101
	209.542	361.575	298.043	270.33	275.22	259.822		203.782
	220.253	370.241	303.531	273.658	288.297	240.887	49.1418	207.701
	206.143	356.89	292.937	267.171	275.423	235.798	95.2374	219.02
	223.371	371.848	291.107	267.22	274.225	261.864	68.5733	202.193
	238.468	370.321	290.584	268.432	277.536	238.267	57.0654	225.009
	225.378	377.271	291.192	277.851	280.127	258.754	54.2537	228.699
	215.889	370.532	294.347	262.214	277.037	255.54	64.5112	222.084
	210.539	395.869	297.444	266.26	273.28	239.331	69.1091	190.43
	225.926	380.359	293.701	266.258	267.627	245.591	73.8131	211.29
	225.559	389.498	298.542	262.537	276.821	222.069	79.6187	234.724
	216.717	394.39	289.012	286.372	270.793	236.331	73.7863	199.568
	229.91	372.107	293.457	258.811	286.962	219.727	54.293	201.857
AVG	219.7391	377.9734	296.1567	269.4347	277.298	242.6953	71.88566	211.3715
MIN	206.143	356.89	289.012	258.811	267.627	219.727	49.1418	190.43

	beckon	fold	no	nod	please	shake	think	wave
think5								
	226.274	367.997	283.509	250.375	244.472	196.152	115.58	245.802
	220.099	389.857	290.955	233.498	250.924	212.52	70.7956	215.347
	209.466	361.959	279.621	238.636	241.838	203.291	45.7846	213.379
	213.576	361.315	292.594	242.888	240.963	213.231	49.1418	213.346
	217.87	361.065	280.786	247.591	250.026	205.421		213.636
	204.064	343.024	271.716	247.012	245.442	206.513	60.9761	221.761
	223.604	364.017	265.154	234.497	253.912	209.65	48.1071	203.828
	15290.6	360.69	266.705	236.314	244.595	201.847	54.4939	235.227
	224.233	364.077	266.015	250.349	245.091	219.825	65.651	234.325
	216.039	359.387	275.415	230.743	241.244	218.702	58.5101	227.968
	211.123	383.361	266.38	231.418	237.095	204.938	70.6179	201.436
	224.498	371.906	264.352	240.028	244.716	204.035	71.4387	219.508
	223.427	381.558	267.159	234.443	244.338	199.57	75.103	220.202
	216.003	380.262	264.885	246.544	242.359	215.729	51.8809	209.976
	225.559	360.441	273.284	228.196	251.201	193.291	62.3566	216.7
AVG	1223.096	367.3944	273.902	239.5021	245.2144	206.981	64.31695	219.4961
MIN	204.064	343.024	264.352	228.196	237.095	193.291	45.7846	201.436

	beckon	fold	no	nod	please	shake	think	wave
think6								
	215.724	353.013	258.881	228.716	244.528	209.967	78.0542	232.311
	205.182	415.943	262.777	217.923	241.14	221.653	56.5021	207.833
	194.375	352.737	247.523	222.953	235.717	204.723	65.4802	212.189
	197.421	342.167	252.052	218.381	248.225	220.555	95.2374	214.905
	207.807	343.023	262.273	224.545	249.325	214.519	60.9761	213.919
	190.11	328.012	254.399	210.24	235.304	207.53		215.376
	209.875	347.127	254.29	220.751	246.227	204.402	57.8874	215.323
	220.292	345.578	251.015	218.013	244.86	209.609	57.3234	232.573
	210.608	358.678	256.245	225.656	237.953	227.932	61.6694	232.8
	206.594	349.155	257.722	225.201	237.639	220.15	55.3865	239.948
	188.226	377.491	269.12	234.691	231.166	214.476	71.1607	198.02
	208.561	362.249	258.186	227.635	240.866	200.578	58.6882	216.312
	212.068	369.114	271.775	222.343	239.676	184.927	67.3594	252.791
	201.298	371.471	257.027	246.194	237.3	194.362	60.4169	203.86
	217.809	349.12	257.126	213.361	252.683	177.57	57.2185	215.121
AVG	205.73	357.6585	258.0274	223.7735	241.5073	207.5302	64.52574	220.2187
MIN	188.226	328.012	247.523	210.24	231.166	177.57	55.3865	198.02

	beckon	fold	no	nod	please	shake	think	wave
think7								
	211.854	365.042	281.665	251.933	257.336	206.309	144.006	230.047
	198.65	389.114	285.039	243.264	258.286	221.024	45.4724	202.919
	189.049	361.747	274.339	241.814	253.761	211.75	81.7998	208.318
	191.654	351.772	283.198	240.9	253.283	224.446	68.5733	210.738
	200.717	357.084	281.988	245.699	263.717	216.749	48.1071	206.771
	187.126	339.581	273.624	238.098	252.692	210.674	57.8874	213.189
	205.002	360.648	268.441	237.683	252.572	223.111		201.254
	15649.5	357.993	270.123	238.803	255.219	218.505	40.1265	225.518
	207.855	364.873	269.834	266.138	257.384	234.941	55.6274	229.785
	198.663	357.528	278.164	238.37	252.688	219.097	48.1279	220.224
	191.655	387.146	277.465	244.363	249.089	211.233	59.3671	195.675
	205.487	370.154	275.049	248.219	247.526	218.427	48.7358	210.735
	207.924	378.866	276.632	242.572	252.382	196.112	66.5687	231.852
	198.56	380.176	270.143	262.81	245.92	222.221	59.4656	195.392
	212.508	360.55	277.337	239.386	262.925	188.9	43.4616	206.138
AVG	1230.414	365.4849	276.2027	245.3368	254.3187	214.8999	61.9519	212.5703
MIN	187.126	339.581	268.441	237.683	245.92	188.9	40.1265	195.392

	beckon	fold	no	nod	please	shake	think	wave
think8								
	202.605	383.297	291.099	276.153	274.514	208.545	87.0817	208.546
	185.986	8643.02	292.761	266.068	260.965	218.85	56.5777	195.946
	179.404	369.942	285.671	269.813	259.201	214.411	58.0456	199.29
	180.323	356.41	285.41	254.028	256.924	222.557	57.0654	203.649
	191.196	364.312	296.668	254.528	242.02	213.378	54.4939	204.428
	179.989	343.65	287.956	250.067	255.477	226.471	57.3234	210.927
	196.748	365.421	295.113	264.534	252.915	205.003	40.1265	215.297
	210.682	364.107	293.989	261.447	260.095	220.155		220.418
	200.16	373.388	298.749	253.547	257.409	237.51	58.5976	219.881
	191.228	362.247	288.432	270.736	255.086	226.127	69.4039	236.847
	185.932	393.19	300.485	281.982	251.881	202.88	46.6283	184.919
	198.277	375.913	298.292	263.324	249.062	193.528	54.2826	203.454
	206.324	381.08	292.656	264.246	256.241	199.766	58.5209	213.115
	194.51	389.298	300.688	263.442	248.51	200.724	69.1795	189.098
	206.194	363.344	292.849	261.928	267.687	204.272	47.1561	190.523
AVG	193.9705	921.9079	293.3879	263.7229	256.5325	212.9451	58.17736	206.4225
MIN	179.404	343.65	285.41	250.067	242.02	193.528	40.1265	184.919

	beckon	fold	no	nod	please	shake	think	wave
think9								
	217.185	376.091	280.892	253.607	233.789	201.03	76.6693	215.149
	202.035	9057.98	265.813	251.01	267.547	207.489	50.395	191.103
	196.55	374.994	266.247	243.958	265.276	206.642	58.3863	190.971
	196.317	356.494	265.677	257.305	240.443	206.117	54.2537	193.093
	209.123	363.885	295.932	232.78	247.795	202.27	65.651	204.407
	196.228	347.724	281.457	232.376	259.225	203.018	61.6694	227.175
	210.397	369.138	259.989	231.563	257.004	202.507	55.6274	195.773
	218.576	365.655	268.9	244.611	249.126	203.325	58.5976	218.162
	212.375	378.972	262.008	229.093	249.249	216.093		213.759
	205.803	368.539	261.201	229.688	259.632	209.023	42.1553	225.159
	191.573	400.14	255.906	230.919	262.932	197.183	53.9481	174.027
	212.959	380.778	280.827	249.654	255.027	197.572	57.5611	198.661
	213.831	390	253.743	264.031	253.64	202.742	54.3488	214.048
	206.429	401.302	261.76	233.232	248.974	205.38	53.602	201.796
	220.29	370.003	286.951	242.092	258.146	200.407	56.5682	195.768
AVG	207.3114	953.4463	269.8202	241.7279	253.8537	204.0532	57.10237	203.9367
MIN	191.573	347.724	253.743	229.093	233.789	197.183	42.1553	174.027

	beckon	fold	no	nod	please	shake	think	wave
think10								
	217.185	376.091	261.154	253.607	233.789	201.03	60.4846	215.149
	202.035	9057.98	247.684	251.01	267.547	207.489	47.9392	191.103
	196.55	374.994	240.22	243.958	265.276	206.642	57.0324	190.971
	196.317	356.494	241.325	257.305	240.443	206.117	64.5112	193.093
	209.123	363.885	274.534	232.78	247.795	202.27	58.5101	204.407
	196.228	347.724	260.795	232.376	259.225	203.018	55.3865	227.175
	210.397	369.138	245.212	231.563	257.004	202.507	48.1279	195.773
	218.576	365.655	258.134	244.611	249.126	203.325	69.4039	218.162
	212.375	378.972	246.51	229.093	249.249	216.093	42.1553	213.759
	205.803	368.539	239.17	229.688	259.632	209.023		225.159
	191.573	400.14	232.605	230.919	262.932	197.183	63.6551	174.027
	212.959	380.778	260.98	249.654	255.027	197.572	53.4424	198.661
	213.831	390	227.076	264.031	253.64	202.742	46.6373	214.048
	206.429	401.302	244.333	233.232	248.974	205.38	50.4504	201.796
	220.29	370.003	263.525	242.092	258.146	200.407	73.749	195.768
AVG	207.3114	953.4463	249.5505	241.7279	253.8537	204.0532	56.53466	203.9367
MIN	191.573	347.724	227.076	229.093	233.789	197.183	42.1553	174.027

	beckon	fold	no	nod	please	shake	think	wave
think11								
	205.011	383.245	283.912	263.486	235.589	199.612	85.1436	203.853
	189.792	9033.43	267.003	260.703	264.109	202.335	61.3888	189.643
	185.321	377.82	271.001	254.922	264.198	202.114	69.2519	193.4
	183.09	357.046	271.18	260.418	234.757	202.172	69.1091	200.192
	195.367	364.723	300.054	238.233	242.32	199.588	70.6179	199.568
	180.481	345.605	288.496	238.964	256.645	196.81	71.1607	220.923
	198.527	368.6	269.392	243.336	254.738	199.62	59.3671	188.096
	209.337	367.852	280.359	257.099	246.695	197.463	46.6283	213.731
	204.707	379.671	272.002	241.29	248.949	215.303	53.9481	214.171
	195.405	365.788	269.608	244.23	256.094	199.03	63.6551	220.365
	185.256	402.082	265.853	244.76	259.71	192.837		178.965
	203.83	380.243	292.415	261.673	251.207	189.324	55.9102	197.163
	206.004	387.34	262.049	277.042	252.768	198.512	57.0639	205.991
	198.175	401.531	272.757	245.525	247.591	201.265	47.5088	194.941
	209.746	367.531	295.259	256.192	260.034	198.654	66.5971	185.61
AVG	196.6699	952.1671	277.4227	252.5249	251.6936	199.6426	62.6679	200.4408
MIN	180.481	345.605	262.049	238.233	234.757	189.324	46.6283	178.965

	beckon	fold	no	nod	please	shake	think	wave
think12								
	221.96	383.757	300.257	253.625	245.18	204.775	105.787	224.498
	194.956	9199.65	272.32	270.448	269.122	209.087	58.5069	206.521
	179.801	377.053	280.453	245.957	255.395	199.269	69.6918	199.955
	186.29	360.095	278.25	254.299	244.196	205.137	73.8131	204.509
	198.446	363.754	289.137	252.015	256.194	201.177	71.4387	210.747
	182.354	352.937	286.445	246.644	254.229	198.557	58.6882	222.46
	204.563	371.409	268.803	238.217	266.824	205.464	48.7358	202.698
	214.285	368.682	271.148	239.178	253.375	197.967	54.2826	227.265
	205.962	384.207	271.275	248.603	268.327	215.221	57.5611	220.979
	194.096	373.028	281.712	243.628	277.201	208.237	53.4424	231.65
	183.818	10683.8	270.539	247.438	267.61	195.079	55.9102	189.655
	204.18	386.024	10373.4	276.759	264.957	195.021		216.908
	208.128	393.101	269.792	257.675	270.117	204.768	73.8183	219.134
	199.48	10493.2	272.238	251.203	260.493	206.829	58.1501	196.216
	210.342	374.112	296.162	263.494	276.447	213	61.3099	216.36
AVG	199.2441	2324.321	952.1287	252.6122	261.9778	203.9725	64.36686	212.637
MIN	179.801	352.937	268.803	238.217	244.196	195.021	48.7358	189.655

	beckon	fold	no	nod	please	shake	think	wave
think13								
	204.312	12360.9	244.007	226.702	214.919	192.628	74.3712	237.793
	191.091	9699.31	259.868	256.803	219.806	195.377	81.7091	201.177
	210.305	11507.5	267.719	221.468	212.187	184.711	66.2491	221.935
	183.881	344.54	266.134	207.037	213.351	193.858	79.6187	214.628
	205.036	348.254	252.619	205.042	229.339	187.297	75.103	201.781
	202.096	327.729	241.382	232.841	220.123	189.518	67.3594	228.244
	200.445	354.949	245.139	212.449	233.515	185.888	66.5687	211.491
	205.886	350.998	246.485	211.186	227.073	182.704	58.5209	225.765
	206.446	11862.3	248.207	231.241	217.588	196.528	54.3488	233.485
	203.216	12903.2	242.234	215.7	219.709	200.91	46.6373	240.507
	177.019	11363.6	253.04	222.43	207.547	180.599	57.0639	192.597
	206.313	12499.9	11013.2	213.909	229.721	179.894	73.8183	213.759
	209.864	12970.2	250.429	215.314	221.523	191.042		231.897
	203.963	11148.2	248.962	233.862	216.776	186.81	49.8559	196.744
	215.251	12936.6	248.379	247.096	232.47	198.764	79.1907	198.341
AVG	201.6749	8065.212	968.5203	223.5387	221.0431	189.7685	66.45821	216.6763
MIN	177.019	327.729	241.382	205.042	207.547	179.894	46.6373	192.597

	beckon	fold	no	nod	please	shake	think	wave
think14								
	210.806	360.596	264.464	251.161	254.74	195.268	68.2892	222.664
	201.2	8657.99	268.709	236.151	241.354	197.426	64.6383	200.342
	196.478	356.665	254.901	246.051	241.927	197.998	60.0789	209.696
	194.921	340.169	255.959	223.888	245.172	200.077	73.7863	214.232
	202.086	345.508	270.385	227.866	224.23	197.098	51.8809	206.094
	188.058	326.859	260.495	216.359	241.27	205.812	60.4169	217.732
	205.571	350.004	272.27	239.63	237.311	183.752	59.4656	234.614
	215.756	348.274	269.237	233.458	246.068	207.611	69.1795	223.096
	209.565	357.475	275.633	220.804	236.87	219.913	53.602	227.605
	203.452	348.51	263.499	246.736	235.689	206.044	50.4504	253.901
	187.968	379.74	276.559	258.748	232.883	188.381	47.5088	190.729
	208.493	360.431	273.441	235.78	233.581	181.881	58.1501	205.97
	209.852	369.235	267.846	234.356	238.845	179.914	49.8559	223.661
	199.961	376.293	277.944	232.63	229.833	183.492		194.091
	211.373	348.709	265.062	228.497	250.064	178.5	54.2644	198.312
AVG	203.036	908.4305	267.7603	235.4743	239.3225	194.8778	58.68337	214.8493
MIN	187.968	326.859	254.901	216.359	224.23	178.5	47.5088	190.729

	beckon	fold	no	nod	please	shake	think	wave
think15								
	216.156	389.892	299.172	288.731	264.959	214.89	97.1924	213.623
	197.945	8802.87	295.581	270.962	274.906	229	52.6226	197.428
	189.732	382.278	292.225	279.518	273.425	236.534	61.3084	199.789
	193.57	366.616	291.424	266.764	272.526	230.784	54.293	202.413
	204.068	372.959	306.957	259.927	264.678	222.303	62.3566	206.251
	193.91	361.304	295.136	258.456	272.617	223.217	57.2185	216.172
	208.074	377.993	307.568	278.192	269.764	223.155	43.4616	196.431
	221.146	378.175	303.413	273.243	280.823	232.443	47.1561	220.261
	208.26	388.557	309.138	255.997	267.58	236.799	56.5682	224.143
	199.754	376.456	287.972	281.874	269.624	230.48	73.749	224.323
	195.648	407.708	289.104	268.111	268.911	216.642	66.5971	185.421
	206.416	388.798	301.745	262.018	266.582	212.508	61.3099	207.879
	213.929	396.419	283.719	268.937	265.19	217.492	79.1907	213.852
	204.474	402.045	308.213	259.399	267.22	221.326	54.2644	191.941
	214.809	378.74	296.744	262.09	277.276	224.181		202.281
AVG	204.5261	944.7207	297.8741	268.9479	270.4054	224.7836	61.94918	206.8139
MIN	189.732	361.304	283.719	255.997	264.678	212.508	43.4616	185.421

	beckon	fold	no	nod	please	shake	think	wave
please1								
	268.296	405.432	180.569	174.262	44.706	169.121	208.666	305.399
	264.01	8650.49	181.753	166.466	56.9555	151.491	245.993	284.731
	264.561	464.459	166.874	177.017	57.2119	150.69	247.132	283.132
	257.089	406.805	171.651	166.154	58.394	155.563	281.327	290.654
	267.827	400.122	186.71	167.228	51.7679	154.943	244.472	278.982
	261.971	349.152	178.205	153.597	77.6737	163.298	244.528	282.826
	271.71	408.028	181.267	170.964	66.1351	144.548	257.336	290.181
	268.957	403.44	187.122	169.339	76.7599	170.963	274.514	284.859
	271.951	425	192.085	163.236	80.0462	153.846	233.789	275.077
	270.288	401.099	182.613	176.509	75.4022	151.104	216.255	295.538
	256.949	470.475	192.858	186.257	78.179	157.872	235.589	273.511
	276.212	437.68	182.761	175.011	84.0825	160.178	245.18	268.105
	267.672	440.106	188.043	174.023	85.5854	139.798	214.919	284.674
	270.418	460.663	193.296	173.05	82.1618	138.984	254.74	278.059
	263.51	402.166	186.825	166.48	84.1443	132.13	264.959	275.843
AVG	266.7614	968.3411	183.5088	170.6395	70.61369	152.9686	244.6266	283.4381
MIN	256.949	349.152	166.874	153.597	44.706	132.13	208.666	268.105

	beckon	fold	no	nod	please	shake	think	wave
please2								
	271.75	414.033	195.156	173.994	44.706	165.403	216.508	301.629
	258.835	9099.17	181.031	178.231		150.371	259.23	288
	262.061	476.795	178.714	174.254	43.9534	161.097	244.498	278.78
	253.31	421.09	174.485	187.076	57.859	152.251	278.54	287.427
	265.147	416.84	200.038	170.839	51.3153	153.491	250.924	282.078
	253.9	368.185	193.466	163.298	55.3951	156.78	241.14	285.446
	267.985	426.512	175.831	164.693	63.3324	144.607	258.286	277.47
	262.35	419.075	182.275	173.501	65.818	169.18	260.965	286.586
	268.163	437.068	178.05	164.113	64.3788	151.265	267.547	275.164
	265.29	414.743	185.255	162.347	73.2072	154.983	251.465	278.404
	250.946	484.511	167.663	162.013	78.8368	157.225	264.109	271.824
	274.013	448.838	10245.9	184.229	61.5871	161.051	269.122	271.089
	265.515	457.775	173.924	188.061	73.0709	147.858	219.806	277.39
	269.246	479.413	180.793	168.421	73.1867	146.612	241.354	294.19
	262.376	418	202.448	172.42	69.1256	145.051	274.906	283.985
AVG	263.3925	1012.137	854.3353	172.4993	62.55516	154.4817	253.2267	282.6308
MIN	250.946	368.185	167.663	162.013	43.9534	144.607	216.508	271.089

	beckon	fold	no	nod	please	shake	think	wave
please3								
	258.076	404.473	186.267	166.472	56.9555	158.308	211.425	296.112
	247.318	9041.59	174.658	164.766	43.9534	146.478	251.269	280.642
	251.207	463.798	169.402	165.818		157.035	241.124	271.766
	243.034	418.367	179.994	168.575	47.2923	147.053	276.255	278.744
	253.466	412.081	194.98	157.079	44.985	149.719	241.838	274.709
	246.063	357.947	181.389	150.129	60.3861	152.401	235.717	282.146
	254.767	422.077	171.599	156.718	59.78	140.428	253.761	273.568
	249.089	411.823	180.516	165.469	57.9651	166.316	259.201	279.724
	260.771	426.785	176.815	150.614	56.9881	146.631	265.276	268.325
	261.275	408.85	178.386	152.858	53.4093	151.911	253.056	274.52
	244.13	477.179	160.445	150.259	54.7152	154.723	264.198	263.634
	264.391	441.154	186.248	166.755	47.6981	160.029	255.395	265.699
	257.601	450.626	166.627	179.822	54.7558	147.339	212.187	273.097
	260.34	467.49	178.155	154.78	64.9668	143.997	241.927	283.892
	256	410	191.231	158.449	59.3084	138.8	273.425	275.032
AVG	253.8352	1000.949	178.4475	160.5709	54.51136	150.7445	249.0703	276.1073
MIN	243.034	357.947	160.445	150.129	43.9534	138.8	211.425	263.634

	beckon	fold	no	nod	please	shake	think	wave
please4								
	247.877	406.936	195.284	188.413	57.2119	169.084	219.54	291.038
	240.787	8764.21	190.834	176.399	57.859	159.803	251.747	274.089
	244.781	452.182	177.667	188.964	47.2923	159.027	248.323	269.597
	235.819	422.548	179.994	177.295		162.798	275.22	276.219
	247.142	418.219	200.834	178.414	47.8747	159.532	240.963	267.548
	239.35	359.488	191.79	163.572	44.8612	166.056	248.225	275.072
	247.23	426.559	194.601	185.748	63.841	151.712	253.283	271.381
	242.41	418.643	201.488	183.532	45.9522	176.68	256.924	274.358
	255.19	416.64	207.34	170.76	69.8622	148.965	240.443	265.751
	258.895	411.183	193.337	191.37	69.3562	162.85	228.549	282.459
	241.981	466.248	191.663	188.556	70.6333	162.701	234.757	260.409
	258.628	442.635	193.902	187.346	60.9059	163.816	244.196	260.964
	252.039	450.294	190.247	187.107	69.9753	152.201	213.351	269.555
	254.854	451.404	206.656	177.353	77.0242	145.373	245.172	267.195
	253.7	408.328	200.33	176.3	69.19	148.068	272.526	261.89
AVG	248.0455	981.0345	194.3978	181.4086	60.84567	159.2444	244.8813	271.1683
MIN	235.819	359.488	177.667	163.572	44.8612	145.373	213.351	260.409

	beckon	fold	no	nod	please	shake	think	wave
please5								
	260.174	398.461	171.279	167.27	58.394	173.219	236.236	301.143
	252.983	500.352	175.161	157.437	51.3153	161.018	260.851	280.658
	254.469	448.243	162.974	167.872	44.985	158.249	259.681	279.245
	246.16	425.163	170.624	159.324	47.8747	160.691	288.297	285.176
	257.704	414.369	176.359	163.494		158.191	250.026	268.973
	249.218	365.753	167.537	147.676	45.8861	160.247	249.325	276.222
	257.836	418.171	171.746	160.097	78.3824	163.824	263.717	273.549
	261.674	416.834	174.101	160.36	48.8748	167.266	242.02	279.635
	264.418	416.474	179.985	171.332	76.5138	150.776	247.795	272.653
	267.374	404.623	174.321	164.379	68.7066	161.541	229.738	282.571
	251.07	455.519	180.862	169.955	68.1568	171.486	242.32	268.161
	268.476	438.351	165.756	171.508	68.4875	177.698	256.194	263.853
	260	446.193	186.259	167.162	73.4981	151.779	229.339	293.801
	261.539	441.826	182.141	187.106	76.6335	154.495	224.23	269.878
	258.931	408.37	177.306	158.342	73.9967	142.7	264.678	269.3
AVG	258.1351	426.5801	174.4274	164.8876	62.97895	160.8787	249.6298	277.6545
MIN	246.16	365.753	162.974	147.676	44.985	142.7	224.23	263.853

	beckon	fold	no	nod	please	shake	think	wave
please6								
	263.258	402.395	191.703	176.503	51.7679	165.978	216.122	297.635
	252.839	9009	180.109	171.905	55.3951	151.903	249.702	279.32
	257.231	462.973	177.454	177.06	60.3861	162.364	242.927	275.098
	245.836	417.693	173.43	176.529	44.8612	152.813	275.423	283.988
	259.95	411.486	201.307	167.268	45.8861	154.915	245.442	274.848
	248.919	356.377	190.779	160.356		156.439	235.304	285.408
	260.002	419.411	175.682	170.111	44.9365	149.85	252.692	276.458
	255.078	411.254	190.998	181.366	45.6964	174.646	255.477	280.329
	265.957	421.164	185.903	163.857	68.7047	157.206	259.225	270.454
	263.548	400.748	186.402	168.607	63.2137	154.813	252.179	278.83
	249.114	472.486	170.737	165.17	67.3982	159.862	256.645	268.909
	267.723	436.937	195.187	180.045	58.946	165.377	254.229	266.367
	263.103	444.948	174.11	189.734	68.3524	152.451	220.123	275.776
	263.412	465.485	186.002	167.149	72.1538	151.564	241.27	282.882
	259.542	403.76	198.677	171.607	70.3405	145.99	272.617	275.886
AVG	258.3675	995.7411	185.232	172.4845	58.43133	157.0781	248.6251	278.1459
MIN	245.836	356.377	170.737	160.356	44.8612	145.99	216.122	266.367

	beckon	fold	no	nod	please	shake	think	wave
please7								
	263.707	415.502	202.699	184.788	77.6737	174.616	227.669	300.911
	246.259	9460.7	212.227	202.112	63.3324	164.587	267.376	285.495
	258.26	11173.1	202.888	183.33	59.78	170.45	245.909	278.237
	236.542	402.91	203.268	181.013	63.841	167.809	274.225	289.168
	249.753	403.534	202.336	198.841	78.3824	169.496	253.912	279.478
	241.43	361.268	191.059	189.327	44.9365	165.523	246.227	279.17
	249.627	411.661	188.181	180.812		163.187	252.572	279.876
	251.316	404.719	197.224	181.006	43.32	181.614	252.915	290.596
	254.564	11507.4	200.51	188.35	90.7618	175.366	257.004	276.564
	254.803	405.863	215.466	182.756	59.4045	164.306	245.444	286.11
	244.737	11037.5	199.599	184.804	66.8429	172.652	254.738	285.318
	255.684	447.624	10706.6	191.068	61.2543	172.248	266.824	275.998
	260.838	444.165	200.241	185.307	64.7049	166.849	233.515	283.722
	257.755	10834.2	195.989	191.123	71.1971	169.761	237.311	284.919
	253.586	411.8	199.673	198.288	110.885	163.33	269.764	282.536
AVG	251.9241	3874.796	901.1973	188.195	68.30832	169.4529	252.3603	283.8732
MIN	236.542	361.268	188.181	180.812	43.32	163.187	227.669	275.998

	beckon	fold	no	nod	please	shake	think	wave
please8								
	261.42	398.345	203.749	195.074	66.1351	167.948	215.94	295.088
	252.14	8873.1	197.768	177.768	65.818	159.155	252.535	281.869
	256.577	453.857	188.322	196.068	57.9651	178.701	244.948	279.358
	247.679	418.998	183.851	182.126	45.9522	161.199	277.536	284.018
	260.018	411.339	203.89	180.248	48.8748	161.493	244.595	276.272
	247.81	357.268	196.205	171.571	45.6964	161.855	244.86	288.817
	258.47	419.461	199.752	195.093	43.32	156.556	255.219	279.31
	255.564	412.589	207.035	191.064		179.131	260.095	275.168
	267.925	415.428	207.29	171.682	66.1614	162.993	249.126	274.899
	267.258	401.697	195.233	189.262	54.2171	162.805	239.634	282.829
	252.764	462.378	183.221	178.447	62.8663	164.263	246.695	269.314
	270.656	434.849	197.291	184.039	45.475	170.949	253.375	270.104
	264.036	443.919	186.029	188.847	57.5887	162.087	227.073	276.945
	265.191	453.032	203.369	175.147	65.1026	159.658	246.068	283.72
	263.096	403	202.226	176.032	58.4697	154.4	280.823	279.253
AVG	259.3736	983.9507	197.0154	183.4979	55.97446	164.2129	249.2348	279.7976
MIN	247.679	357.268	183.221	171.571	43.32	154.4	215.94	269.314

	beckon	fold	no	nod	please	shake	think	wave
please9								
	262.065	433.715	172.751	148.908	76.7599	146.824	217.398	299.198
	245.271	9398.49	177.395	164.046	64.3788	131.131	274.048	283.283
	250.818	11086.5	173.402	148.122	56.9881	141.22	243.912	271.519
	237.025	428.714	170.191	143.742	69.8622	135.376	280.127	279.027
	250.754	420.756	166.176	161.054	76.5138	135.736	245.091	273.29
	240.801	370.64	158.469	150.794	68.7047	138.398	237.953	271.143
	250.565	429.488	160.802	144.882	90.7618	129.239	257.384	271.504
	243.896	419.131	162.849	145.499	66.1614	147.278	257.409	286.473
	255.275	11415.5	165.646	150.809		132.937	249.249	263.831
	250.162	428.98	180.058	144.684	44.292	141.353	231.79	269.227
	238.685	10952.9	165.57	149.304	34.7467	141.608	248.949	272.602
	257.92	470.151	10626.9	157.882	76.7536	143.612	268.327	261.819
	250.574	469.519	171.078	149.031	58.9495	137.547	217.588	271.241
	255.167	10752.6	166.635	154.169	63.4655	132.869	236.87	274.572
	249.173	430.1	168.158	159.452	50.6384	134.48	267.58	275.776
AVG	249.2101	3860.479	865.7387	151.4919	64.2126	137.9739	248.9117	274.967
MIN	237.025	370.64	158.469	143.742	34.7467	129.239	217.398	261.819

	beckon	fold	no	nod	please	shake	think	wave
please10								
	267.44	403.257	183.929	149.669	80.0462	144.828	214.379	297.901
	242.359	9242.13	172.968	160.353	73.2072	131.545	274.783	293.019
	246.54	475.594	166.943	147.291	53.4093	139.199	239.863	274.993
	234.376	410.631	166.037	150.582	69.3562	133.079	277.037	281.837
	245.75	401.449	173.385	153.935	68.7066	135.873	241.244	287.45
	235.151	350.892	166.436	147.051	63.2137	136.337	237.639	274.384
	246.332	409.96	158.098	141.819	59.4045	126.814	252.688	273.144
	241.01	401.29	159.985	143.426	54.2171	149.488	255.086	285.825
	251.97	435.289	162.591	145.763	44.292	138.222	259.632	267.197
	247.881	399.01	172.961	142.022		136.56	241.232	275.11
	235.782	10741.1	160.273	145.723	26.378	139.649	256.094	264.676
	254.538	438.428	10427.5	169.267	39.6329	144.654	277.201	273.69
	247.89	442.084	164.784	151.655	30.6809	134.436	219.709	272.017
	251.337	10548.5	163.302	147.939	39.324	134.522	235.689	280.554
	248.265	403.12	177.634	154.885	49.4295	130.86	269.624	290.417
AVG	246.4414	2366.849	851.7884	150.092	53.66415	137.0711	250.1267	279.4809
MIN	234.376	350.892	158.098	141.819	26.378	126.814	214.379	264.676

	beckon	fold	no	nod	please	shake	think	wave
please11								
	254.393	405.008	176.438	144.755	75.4022	138.565	205.591	290.95
	241.573	9132.42	166.589	147.552	78.8368	126.802	256.098	274.976
	244.455	473.812	161.203	140.585	54.7152	137.022	235.284	267.347
	232.986	420.383	159.808	150.8	70.6333	129.862	273.28	273.418
	245.694	411.747	174.843	141.218	68.1568	132.291	237.095	270.704
	235.478	354.928	170.484	134.994	67.3982	133.536	231.166	273.391
	246.297	420.841	155.211	135.52	66.8429	122.257	249.089	269.376
	241.113	411.038	160.337	140.788	62.8663	147.368	251.881	275.34
	251.102	435.605	158.353	133.856	34.7467	130.714	262.932	259.633
	246.442	406.297	163.804	131.67	26.378	132.818	244.363	266.927
	237.346	482.361	151.662	132.793		137.489	259.71	257.546
	253.797	442.236	10288	152.121	42.4719	140.606	267.61	256.016
	246.971	449.021	155.132	150.434	29.9547	129.28	207.547	269.491
	252.241	10405.8	158.341	138.383	39.9485	126.13	232.883	282.487
	246.31	408.497	179.917	140.464	45.4729	124.335	268.911	271.13
AVG	245.0799	1670.666	838.6748	141.0622	54.55889	132.605	245.5627	270.5821
MIN	232.986	354.928	151.662	131.67	26.378	122.257	205.591	256.016

	beckon	fold	no	nod	please	shake	think	wave
please12								
	255.418	415.868	204.736	179.185	78.179	158.777	222.901	299.859
	239.562	9319.67	202.531	192.077	61.5871	148.265	270.908	288.784
	245.567	10977	196.935	176.431	47.6981	149.623	240.026	275.883
	230.901	409.768	196.108	171.843	60.9059	150.24	267.627	282.681
	241.789	404.898	197.667	184.584	68.4875	149.31	244.716	281.23
	230.682	361.971	190.257	176.715	58.946	145.274	240.866	276.798
	245.174	409.618	184.886	171.593	61.2543	144.02	247.526	275.256
	240.988	404.455	192.059	171.795	45.475	163.318	249.062	289.247
	253.051	439.175	196.451	177.13	76.7536	152.966	255.027	269.118
	245.812	404.579	200.913	172.549	39.6329	148.026	239.496	277.765
	236.077	10846	194.293	175.215	42.4719	151.773	251.207	266.038
	255.004	445.811	10526.3	190.641		156.819	264.957	278.667
	247.99	445.566	193.07	175.363	58.4589	151.65	229.721	273.678
	250.623	10649.6	192.871	180.402	57.6924	150.812	233.581	278.282
	250.227	412.517	199.721	186.831	73.2995	148.897	266.582	282.6
AVG	244.591	3089.766	884.5865	178.8236	59.34586	151.318	248.2802	279.7257
MIN	230.682	361.971	184.886	171.593	39.6329	144.02	222.901	266.038

	beckon	fold	no	nod	please	shake	think	wave
please13								
	255.264	414.641	184.875	155.367	84.0825	140.417	219.064	296.116
	241.362	9354.54	185.118	166.876	73.0709	131.288	276.148	288.508
	245.965	11025.4	178.936	152.419	54.7558	134.613	243.261	274.713
	232.833	412.958	176.738	151.042	69.9753	134.724	276.821	280.093
	244.953	404.256	176.664	163.467	73.4981	133.177	244.338	278.297
	235.152	359.231	169.459	155.238	68.3524	133.183	239.676	273.271
	245.058	413.965	167.792	147.859	64.7049	126.966	252.382	272.874
	238.758	404.391	170.469	148.58	57.5887	144.143	256.241	291.363
	252.101	446.917	172.663	152.285	58.9495	132.009	253.64	266.066
	247.768	410.127	185.027	147.023	30.6809	136.941	233.946	273.879
	235.384	10893.2	170.022	150.61	29.9547	137.269	252.768	270.574
	255.037	448.867	10570.8	163.599	58.4589	141.976	270.117	273.3
	248.577	449.936	173.935	150.653		136.225	221.523	272.941
	252.153	10695.2	172.055	155.25	39.1338	132.368	238.845	278.046
	249.835	412.602	177.305	160.337	54.3458	133	265.19	283.25
AVG	245.3467	3103.082	868.7905	154.707	58.39659	135.2199	249.5973	278.2194
MIN	232.833	359.231	167.792	147.023	29.9547	126.966	219.064	266.066

	beckon	fold	no	nod	please	shake	think	wave
please14								
	253.216	408.773	176.096	154.281	85.5854	147.386	216.321	297.417
	237.974	9451.79	186.672	170.727	73.1867	140.486	264.062	283.02
	242.964	11160.7	178.679	150.805	64.9668	140.638	239.084	274.649
	226.998	399.576	177.307	146.739	77.0242	143.801	270.793	282.862
	243.381	395.029	172.698	165.992	76.6335	141.083	242.359	273.801
	231.664	352.116	164.365	155.705	72.1538	140.478	237.3	275.542
	243.173	403.85	166.351	145.971	71.1971	134.936	245.92	274.347
	237.921	395.28	169.403	145.697	65.1026	157.194	248.51	285.351
	247.99	11494.2	173.323	154.666	63.4655	143.476	248.974	269.379
	241.738	404.633	189.803	148.609	39.324	140.658	234.33	277.106
	230.478	11025.3	170.327	152.207	39.9485	144.823	247.591	281.3
	249.838	445.969	10695.1	157.021	57.6924	151.048	260.493	265.938
	245.528	444.909	174.243	149.999	39.1338	143.074	216.776	277.689
	249.3	10822.5	173.354	157.08		139.864	229.833	278.009
	248.107	407.029	172.201	164.789	73.3258	136	267.22	277.419
AVG	242.018	3867.444	875.9948	154.6859	64.19572	142.9963	244.6377	278.2553
MIN	226.998	352.116	164.365	145.697	39.1338	134.936	216.321	265.938

	beckon	fold	no	nod	please	shake	think	wave
please15								
	268.755	12062.7	180.449	168.551	82.1618	164.572	229.572	301.916
	251.443	9514.75	200.218	185.145	69.1256	159.906	277.865	291.718
	254.519	11248.6	186.539	167.261	59.3084	158.772	254.528	284.693
	244.583	434.078	186.748	162.469	69.19	164.048	286.962	299.622
	258.603	427.582	178.846	174.169	73.9967	158.59	251.201	284.193
	250.345	381.776	171.699	173.454	70.3405	158.983	252.683	287.076
	257.811	438.933	173.835	163.791	110.885	154.898	262.925	283.967
	251.266	428.009	175.524	164.455	58.4697	170.469	267.687	292.09
	265.67	11587.5	178.354	171.318	50.6384	155.317	258.146	282.784
	265.079	441.544	190.151	161.936	49.4295	162.247	243.421	282.415
	248.932	11111.1	178.484	165.722	45.4729	163.148	260.034	282.402
	267.009	483.576	10775.8	167.046	73.2995	168.814	276.447	272.404
	259.406	481.362	182.347	165.298	54.3458	163.471	232.47	285.734
	263.54	10905.1	178.047	173.589	73.3258	156.556	250.064	289.924
	259.548	442.311	176.811	178.664		157	277.276	284.4
AVG	257.7673	4692.595	887.5901	169.5245	67.14211	161.1194	258.7521	287.0225
MIN	244.583	381.776	171.699	161.936	45.4729	154.898	229.572	272.404

	beckon	fold	no	nod	please	shake	think	wave
fold1								
	401.81	103.843	439.094	408.837	405.432	353.455	340.652	430.01
	12690.4	93.2066	12150.6	395.651	414.033	358.898	386.634	445.847
	12361	80.3531	392.047	403.736	404.473	372.661	360.735	12285.1
	12820.6	69.4022	394.454	410.739	406.936	359.909	385.449	12106.6
	12468.9	121.711	428.186	427.332	398.461	363.538	367.997	437.884
	12407	82.7162	424.892	371.36	402.395	363.677	353.013	439.409
	12787.8	77.7528	408.529	401.608	415.502	357.575	365.042	436.336
	13072	87.1244	419.688	405.9	398.345	367.014	383.297	454.228
	12771.6	95.5409	414.184	379.839	433.715	370.417	376.091	12195.2
	12594.6	100.513	442.294	397.784	403.257	362.537	356.715	440.726
	12837	92.5838	401.256	391.789	405.008	357.863	383.245	437.541
	12804.3	101.013	370.026	422.631	415.868	356.674	383.757	446.766
	12531.4	72.4315	398.456	410.823	414.641	351.257	12360.9	435.937
	12468.9	105.398	412.353	389.107	408.773	360.607	360.596	441.78
	12547.1		429.722	379.792	12062.7	352	389.892	453.14
AVG	11837.63	91.68496	1195.052	399.7952	1185.969	360.5388	1170.268	2792.434
MIN	401.81	69.4022	370.026	371.36	398.345	351.257	340.652	430.01

	beckon	fold	no	nod	please	shake	think	wave
fold2								
	9242.23	103.843	9216.58	8912.65	8650.49	461.523	432.517	472.195
	9901.05		9569.36	503.963	9099.17	477.891	9267.87	9267.88
	9699.39	60.8563	520.331	8896.81	9041.59	8865.24	416.735	9652.55
	9980.09	105.415	524.535	9107.47	8764.21	481.688	400.288	9542.03
	9765.68	108.597	9066.17	9425.08	500.352	478.183	389.857	9250.75
	9727.68	182.151	9107.47	512.472	9009	482.205	415.943	8920.66
	9960.22	107.674	8841.73	8857.41	9460.7	474.255	389.114	8635.63
	10131.8	109.202	8920.6	8952.57	8873.1	8733.59	8643.02	9302.36
	9950.41	119.277	8833.92	522.975	9398.49	8605.82	9057.98	9596.98
	9842.6	113.994	9451.79	8810.59	9242.13	481.912	9000.9	8620.73
	9990.05	67.8519	538.461	8688.11	9132.42	471.419	9033.43	9442.91
	9970.25	90.6904	494.727	9259.28	9319.67	461.732	9199.65	9293.72
	9804	98.1921	537.092	9049.79	9354.54	450.899	9699.31	487.224
	9765.69	86.3438	8826.13	532.189	9451.79	465.825	8657.99	9090.97
	9813.61	119.197	9124.09	508.317	9514.75	443.972	8802.87	9267
AVG	9836.317	105.2346	6238.199	6169.312	8587.493	2122.41	5587.165	8056.239
MIN	9242.23	60.8563	494.727	503.963	500.352	443.972	389.114	472.195

	beckon	fold	no	nod	please	shake	think	wave
fold3								
	417.467	93.2066	506.405	482.698	464.459	387.757	347.959	429.25
	11792.5	60.8563	11325	448.437	476.795	398.304	10905.1	10905.2
	11507.5		457.232	480.851	463.798	410.838	358.305	11441.7
	11904.8	34.1955	460.651	487.897	452.182	401.27	372.963	11286.7
	11601	48.1773	497.034	11123.5	448.243	404.718	361.959	10881.4
	11547.4	103.801	489.407	450.984	462.973	405.035	352.737	456.805
	11876.5	57.6373	474.664	477.511	11173.1	401.419	361.747	440.719
	12121.3	54.2984	486.289	482.207	453.857	404.009	369.942	10952.9
	11862.6	101.462	480.642	457.964	11086.5	414.472	374.994	11363.7
	11709.7	79.4395	11160.7	473.259	475.594	407.21	365.157	452.172
	11919	78.0674	468.521	469.584	473.812	401.381	377.82	11148.3
	11890.8	71.0076	452.581	10893.2	10977	397.48	377.053	10941
	11655.1	71.4316	466.221	487.305	11025.4	389.224	11507.5	439.019
	11601	57.7714	478.427	463.675	11160.7	402.683	356.665	434.441
	11668.7	81.8228	498.793	452.488	11248.6	386.755	382.278	10905.2
AVG	11005.02	70.94105	1913.504	1875.437	4722.868	400.837	1811.479	6831.9
MIN	417.467	34.1955	452.581	448.437	448.243	386.755	347.959	429.25

	beckon	fold	no	nod	please	shake	think	wave
fold4								
	383.988	80.3531	425.412	401.408	406.805	346.219	336.869	424.708
	379.561	105.415	435.013	389.691	421.09	355.759	362.928	406.574
	372.308	34.1955	446.727	402.247	418.367	360.207	344.156	422.464
	14620		444.427	405.072	422.548	356.951	361.575	424.89
	373.592	37.5038	419.972	419.273	425.163	356.689	361.315	404.283
	370.923	103.412	414.048	437.907	417.693	354.312	342.167	409.988
	391.558	51.9493	402.248	401.912	402.91	366.393	351.772	412.697
	14947.8	45.9065	413.75	404.145	418.998	359.196	356.41	410.285
	389.838	66.5548	409.801	420.023	428.714	367.312	356.494	428.157
	391.21	60.7823	428.358	398.833	410.631	356.07	343.791	412.29
	14641.4	63.054	404.864	395.906	420.383	358.68	357.046	406.488
	14598.8	63.1063	403.448	417.89	409.768	362.835	360.095	400.763
	380.375	70.9558	406.389	408.563	412.958	364.928	344.54	415.675
	368.939	58.7975	408.751	410.346	399.576	378.315	340.169	399.028
	397.612	62.8687	421.924	414.865	434.078	337.34	366.616	411.73
AVG	4200.527	64.63247	419.0088	408.5387	416.6455	358.7471	352.3962	412.668
MIN	368.939	34.1955	402.248	389.691	399.576	337.34	336.869	399.028

	beckon	fold	no	nod	please	shake	think	wave
fold5								
	388.953	69.4022	421.341	398.4	400.122	343.451	333.855	431.915
	387.114	108.597	433.048	387.916	416.84	348.84	371.156	420.241
	379.183	48.1773	445.104	398.881	412.081	357.275	347.978	435.805
	14430.1	37.5038	430.857	401.551	418.219	347.452	370.241	438.118
	378.833		415.401	416.855	414.369	351.481	361.065	415.613
	375.039	110.388	410.003	432.948	411.486	351.498	343.023	416.293
	14388.6	50.5253	397.751	397.917	403.534	355.673	357.084	417.452
	14749.4	47.3225	408.509	399.469	411.339	352.754	364.312	419.432
	14368.1	62.2066	404.848	407.292	420.756	362.656	363.885	445.197
	397.958	55.3722	425.157	395.767	401.449	352.103	348.357	422.553
	14450.9	61.0647	396.743	392.473	411.747	351.517	364.723	421.458
	14409.4	59.5025	391.201	414.319	404.898	353.4	363.754	416.314
	387.066	67.8143	396.444	404.232	404.256	376.896	348.254	420.373
	374.244	46.5519	403.853	399.609	395.029	368.126	345.508	411.712
	404.619	59.4406	417.759	421.857	427.582	342.095	372.959	426
AVG	6017.967	63.13349	413.2013	404.6324	410.2471	354.3478	357.0769	423.8984
MIN	374.244	37.5038	391.201	387.916	395.029	342.095	333.855	411.712

	beckon	fold	no	nod	please	shake	think	wave
fold6								
	372.309	121.711	379.573	356.719	349.152	307.957	308.34	406.321
	361.93	182.151	391.371	341.81	368.185	309.087	357.458	399.941
	363.594	103.801	402.499	360.439	357.947	321.214	331.188	420.714
	14450.9	103.412	388.259	361.776	359.488	309.226	356.89	416.425
	360.023	110.388	375.372	375.21	365.753	315.102	343.024	394.221
	354.125		369.9	389.556	356.377	316.679	328.012	389.852
	14409.3	113.966	360.696	358.52	361.268	311.958	339.581	385.997
	14771.1	118.705	369.055	361.063	357.268	313.481	343.65	396.819
	14388.7	64.2942	368.052	364.928	370.64	316.86	347.724	430.507
	373.314	91.9264	385.124	359.419	350.892	315.752	331.311	396.505
	14471.8	114.303	360.66	358.034	354.928	312.673	345.605	401.934
	14430.2	105.826	342.184	375.009	361.971	313.583	352.937	398.369
	364.519	122.581	360.424	366.05	359.231	325.418	327.729	387.383
	357.509	90.0438	368.512	360.106	352.116	318.955	326.859	392.362
	370.473	78.5293	378.348	378.273	381.776	301.6	361.304	409.662
AVG	6013.32	108.6884	373.3353	364.4608	360.4661	313.9697	340.1075	401.8008
MIN	354.125	64.2942	342.184	341.81	349.152	301.6	308.34	385.997

	beckon	fold	no	nod	please	shake	think	wave
fold7								
	390.068	82.7162	435.568	410.187	408.028	345.027	341.484	425.508
	14084.6	107.674	447.872	410.623	426.512	353.177	373.918	424.053
	386.556	57.6373	449.974	411.838	422.077	361.203	351.189	437.2
	14245.1	51.9493	437.66	414.399	426.559	354.333	371.848	439.537
	385.425	50.5253	429.46	429.383	418.171	356.745	364.017	421.18
	381.666	113.966	423.887	437.425	419.411	357.462	347.127	419.635
	14204.6		412.425	411.194	411.661	358.855	360.648	422.408
	14556.1	40.7845	422.86	412.933	419.461	356.331	365.421	423.369
	14184.6	51.9597	420.046	413.838	429.488	368.767	369.138	448.846
	401.966	37.478	438.746	409.353	409.96	355.294	356.333	425.503
	14265.4	52.4013	411.746	406.517	420.841	355.755	368.6	424.163
	14225	55.6977	404.765	427.651	409.618	356.639	371.409	423.481
	393.628	60.64	410.557	417.519	413.965	378.567	354.949	422.388
	379.581	48.4421	418.844	410.587	403.85	370.64	350.004	415.002
	409.29	47.5008	431.594	446.777	438.933	355.2	377.993	429.897
AVG	6859.572	61.38373	426.4003	418.0149	418.569	358.933	361.6052	426.8113
MIN	379.581	37.478	404.765	406.517	403.85	345.027	341.484	415.002

	beckon	fold	no	nod	please	shake	think	wave
fold8								
	390.194	77.7528	427.224	403.886	403.44	340.95	335.985	435.044
	388.847	109.202	439.784	394.295	419.075	348.048	372.032	426.361
	383.801	54.2984	451.055	403.889	411.823	357.21	349.103	436.635
	14409.3	45.9065	436.966	406.392	418.643	349.133	370.321	438.78
	380.747	47.3225	421.435	421.339	416.834	351.649	360.69	424.286
	377.766	118.705	416.405	436.228	411.254	352.78	345.578	423.397
	14367.9	40.7845	404.86	402.681	404.719	355.757	357.993	425.223
	14727.6		414.932	404.768	412.589	350.836	364.107	427.408
	14347.4	52.6691	411.637	411.275	419.131	362.663	365.655	449.58
	399.093	48.0671	430.564	399.967	401.29	351.223	351.648	426.825
	14430.1	61.49	402.756	396.774	411.038	351.15	367.852	423.923
	14388.7	67.3039	398.703	419.613	404.455	353.169	368.682	422.094
	388.763	74.0599	403.37	409.371	404.391	381.696	350.998	427.691
	376.325	55.3301	410.531	404.979	395.28	369.033	348.274	417.419
	406.623	57.2491	423.119	427.046	428.009	343.392	378.175	430.98
AVG	6010.877	65.01006	419.5561	409.5002	410.7981	354.5793	359.1395	429.0431
MIN	376.325	40.7845	398.703	394.295	395.28	340.95	335.985	417.419

	beckon	fold	no	nod	please	shake	think	wave
fold9								
	406.882	87.1244	479.599	453.268	425	367.963	339.598	431.838
	12165.5	119.277	11668.6	420.045	437.068	375.765	386.012	444.17
	11862.5	101.462	427.658	451.559	426.785	387.488	359.889	11792.5
	12285	66.5548	432.24	459.527	416.64	377.35	377.271	11627.9
	11961.8	62.2066	468.547	11454.7	416.474	382.267	364.077	438.573
	11904.8	64.2942	463.933	419.119	421.164	381.164	358.678	448.473
	12255	51.9597	446.205	448.603	11507.4	376.209	364.873	438.521
	12515.7	52.6691	458.901	453.507	415.428	384.199	373.388	461.938
	12240.1		453.466	428.01	11415.5	390.432	378.972	11709.6
	12077.4	46.9109	11494.2	446.155	435.289	379.338	364.431	446.564
	12300.2	102.044	440.073	440.943	435.605	376.247	379.671	11481.1
	12270.1	59.8106	408.636	470.148	439.175	372.905	384.207	448.506
	12019.3	71.7817	438.729	458.985	446.917	364.847	11862.3	441.33
	11961.8	80.0073	451.921	434.788	11494.2	377.153	357.475	440.283
	12033.7	51.0962	472.603	422.752	11587.5	356.9	388.557	451.151
AVG	11350.65	72.65704	1933.687	1177.474	3381.343	376.6818	1135.96	3433.496
MIN	406.882	46.9109	408.636	419.119	415.428	356.9	339.598	431.838

	beckon	fold	no	nod	please	shake	think	wave
fold10								
	389.008	95.5409	431.125	408.899	401.099	342.527	336.432	416.786
	13262.7	113.994	446.552	430.784	414.743	349.029	372.445	426.193
	12903.3	79.4395	404.319	408.447	408.85	355.225	350.042	441.173
	13404.9	60.7823	397.931	413.004	411.183	349.306	370.532	442.737
	13020.9	55.3722	422.294	429.064	404.623	351.359	359.387	424.554
	12953.4	91.9264	417.619	395.116	400.748	350.581	349.155	420.639
	13369.1	37.478	402.819	407.107	405.863	348.593	357.528	418.466
	13680	48.0671	414.429	410.004	401.697	351.055	362.247	426.823
	13351.4	46.9109	410.981	391.455	428.98	363.955	368.539	452.078
	13158		435.624	404.828	399.01	349.176	354.725	424.587
	13422.9	74.8089	400.118	400.574	406.297	347.605	365.788	426.92
	13387.1	60.7319	376.968	426.11	404.579	345.4	373.028	430.504
	13089.1	68.7788	399.284	415.296	410.127	350.058	12903.2	418.325
	13020.9	56.7119	409.939	399.014	404.633	354.934	348.51	419.467
	13106.2	58.7903	425.714	412.936	441.544	360.59	376.456	432.42
AVG	12367.93	67.80951	413.0477	410.1759	409.5984	351.2929	1196.534	428.1115
MIN	389.008	37.478	376.968	391.455	399.01	342.527	336.432	416.786

	beckon	fold	no	nod	please	shake	think	wave
fold11								
	10741.2	100.513	10706.6	491.841	470.475	393.911	369.869	444.868
	11641.5	67.8519	11185.7	451.135	484.511	405.597	10775.9	10775.9
	11363.7	78.0674	463.496	487.475	477.179	417.431	379.066	11299.5
	11750.9	63.054	466.937	496.223	466.248	412.212	395.869	11148.3
	11454.8	61.0647	506.773	10989	455.519	411.158	383.361	10752.7
	11402.6	114.303	498.857	455.654	472.486	410.179	377.491	471.232
	11723.4	52.4013	482.915	484.287	11037.5	411.411	387.146	454.362
	11961.8	61.49	495.897	488.965	462.378	417.875	393.19	10822.5
	11709.8	102.044	489.75	462.646	10952.9	424.552	400.14	11223.4
	11560.8	74.8089	11025.3	480.618	10741.1	411.116	392.719	459.726
	11764.8		475.992	475.28	482.361	408.506	402.082	11013.3
	11737.3	68.3401	469.896	10764.3	10846	406.942	10683.8	10810.9
	11507.6	61.6421	474.544	493.469	10893.2	399.365	11363.6	448.803
	11454.8	44.116	487.511	469.245	11025.3	413.479	379.74	459.576
	11520.8	77.5699	508.938	456.228	11111.1	393	407.708	10775
AVG	11553.05	73.37616	2582.607	1863.091	5358.55	409.1156	2499.445	6757.338
MIN	10741.2	44.116	463.496	451.135	455.519	393	369.869	444.868

	beckon	fold	no	nod	please	shake	think	wave
fold12								
	400.729	92.5838	474.95	449.33	437.68	372.998	351.797	426.108
	12837	90.6904	12285	449.055	448.838	381.446	386.304	438.326
	12500.1	71.0076	435.251	448.465	441.154	389.769	364.27	12422.4
	12970.2	63.1063	436.293	455.297	442.635	384.003	380.359	454.347
	12610.4	59.5025	464.621	471.877	438.351	388.239	371.906	435.978
	12547.1	105.826	460.442	425.616	436.937	384.157	362.249	438.914
	12936.7	55.6977	445.449	447.109	447.624	385.148	370.154	438.375
	13227.6	67.3039	456.256	450.611	434.849	387.196	375.913	455.655
	12920.1	59.8106	451.819	431.216	470.151	399.816	380.778	12330.5
	12738.9	60.7319	479.03	444.307	438.428	384.697	369.446	437.786
	12987	68.3401	441.08	440.153	442.236	383.347	380.243	436.089
	12953.5		415.885	466.999	445.811	379.483	386.024	448.392
	12674.3	44.6128	439.389	455.832	448.867	381.761	12499.9	434.558
	12610.4	55.9397	450.849	438.259	445.969	388.713	360.431	435.821
	12690.4	61.7212	468.236	436.555	483.576	384	388.798	448.7
AVG	11973.63	68.34818	1240.303	447.3787	446.8737	384.9849	1181.905	2032.13
MIN	400.729	44.6128	415.885	425.616	434.849	372.998	351.797	426.108

	beckon	fold	no	nod	please	shake	think	wave
fold13								
	398.663	101.013	473.269	450.302	440.106	378.795	363.943	430.454
	13333.4	98.1921	487.678	475.822	457.775	387.352	392.403	439.987
	12970.3	71.4316	455.548	451.65	450.626	391.601	370.853	456.14
	13477.2	70.9558	449.992	455.918	450.294	389.144	389.498	456.373
	13089.1	67.8143	465.469	470.511	446.193	391.57	381.558	439.101
	13020.9	122.581	460.876	446.826	444.948	388.422	369.114	441.266
	13441	60.64	448.871	450.921	444.165	390.154	378.866	441.258
	13755.3	74.0599	458.18	453.162	443.919	388.48	381.08	449.7
	13423.1	71.7817	456.015	442.91	469.519	404.129	390	468.216
	13227.6	68.7788	477.149	450.208	442.084	389.601	379.913	442.353
	13495.4	61.6421	448.816	448.054	449.021	388.417	387.34	438.965
	13459.2	44.6128	431.925	467.649	445.566	385.121	393.101	450.961
	13158		448.27	457.982	449.936	391.202	12970.2	439.121
	13089.1	53.8147	455.985	448.465	444.909	396.532	369.235	435.883
	13175.3	66.7966	469.603	461.757	481.362	407.43	396.419	446.392
AVG	12434.24	73.86531	459.1764	455.4758	450.6949	391.1967	1220.902	445.078
MIN	398.663	44.6128	431.925	442.91	440.106	378.795	363.943	430.454

	beckon	fold	no	nod	please	shake	think	wave
fold14								
	10548.6	72.4315	10515.2	485.308	460.663	396.079	366.601	448.166
	11415.6	86.3438	10976.9	444.865	479.413	404.703	10582	10582
	11148.3	57.7714	458.639	481.824	467.49	415.632	376.104	11086.5
	11520.8	58.7975	462.429	491.037	451.404	406.069	394.39	10941
	11236	46.5519	501.844	10787.5	441.826	410.982	380.262	10559.7
	11185.7	90.0438	494.223	449.203	465.485	411.214	371.471	480.138
	11494.3	48.4421	479.163	479.357	10834.2	406.089	380.176	459.076
	11723.4	55.3301	490.836	484.539	453.032	411.694	389.298	10627
	11481.2	80.0073	484.939	456.898	10752.6	420.574	401.302	11013.3
	11337.9	56.7119	10822.5	474.464	10548.5	413.811	390.707	475.314
	11534.1	44.116	471.69	470.203	10405.8	407.428	401.531	10810.8
	11507.6	55.9397	478.176	10570.8	10649.6	402.68	10493.2	10615.8
	11286.8	53.8147	468.697	488.693	10695.2	389.524	11148.2	459.803
	11236		482.814	463.668	10822.5	405.719	376.293	459.266
	11299.5	59.3512	502.836	449.543	10905.1	388.3	402.045	10582
AVG	11330.39	61.83235	2539.392	1831.86	5922.188	406.0332	2456.905	6639.991
MIN	10548.6	44.116	458.639	444.865	441.826	388.3	366.601	448.166

	beckon	fold	no	nod	please	shake	think	wave
fold15								
	385.617	105.398	439.198	415.198	402.166	346.516	336.16	416.88
	13298	119.197	453.865	440.31	418.183	352.815	375.535	424.761
	12936.7	81.8228	416.75	417.66	410.59	361.109	352.128	443.384
	13440.9	62.8687	411.088	422.086	408.328	354.768	372.107	443.562
	13054.9	59.4406	431.449	437.382	408.37	359.023	360.441	422.616
	12987.1	78.5293	427.227	407.728	403.76	356.706	349.124	421.874
	13404.9	47.5008	413.61	416.715	411.85	354.129	360.557	418.301
	13717.5	57.2491	423.636	418.942	403.936	355.304	363.344	430.519
	13387.1	51.0962	421	406.918	430.153	366.997	370.003	453.647
	13192.7	58.7903	444	415.961	403.128	356.053	359.079	425.896
	13459	77.5699	412.62	413.206	408.497	354.79	367.531	425.204
	13423	61.7212	389	434.917	412.517	350.629	374.112	433.93
	13123.4	66.7966	412.3	424.495	412.602	353.978	12936.6	415.265
	13054.9	59.3512	421	411.908	407.029	358.54	348.709	420.68
	13140.7		435	425.506	442.311	370.98	378.744	432.116
AVG	12400.43	70.52369	423.4495	420.5955	412.228	356.8225	1200.278	428.5757
MIN	385.617	47.5008	389	406.918	402.166	346.516	336.16	415.265

	beckon	fold	no	nod	please	shake	think	wave
shake1								
	198.689	353.455	197.928	149.434	169.121		192.598	242.449
	191.917	461.523	195.909	151.311	165.403	59.3954	209.202	229.066
	197.213	387.757	189.92	154.608	158.308	56.095	202.84	239.603
	177.052	346.219	191.994	153.981	169.084	81.9414	236.235	247.232
	191.364	343.451	196.712	157.157	173.219	77.075	196.152	229.506
	182.488	307.957	191.254	150.221	165.978	67.4741	209.967	225.709
	197.71	345.027	189.106	159.631	174.616	69.0103	206.309	225.896
	198.075	340.95	194.779	158.182	167.948	87.0535	208.545	236.641
	196.773	367.963	195.172	160.092	146.824	104.619	201.03	236.713
	184.153	342.527	194.592	161.07	144.828	88.1353	194.591	237.064
	187.697	393.911	197.061	166.756	138.565	81.8037	199.612	226.32
	201.598	372.998	190.143	164.097	158.777	81.0414	204.775	221.891
	193.978	378.795	200.314	162.046	140.417	75.1002	192.628	235.522
	194.06	396.079	195.515	171.49	147.386	71.2919	195.268	224.193
	194.033	346.51	196.751	160.185	164.572	82.2674	214.89	232.6
AVG	192.4533	365.6748	194.4767	158.6841	159.0031	77.3074	204.3095	232.6937
MIN	177.052	307.957	189.106	149.434	138.565	56.095	192.598	221.891

	beckon	fold	no	nod	please	shake	think	wave
shake2								
	204.68	358.898	177.696	149.687	151.491	59.3954	205.143	267.475
	198.979	477.891	176.515	151.782	150.371		221.661	248.535
	208.488	398.304	173.672	153.559	146.478	36.9387	218.312	256.775
	186.649	355.759	175.233	142.978	159.803	39.7942	256.985	266.261
	195.767	348.84	180.334	147.708	161.018	57.7319	212.52	246.109
	189.673	309.087	178.744	140.641	151.903	40.4317	221.653	239.466
	204.458	353.177	174.736	152.016	164.587	41.856	221.024	238.834
	202.973	348.048	183.412	149.037	159.155	67.1971	218.85	249.688
	200.932	375.765	183.86	154.491	131.131	87.85	207.489	249.458
	195.364	349.029	182.736	156.689	131.545	59.0688	197.581	251.57
	196.862	405.597	187.26	163.296	126.802	69.7772	202.335	242.964
	205.752	381.446	181.032	161.077	148.265	64.5706	209.087	236.781
	199.102	387.352	190.141	157.686	131.288	44.6527	195.377	246.255
	200.525	404.703	185.777	166.777	140.486	49.6238	197.426	236.245
	197.79	352.81	187.482	156.073	159.906	55.4319	229	246.3
AVG	199.1996	373.7804	181.242	153.5665	147.6153	55.30857	214.2962	248.1811
MIN	186.649	309.087	173.672	140.641	126.802	36.9387	195.377	236.245

	beckon	fold	no	nod	please	shake	think	wave
shake3								
	193.134	372.661	192.271	170.246	150.69	56.095	203.291	254.816
	184.522	8865.24	188.435	167.064	161.097	36.9387	213.106	234.081
	190.258	410.838	187.858	172.393	157.035		203.433	240.372
	166.623	360.207	175.127	158.441	159.027	36.514	233.229	249.773
	180.67	357.275	195.967	157.754	158.249	30.8738	203.291	231.793
	170.444	321.214	191.258	153.081	162.364	35.1724	204.723	237.135
	186.808	361.203	193.364	170.535	170.45	35.8511	211.75	230.528
	183.899	357.21	201.79	165.79	178.701	48.1263	214.411	239.574
	186.689	387.488	202.448	159.037	141.22	37.9086	206.642	236.817
	178.862	355.225	194.137	168.399	139.199	51.1765	204.037	247.682
	176.925	417.431	189.842	166.316	137.022	43.2666	202.114	228.416
	191.863	389.769	195.849	170.047	149.623	56.2848	199.269	224.993
	183.155	391.601	189.394	172.149	134.613	47.2237	184.711	232.067
	185.907	415.632	202.399	165.833	140.638	44.5775	197.998	222.953
	185.66	361.1	201.723	169.104	158.772	65.9623	236.534	232.548
AVG	183.0279	941.6063	193.4575	165.7459	153.2467	44.71224	207.9026	236.2365
MIN	166.623	321.214	175.127	153.081	134.613	30.8738	184.711	222.953

	beckon	fold	no	nod	please	shake	think	wave
shake4								
	210.561	359.909	176.985	155.831	155.563	81.9414	207.138	270.785
	205.014	481.688	176.622	157.626	152.251	39.7942	222.116	248.857
	210.82	401.27	173.549	158.074	147.053	36.514	219.02	258.687
	192.733	356.951	175.127	145.864	162.798		259.822	268.348
	198.686	347.452	180.299	149.834	160.691	59.3393	213.231	246.473
	193.099	309.226	179.449	142.79	152.813	35.8624	220.555	241.668
	209.178	354.333	175.458	154.426	167.809	30.0799	224.446	242.767
	207.85	349.133	184.297	151.077	161.199	59.6727	222.557	250.948
	206.23	377.35	184.841	155.883	135.376	95.8751	206.117	250.277
	201.965	349.306	183.519	159.507	133.079	73.1238	194.623	255.53
	201.467	412.212	190.392	166.377	129.862	69.7215	202.172	243.824
	209.975	384.003	183.689	162.752	150.24	64.1435	205.137	238.762
	202.798	389.144	192.694	159.816	134.724	39.0354	193.858	250.522
	204.634	406.069	186.42	168.264	143.801	43.5314	200.077	237.267
	199.051	354.768	188.481	158.428	164.048	56.4641	230.784	248.549
AVG	203.6041	375.5209	182.1215	156.4366	150.0871	56.07848	214.7769	250.2176
MIN	192.733	309.226	173.549	142.79	129.862	30.0799	193.858	237.267

	beckon	fold	no	nod	please	shake	think	wave
shake5								
	198.531	363.538	190.461	170.233	154.943	77.075	201.364	256.543
	192.26	478.183	189.795	168.42	153.491	57.7319	216.115	235.877
	198.955	404.718	185.689	171.163	149.719	30.8738	208.838	244.079
	176.081	356.689	186.955	159.379	159.532	59.3393	240.887	252.925
	189.948	351.481	192.772	160.869	158.191		205.421	234.999
	180.61	315.102	190.109	152.765	154.915	53.3801	214.519	227.453
	194.505	356.745	188.582	166.009	169.496	29.084	216.749	229.212
	194.785	351.649	196.573	163.707	161.493	50.7695	213.378	239.845
	195.607	382.267	197.805	163.63	135.736	77.1509	202.27	237.287
	188.344	351.359	194.571	167.326	135.873	94.613	199.243	243.701
	186.182	411.158	198.482	173.678	132.291	42.9016	199.588	229.13
	200.522	388.239	191.279	172.936	149.31	45.8312	201.177	223.643
	192.151	391.57	201.308	171.105	133.177	44.7212	187.297	235.888
	192.696	410.982	199.679	173.895	141.083	41.0947	197.098	224.62
	189.608	359.02	201.059	169.284	158.59	56.6691	222.303	231.363
AVG	191.3857	378.18	193.6746	166.9599	149.856	54.37395	208.4165	236.4377
MIN	176.081	315.102	185.689	152.765	132.291	29.084	187.297	223.643

	beckon	fold	no	nod	please	shake	think	wave
shake6								
	198.64	363.677	182.902	166.498	163.298	67.4741	200.306	253.284
	191.038	482.205	180.897	167.129	156.78	40.4317	207.968	233.616
	197.799	405.035	180.201	166.517	152.401	35.1724	206.946	242.791
	178.578	354.312	182.005	152.222	166.056	35.8624	235.798	251.163
	191.542	351.498	184.242	154.807	160.247	53.3801	206.513	231.134
	183.571	316.679	182.272	150.268	156.439		207.53	224.978
	196.451	357.462	179.597	159.412	165.523	36.313	210.674	236.33
	198.365	352.78	189.142	157.441	161.855	96.6626	226.471	234.407
	196.911	381.164	190.417	157.947	138.398	113.31	203.018	234.865
	191.315	350.581	186.016	164.145	136.337	40.1193	196.073	248.636
	188.187	410.179	195.956	171.531	133.536	38.1255	196.81	227.179
	202.029	384.157	187.156	166.923	145.274	54.7705	198.557	223.013
	191.695	388.422	191.304	164.076	133.183	45.1525	189.518	231.616
	194.7	411.214	191.38	166.662	140.478	43.7567	205.812	223.01
	191.207	356.7	191.517	164.711	158.983	48.4656	223.217	231.002
AVG	192.8019	377.7377	186.3336	162.0193	151.2525	53.49974	207.6807	235.1349
MIN	178.578	316.679	179.597	150.268	133.183	35.1724	189.518	223.01

	beckon	fold	no	nod	please	shake	think	wave
shake7								
	204.224	357.575	177.868	159.729	144.548	69.0103	204.275	268.211
	200.92	474.255	178.458	156.814	144.607	41.856	219.434	242.907
	205.068	401.419	174.316	159.797	140.428	35.8511	211.945	251.641
	187.864	366.393	176.912	147.132	151.712	30.0799	261.864	259.996
	194.734	355.673	181.446	150.096	163.824	29.084	209.65	241.005
	187.106	311.958	178.706	141.29	149.85	36.313	204.402	234.232
	202.513	358.855	174.847	152.657	163.187		223.111	231.382
	204.057	355.757	184.749	150.607	156.556	39.7419	205.003	244.981
	201.957	376.209	184.363	159.594	129.239	42.3408	202.507	241.33
	197.131	348.593	182.065	154.745	126.814	49.4854	190.929	245.419
	195.679	411.411	185.008	160.646	122.257	35.6659	199.62	235.654
	206.154	385.148	178.695	161.177	144.02	60.548	205.464	230.578
	196.527	390.154	187.499	158.8	126.966	35.1032	185.888	249.253
	199.537	406.089	185.876	169.24	134.936	34.5491	183.752	231.879
	194.1	354.1	188.827	154.622	154.898	51.6597	223.155	238.76
AVG	198.5047	376.9059	181.309	155.7964	143.5895	42.23488	208.7333	243.1485
MIN	187.106	311.958	174.316	141.29	122.257	29.084	183.752	230.578

	beckon	fold	no	nod	please	shake	think	wave
shake8								
	191.117	367.014	207.511	188.113	170.963	87.0535	202.601	265.323
	184.835	8733.59	205.189	186.314	169.18	67.1971	218.928	238.728
	190.855	404.009	200.664	190.398	166.316	48.1263	205.751	248.271
	167.877	359.196	200.514	176.66	176.68	59.6727	238.267	257.061
	174.61	352.754	210.828	178.222	167.266	50.7695	201.847	238.593
	169.825	313.481	207.46	170.22	174.646	96.6626	209.609	232.977
	186.703	356.331	207.528	186.495	181.614	39.7419	218.505	239.318
	180.921	350.836	215.395	182.915	179.131		220.155	241.908
	180.44	384.199	217.705	175.378	147.278	40.5015	203.325	241.179
	174.842	351.055	210.857	190.158	149.488	100.234	197.335	258.452
	173.028	417.875	206.878	193.711	147.368	57.5803	197.463	230.909
	186.772	387.196	209.516	189.774	163.318	44.5872	197.967	226.525
	177.394	388.48	206.746	189.875	144.143	53.1076	182.704	239.346
	179.943	411.694	218.565	182.734	157.194	48.064	207.611	223.497
	181.859	355.3	218.398	185.008	170.469	88.7678	232.443	233.6
AVG	180.0681	928.8673	209.5836	184.3983	164.3369	63.00471	208.9674	241.0458
MIN	167.877	313.481	200.514	170.22	144.143	39.7419	182.704	223.497

	beckon	fold	no	nod	please	shake	think	wave
shake9								
	203.265	370.417	182.491	167.221	153.846	104.619	207.588	265.332
	200.864	8605.82	183.222	163.474	151.265	87.85	232.457	242.432
	203.673	414.472	175.921	168.197	146.631	37.9086	225.499	244.164
	185.649	367.312	177.332	154.653	148.965	95.8751	258.754	253.097
	194.014	362.656	187.343	155.806	150.776	77.1509	219.825	237.465
	183.936	316.86	182.845	145.365	157.206	113.31	227.932	233.189
	201.035	368.767	183.44	161.785	175.366	42.3408	234.941	240.959
	198.543	362.663	190.688	159.988	162.993	40.5015	237.51	245.436
	197.236	390.432	193.302	156.794	132.937		216.093	239.915
	189.199	363.955	186.32	165.866	138.222	102.908	198.332	260.544
	189.004	424.552	192.691	172.196	130.714	77.1757	215.303	234.392
	203.095	399.816	185.34	169.494	152.966	61.1459	215.221	231.438
	192.741	404.129	190.848	168.389	132.009	42.0033	196.528	239.483
	196.064	420.574	194.473	167.724	143.476	33.4727	219.913	229.643
	194.2	366.99	195.114	162.564	155.317	66.4174	236.799	238.3
AVG	195.5012	929.2943	186.758	162.6344	148.8459	70.19135	222.8463	242.3859
MIN	183.936	316.86	175.921	145.365	130.714	33.4727	196.528	229.643

	beckon	fold	no	nod	please	shake	think	wave
shake10								
	205.786	362.537	174.38	160.985	151.104	88.1353	205.377	263.641
	199.89	481.912	172.176	160.815	154.983	59.0688	215.547	241.752
	206.849	407.21	173.058	160.775	151.911	51.1765	221.713	247.595
	188.662	356.07	176.769	146.759	162.85	73.1238	255.54	258.479
	197.897	352.103	176.808	149.8	161.541	94.613	218.702	237.184
	191.721	315.752	175.135	144.563	154.813	40.1193	220.15	230.88
	206.189	355.294	172.461	154.146	164.306	49.4854	219.097	234.128
	203.575	351.223	181.681	151.524	162.805	100.234	226.127	239.777
	201.004	379.338	182.456	157.551	141.353	102.908	209.023	236.205
	194.828	349.176	180.672	158.141	136.56		201.643	245.865
	195.89	411.116	187.234	165.018	132.818	68.6234	199.03	234.641
	205.499	384.697	181.701	163.411	148.026	67.8112	208.237	226.39
	195.558	389.601	191.113	160.301	136.941	47.2769	200.91	235.915
	198.217	413.811	184.389	168.463	140.658	50.0258	206.044	228.205
	191.547	356.053	185.689	160.549	162.247	45.0893	230.48	237.448
AVG	198.8741	377.7262	179.7148	157.5201	150.8611	66.97791	215.8413	239.8737
MIN	188.662	315.752	172.176	144.563	132.818	40.1193	199.03	226.39

	beckon	fold	no	nod	please	shake	think	wave
shake11								
	190.282	357.863	191.429	171.86	157.872	81.8037	197.289	252.337
	184.952	471.419	190.387	168.969	157.225	69.7772	206.898	227.134
	193.147	401.381	186.456	171.634	154.723	43.2666	212.646	237.358
	172.031	358.68	188.594	157.779	162.701	69.7215	239.331	244.124
	184.095	351.517	194.347	161.533	171.486	42.9016	204.938	227.089
	176.044	312.673	191.231	152.92	159.862	38.1255	214.476	215.441
	189.856	355.755	188.665	164.573	172.652	35.6659	211.233	216.222
	192.576	351.15	196.72	162.46	164.263	57.5803	202.88	230.363
	190.941	376.247	197.817	166.96	141.608	77.1757	197.183	227.733
	184.042	347.605	195.214	167.846	139.649	68.6234	192.258	232.026
	182.273	408.506	197.452	173.3	137.489		192.837	220.644
	197.087	383.347	190.866	173.04	151.773	34.2679	195.079	215.382
	186.778	388.417	200.178	170.502	137.269	35.0885	180.599	231.299
	188.122	407.428	199.198	180.837	144.823	33.9611	188.381	215.73
	184.657	354.79	200.922	168.431	163.148	47.8194	216.642	221.81
AVG	186.4589	375.1185	193.9651	167.5096	154.4362	52.55559	203.5113	227.6461
MIN	172.031	312.673	186.456	152.92	137.269	33.9611	180.599	215.382

	beckon	fold	no	nod	please	shake	think	wave
shake12								
	182.434	356.674	201.293	182.451	160.178	81.0414	204.12	255.929
	181.192	461.732	202.145	178.595	161.051	64.5706	211.318	224.461
	188.698	397.48	195.495	182.395	160.029	56.2848	208.051	237.419
	165.751	362.835	201.127	169.814	163.816	64.1435	245.591	246.729
	176.963	353.4	205.509	172.338	177.698	45.8312	204.035	225.916
	169.124	313.583	202.501	162.807	165.377	54.7705	200.578	215.835
	183.523	356.639	199.342	175.311	172.248	60.548	218.427	207.423
	185.561	353.169	208.347	173.705	170.949	44.5872	193.528	229.429
	183.625	372.905	209.788	181.991	143.612	61.1459	197.572	227.069
	177.49	345.4	207.79	178.465	144.654	67.8112	191.008	232.775
	176.125	406.942	207.53	183.838	140.606	34.2679	189.324	219.225
	190.711	379.483	199.616	185.47	156.819		195.021	213.884
	180.208	385.121	209.69	183.094	141.976	37.2843	179.894	230.168
	183.026	402.68	211.514	190.15	151.048	38.3017	181.881	211.608
	183.133	350.629	213.966	177.94	168.814	60.8282	212.508	219.8
AVG	180.5043	373.2448	205.0435	178.5576	158.5917	55.10117	202.1904	226.5113
MIN	165.751	313.583	195.495	162.807	140.606	34.2679	179.894	207.423

	beckon	fold	no	nod	please	shake	think	wave
shake13								
	202.899	351.257	173.717	160.277	139.798	75.1002	186.834	256.36
	207.924	450.899	175.583	158.702	147.858	44.6527	218.76	243.605
	208.745	389.224	182.616	160.087	147.339	47.2237	188.811	251.162
	14409.3	364.928	180.323	146.673	152.201	39.0354	222.069	258.792
	199.136	376.896	177.937	152.307	151.779	44.7212	199.57	238.723
	190.919	325.418	176.403	153.205	152.451	45.1525	184.927	231.63
	14367.9	378.567	170.741	151.909	166.849	35.1032	196.112	228.18
	14727.6	381.696	180.038	149.967	162.087	53.1076	199.766	247.402
	14347.4	364.847	181.092	156.411	137.547	42.0033	202.742	245.602
	199.357	350.058	183.168	155.612	134.436	47.2769	189.659	244.641
	14430.1	399.365	178.556	159.369	129.28	35.0885	198.512	238.291
	14388.7	381.761	171.644	164.658	151.65	37.2843	204.768	236.404
	201.658	391.202	177.173	160.326	136.225		191.042	230.725
	202.019	389.524	182.397	161.271	143.074	30.1119	179.914	230.349
	199.686	353.978	186.335	166.653	163.471	56.6094	217.492	240.381
AVG	5898.89	376.6413	178.5149	157.1618	147.7363	45.17649	198.7319	241.4831
MIN	190.919	325.418	170.741	146.673	129.28	30.1119	179.914	228.18

	beckon	fold	no	nod	please	shake	think	wave
shake14								
	194.577	360.607	184.617	165.549	138.984	71.2919	207.361	265.166
	193.735	465.825	187.073	161.977	146.612	49.6238	222.076	236.293
	197.486	402.683	183.573	164.806	143.997	44.5775	199.131	241.401
	182.645	378.315	189.046	152.49	145.373	43.5314	236.331	249.567
	189.046	368.126	189.102	155.244	154.495	41.0947	215.729	232.241
	182.059	318.955	185.819	149.546	151.564	43.7567	194.362	224.312
	198.875	370.64	184.059	157.763	169.761	34.5491	222.221	219.339
	15503.9	369.033	192.075	156.243	159.658	48.064	200.724	240.646
	196.567	377.153	194.607	167.435	132.869	33.4727	205.38	235.048
	190.514	354.934	190.989	161.852	134.522	50.0258	194.856	238.916
	189.795	413.479	191.57	166.615	126.13	33.9611	201.265	228.189
	202.624	388.713	185.752	168.314	150.812	38.3017	206.829	226.692
	192.082	396.532	193.046	165.971	132.368	30.1119	186.81	226.869
	193.828	405.719	195.415	171.32	139.864		183.492	223.568
	191.811	358.54	197.791	161.542	156.556	49.2647	221.326	230.4
AVG	1213.303	381.9503	189.6356	161.7778	145.571	43.68764	206.5262	234.5765
MIN	182.059	318.955	183.573	149.546	126.13	30.1119	183.492	219.339

	beckon	fold	no	nod	please	shake	think	wave
shake15								
	212.925	352.182	168.357	154.967	132.13	82.2674	182.529	248.853
	13587	443.972	172.718	161.666	145.051	55.4319	221.517	239.448
	222.113	386.755	167.009	153.201	138.836	65.9623	182.649	248.27
	13736.3	337.341	165.076	139.721	148.068	56.4641	219.727	252.747
	13333.4	342.095	169.907	144.906	142.771	56.6691	193.291	233.909
	208.156	301.614	167.889	137.164	145.998	48.4656	177.574	227.611
	13698.7	355.291	161.263	143.04	163.338	51.6597	188.978	225.069
	14025.3	343.392	171.062	142.058	154.426	88.7678	204.272	243.274
	13680.1	356.937	170.39	142.256	134.481	66.4174	200.407	239.526
	13477.2	360.592	175.727	145.226	130.866	45.0893	181.782	237.444
	13755.2	393.105	165.859	147.932	124.335	47.8194	198.654	232.251
	13717.6	384.203	159.73	156.17	148.897	60.8282	213.33	226.647
	13404.9	407.431	166.36	151.814	133.352	56.6094	198.764	224.95
	13333.4	388.338	172.71	147.904	136.432	49.2647	178.535	227.385
	13422.9	370.9	177.5	154.864	157.553		224.181	231.753
AVG	10921.01	368.2765	168.7705	148.1926	142.4356	59.40831	197.746	235.9425
MIN	208.156	301.614	159.73	137.164	124.335	45.0893	177.574	224.95

	beckon	fold	no	nod	please	shake	think	wave
nod1								
	288.052	408.837	114.65		174.262	149.434	199.914	305.773
	279.051	8912.65	112.359	36.8281	173.994	149.687	250.152	288.612
	276.037	482.698	113.848	34.4791	166.472	170.246	230.678	288.483
	265.141	401.408	113.225	34.5921	188.413	155.831	278.293	296.551
	280.101	398.4	119.618	40.0753	167.27	170.233	250.375	280.178
	271.371	356.719	109.804	44.7329	176.503	166.498	228.716	293.386
	283.698	410.187	111.221	44.6679	184.788	159.729	251.933	294.55
	280.387	403.886	114.128	49.1448	195.074	188.113	276.153	288.075
	285.099	453.268	112.145	46.944	148.908	167.221	253.607	289.331
	273.646	408.899	108.88	62.113	149.669	160.985	244.372	295.246
	262.907	491.841	108.312	56.4459	144.755	171.86	263.486	282.118
	286.727	449.33	111.199	51.3381	179.185	182.451	253.625	280.712
	281.281	450.302	107.83	48.4231	155.367	160.277	226.702	296.862
	283.11	485.308	112.396	47.937	154.281	165.549	251.161	295.525
	279.31	415.198	114.222	50.1279	168.551	154	288.731	301.8
AVG	278.3945	995.2621	112.2558	46.27494	168.4995	164.8076	249.8599	291.8135
MIN	262.907	356.719	107.83	34.4791	144.755	149.434	199.914	280.178

	beckon	fold	no	nod	please	shake	think	wave
nod2								
	295.024	395.651	116.433	36.8281	166.466	151.311	172.383	298.365
	13513.6	503.963	116.3		178.231	151.782	261.712	293.102
	291.795	448.437	110.937	28.7902	164.766	167.064	216.35	291.413
	13661.3	389.691	111.801	41.4562	176.399	157.626	268.009	296.113
	13262.7	387.916	118.358	45.424	157.437	168.42	233.498	286.917
	287.021	341.81	108.825	33.9044	171.905	167.129	217.923	284.25
	13624.1	410.623	105.392	41.7882	202.112	156.814	243.264	289.305
	13947.1	394.295	106.125	43.668	177.768	186.314	266.068	292.187
	13605.6	420.045	104.895	32.8294	164.046	163.474	251.01	294.227
	13404.9	430.784	107.761	37.0782	160.353	160.815	229.476	287.738
	13679.9	451.135	103.024	36.2767	147.552	168.969	260.703	286.996
	13642.8	449.055	100.927	48.567	192.077	178.595	270.448	283.337
	13333.4	475.822	99.7617	45.5642	166.876	158.702	256.803	292.031
	13262.7	444.865	103.825	41.1035	170.727	161.977	236.151	298.284
	13351	440.31	107.742	43.6006	185.145	161	270.962	305.09
AVG	10877.53	425.6268	108.1404	39.77705	172.124	163.9995	243.6507	291.957
MIN	287.021	341.81	99.7617	28.7902	147.552	151.311	172.383	283.337

	beckon	fold	no	nod	please	shake	think	wave
nod3								
	286.29	403.736	112.247	34.4791	177.017	154.608	188.76	306.283
	276.335	8896.81	109.092	28.7902	174.254	153.559	241.368	290.085
	271.575	480.851	108.603		165.818	172.393	222.001	284.97
	262.409	402.247	93.9818	28.2356	188.964	158.074	268.104	291.02
	278.807	398.881	115.628	26.3238	167.872	171.163	238.636	278.581
	267.033	360.439	103.965	31.9088	177.06	166.517	222.953	287.703
	278.288	411.838	105.64	29.1336	183.33	159.797	241.814	291.841
	276.798	403.889	107.757	32.6363	196.068	190.398	269.813	286.329
	282.15	451.559	105.888	26.3519	148.122	168.197	243.958	286.467
	269.547	408.447	102.503	46.177	147.291	160.775	233.688	291.166
	260.519	487.475	101.416	40.1975	140.585	171.634	254.922	279.096
	283.681	448.465	103.664	34.5771	176.431	182.395	245.957	278.92
	280.231	451.65	99.4549	30.4391	152.419	160.087	221.468	293.236
	282.909	481.824	104.665	29.9499	150.805	164.806	246.051	294.304
	279.183	417.66	106.411	32.135	167.261	153	279.518	299.46
AVG	275.717	993.7181	105.3944	32.23821	167.5531	165.8269	241.2674	289.2974
MIN	260.519	360.439	93.9818	26.3238	140.585	153	188.76	278.581

	beckon	fold	no	nod	please	shake	think	wave
nod4								
	280.702	410.739	97.5802	34.5921	166.154	153.981	196.066	307.604
	266.576	9107.47	93.7701	41.4562	187.076	142.978	247.426	287.329
	261.717	487.897	95.1366	28.2356	168.575	158.441	224.72	280.206
	252.887	405.072	93.9818		177.295	145.864	270.33	287.807
	269.878	401.551	104.07	16.5308	159.324	159.379	242.888	274.59
	256.265	361.776	95.8532	24.2316	176.529	152.222	218.381	279.385
	268.252	414.399	90.5358	18.1492	181.013	147.132	240.9	283.887
	266.517	406.392	93.2685	15.8611	182.126	176.66	254.028	279.289
	271.528	459.527	93.913	29.2775	143.742	154.653	257.305	280.093
	261.344	413.004	91.2918	32.5748	150.582	146.759	235.182	286.217
	249.066	496.223	90.993	36.3963	150.8	157.779	260.418	273.889
	272.917	455.297	10256.4	39.3495	171.843	169.814	254.299	272.622
	268.986	455.918	88.2482	29.4011	151.042	146.673	207.037	285.86
	272.086	491.037	94.9602	29.1804	146.739	152.49	223.888	295.789
	266.9	422	101.122	35.7472	162.469	139.7	266.764	291.7
AVG	265.7081	1012.553	772.075	29.35596	165.0206	153.635	239.9755	284.4178
MIN	249.066	361.776	88.2482	15.8611	143.742	139.7	196.066	272.622

	beckon	fold	no	nod	please	shake	think	wave
nod5								
	281.447	427.332	96.8806	40.0753	167.228	157.157	202.592	312.184
	267.608	9425.08	93.9631	45.424	170.839	147.708	256.847	297.207
	263.002	11123.5	95.9542	26.3238	157.079	157.754	229.652	282.847
	252.779	419.273	94.1384	16.5308	178.414	149.834	273.658	291.033
	271.236	416.855	99.3476		163.494	160.869	247.591	283.969
	257.718	375.21	88.8871	21.0191	167.268	154.807	224.545	280.561
	267.575	429.383	89.6796	11.8553	198.841	150.096	245.699	286.865
	265.439	421.339	91.5667	10.9414	180.248	178.222	254.528	289.951
	271.488	11454.7	91.5813	21.0923	161.054	155.806	232.78	282.244
	260.361	429.064	94.1961	21.0784	153.935	149.8	211.717	289.497
	248.653	10989	88.961	25.9704	141.218	161.533	238.233	286.644
	272.779	471.877	10661	23.3692	184.584	172.338	252.015	279.586
	270.135	470.511	88.52	20.194	163.467	152.307	205.042	289.45
	274.082	10787.5	92.7562	23.6131	165.992	155.244	227.866	291.892
	268	437.382	94.71	30.9516	174.169	144.9	259.927	298
AVG	266.1535	3871.867	797.4761	24.17419	168.522	156.5583	237.5128	289.462
MIN	248.653	375.21	88.52	10.9414	141.218	144.9	202.592	279.586

	beckon	fold	no	nod	please	shake	think	wave
nod6								
	280.009	371.36	97.2796	44.7329	153.597	150.221	186.801	305.314
	278.872	512.472	94.993	33.9044	163.298	140.641	249.919	289.336
	270.278	450.984	98.6086	31.9088	150.129	153.081	213.233	283.146
	14556.1	437.907	97.7083	24.2316	163.572	142.79	267.171	289.019
	279.073	432.948	100.198	21.0191	147.676	152.765	247.012	277.4
	265.739	389.556	90.993		160.356	150.268	210.24	275.494
	14513.9	437.425	89.1467	15.6533	189.327	141.29	238.098	279.665
	14881	436.228	92.257	21.1438	171.571	170.22	250.067	281.195
	14493	419.119	89.7921	20.0626	150.794	145.365	232.376	281.494
	270.245	395.116	91.6955	20.1269	147.051	144.563	208.606	281.64
	14577.3	455.654	87.8218	24.5754	134.994	152.92	238.964	277.103
	14535.1	425.616	88.2305	33.4687	176.715	162.807	246.644	273.015
	278.619	446.826	85.5299	29.2444	155.238	153.205	232.841	282.13
	281.412	449.203	89.6895	26.2561	155.705	149.546	216.359	286.337
	276.825	407.72	94.0288	34.7717	173.454	137.164	258.456	293.123
AVG	6002.498	431.2089	92.53149	27.22141	159.5651	149.7897	233.1191	283.6941
MIN	265.739	371.36	85.5299	15.6533	134.994	137.164	186.801	273.015

	beckon	fold	no	nod	please	shake	think	wave
nod7								
	283.958	401.608	99.5642	44.6679	170.964	159.631	186.43	311.336
	273.75	8857.41	96.7542	41.7882	164.693	152.016	236.888	291.421
	267.254	477.511	95.4731	29.1336	156.718	170.535	220.249	283.49
	260.09	401.912	95.2252	18.1492	185.748	154.426	267.22	289.014
	276.991	397.917	103.186	11.8553	160.097	166.009	234.497	278.408
	264.257	358.52	90.8776	15.6533	170.111	159.412	220.751	283.491
	274.142	411.194	96.1214		180.812	152.657	237.683	289.88
	273.165	402.681	94.4582	10.1507	195.093	186.495	264.534	285.422
	277.792	448.603	95.4837	14.987	144.882	161.785	231.563	283.695
	266.323	407.107	89.8954	34.2151	141.819	154.146	218.985	289.842
	255.453	484.287	88.5966	31.4634	135.52	164.573	243.336	277.116
	278.989	447.109	89.9531	21.8095	171.593	175.311	238.217	276.154
	275.504	450.921	87.5322	16.9208	147.859	151.909	212.449	291.302
	278.213	479.357	96.3268	18.683	145.971	157.763	239.63	291.067
	273.6	416.71	93.3748	21.6483	163.791	143	278.192	294.9
AVG	271.9654	989.5231	94.18817	23.65181	162.3781	160.6445	235.3749	287.7692
MIN	255.453	358.52	87.5322	10.1507	135.52	143	186.43	276.154

	beckon	fold	no	nod	please	shake	think	wave
nod8								
	283.978	405.9	99.4946	49.1448	169.339	158.182	190.782	313.146
	272.641	8952.57	96.1537	43.668	173.501	149.037	239.673	292.99
	266.934	482.207	96.1112	32.6363	165.469	165.79	220.692	285.068
	259.227	404.145	94.6133	15.8611	183.532	151.077	268.432	291.134
	275.831	399.469	103.05	10.9414	160.36	163.707	236.314	278.595
	262.943	361.063	90.6214	21.1438	181.366	157.441	218.013	288.992
	272.941	412.933	93.4218	10.1507	181.006	150.607	238.803	289.979
	271.919	404.768	95.9955		191.064	182.915	261.447	285.962
	276.797	453.507	93.8696	16.7413	145.499	159.988	244.611	284.963
	265.925	410.004	91.1889	26.4081	143.426	151.524	235.076	291.238
	254.772	488.965	88.9087	27.6549	140.788	162.46	257.099	278.122
	278.591	450.611	92.1449	21.279	171.795	173.705	239.178	277.286
	274.62	453.162	88.8885	17.8055	148.58	149.967	211.186	291.252
	277.817	484.539	94.721	17.5995	145.697	156.243	233.458	292.652
	273.295	418.942	95.3486	24.0918	164.455	142	273.243	296
AVG	271.2154	998.8523	94.30211	23.93759	164.3918	158.3095	237.8671	289.1586
MIN	254.772	361.063	88.8885	10.1507	140.788	142	190.782	277.286

	beckon	fold	no	nod	please	shake	think	wave
nod9								
	289.101	379.839	102.213	46.944	163.236	160.092	211.975	314.98
	282.642	522.975	99.2774	32.8294	164.113	154.491	244.42	295.203
	274.358	457.964	97.0291	26.3519	150.614	159.037	229.052	287.833
	269.896	420.023	96.8917	29.2775	170.76	155.883	277.851	291.94
	283.796	407.292	100.773	21.0923	171.332	163.63	250.349	285.428
	271.653	364.928	90.682	20.0626	163.857	157.947	225.656	282.857
	283.724	413.838	87.8182	14.987	188.35	159.594	266.138	287.509
	15674.1	411.275	90.775	16.7413	171.682	175.378	253.547	290.338
	287.092	428.01	88.2093		150.809	156.794	229.093	287.836
	274.67	391.455	88.8999	14.3782	145.763	157.551	203.233	287.661
	267.876	462.646	86.4391	18.7272	133.856	166.96	241.29	280.637
	289.214	431.216	83.0861	20.6175	177.13	181.991	248.603	278.164
	283.927	442.91	83.4835	15.3131	152.285	156.411	231.241	292.488
	286.94	456.898	87.0672	16.1149	154.666	167.435	220.804	295.978
	282.182	406.918	89.8506	14.7885	171.318	142.2	255.997	299.8
AVG	1306.745	426.5458	91.49967	22.0161	161.9847	161.0263	239.2833	290.5768
MIN	267.876	364.928	83.0861	14.3782	133.856	142.2	203.233	278.164

	beckon	fold	no	nod	please	shake	think	wave
nod10								
	287.913	397.784	103.891	62.113	176.509	161.07	179.895	312.976
	277.944	8810.59	99.3616	37.0782	162.347	156.689	236.178	294.842
	271.129	473.259	95.2877	46.177	152.858	168.399	217.187	285.35
	263.896	398.833	97.1945	32.5748	191.37	159.507	262.214	289.531
	281.382	395.767	101.647	21.0784	164.379	167.326	230.743	283.092
	267.405	359.419	90.6074	20.1269	168.607	164.145	225.201	284.89
	277.514	409.353	92.9092	34.2151	182.756	154.745	238.37	292.41
	277.928	399.967	92.5606	26.4081	189.262	190.158	270.736	288.243
	282.511	446.155	92.24	14.3782	144.684	165.866	229.688	286.352
	270.948	404.828	89.1296		142.022	158.141	212.695	291.027
	261.049	480.618	86.7856	10.0452	131.67	167.846	244.23	278.875
	284.161	444.307	87.2982	14.0295	172.549	178.465	243.628	277.826
	281.014	450.208	82.518	14.4103	147.023	155.612	215.7	293.736
	284.214	474.464	90.6894	21.2769	148.609	161.852	246.736	295.865
	278.75	415.9	89.8999	17.747	161.936	145	281.874	298.69
AVG	276.5172	984.0968	92.80131	26.54704	162.4387	163.6547	235.6717	290.247
MIN	261.049	359.419	82.518	10.0452	131.67	145	179.895	277.826

	beckon	fold	no	nod	please	shake	think	wave
nod11								
	293.006	391.789	104.304	56.4459	186.257	166.756	179.358	314.951
	283.183	8688.11	101.03	36.2767	162.013	163.296	239.382	297.486
	276.155	469.584	95.6409	40.1975	150.259	166.316	223.532	289.25
	269.13	395.906	96.6567	36.3963	188.556	166.377	266.26	292.987
	286.185	392.473	102.172	25.9704	169.955	173.678	231.418	286.209
	272.246	358.034	90.8864	24.5754	165.17	171.531	234.691	287.197
	282.731	406.517	88.5286	31.4634	184.804	160.646	244.363	298.743
	284.221	396.774	90.5845	27.6549	178.447	193.711	281.982	291.861
	287.474	440.943	87.4054	18.7272	149.304	172.196	230.919	290.669
	275.922	400.574	88.0425	10.0452	145.723	165.018	206.139	296.292
	266.26	475.28	86.47		132.793	173.3	244.76	282.718
	289.056	440.153	85.7361	14.0316	175.215	183.838	247.438	282.008
	285.721	448.054	81.0045	15.5003	150.61	159.369	222.43	298.271
	288.948	470.203	84.8984	28.2767	152.207	166.615	258.748	299.654
	283.335	413.2	87.989	16.815	165.722	147.9	268.111	303.354
AVG	281.5715	972.5063	91.42327	27.31261	163.8023	168.7031	238.6354	294.11
MIN	266.26	358.034	81.0045	10.0452	132.793	147.9	179.358	282.008

	beckon	fold	no	nod	please	shake	think	wave
nod12								
	305.187	422.631	107.969	51.3381	175.011	164.097	189.524	317.82
	281.544	9259.28	102.313	48.567	184.229	161.077	271.53	310.285
	274.742	10893.2	98.3963	34.5771	166.755	170.047	221.883	289.896
	267.521	417.89	97.642	39.3495	187.346	162.752	266.258	293.628
	285.989	414.319	102.879	23.3692	171.508	172.936	240.028	298.492
	272.417	375.009	90.179	33.4687	180.045	166.923	227.635	291.759
	280.904	427.651	90.2983	21.8095	191.068	161.177	248.219	297.548
	280.45	419.613	90.884	21.279	184.039	189.774	263.324	300.49
	285.917	470.148	90.0624	20.6175	157.882	169.494	249.654	291.042
	274.143	426.11	89.4951	14.0295	169.267	163.411	224.137	295.252
	262.849	10764.3	85.6667	14.0316	152.121	173.04	261.673	284.199
	287.704	466.999	10449.3		190.641	185.47	276.759	291.999
	284.423	467.649	86.2072	9.92548	163.599	164.658	213.909	299.18
	288.417	10570.8	88.6698	13.1657	157.021	168.314	235.78	305.871
	282.479	434.917	91.2966	20.8866	167.046	156.1	262.018	315.172
AVG	280.9791	3082.034	784.0839	26.17246	173.1719	168.618	243.4887	298.8422
MIN	262.849	375.009	85.6667	9.92548	152.121	156.1	189.524	284.199

	beckon	fold	no	nod	please	shake	think	wave
nod13								
	294.198	410.823	105.539	48.4231	174.023	162.046	184.072	315.831
	280.943	9049.79	101.736	45.5642	188.061	157.686	243.567	297.528
	273.251	487.305	96.9007	30.4391	179.822	172.149	217.012	288.894
	267.028	408.563	94.5358	29.4011	187.107	159.816	262.537	292.767
	284.795	404.232	107.024	20.194	167.162	171.105	234.443	285.107
	270.899	366.05	91.3435	29.2444	189.734	164.076	222.343	292.453
	280.482	417.519	90.7969	16.9208	185.307	158.8	242.572	295.685
	279.963	409.371	91.3986	17.8055	188.847	189.875	264.246	293.279
	284.882	458.985	89.1615	15.3131	149.031	168.389	264.031	289.925
	272.911	415.296	88.264	14.4103	151.655	160.301	240.204	293.77
	262.508	493.469	84.8919	15.5003	150.434	170.502	277.042	281.774
	286.559	455.832	87.2609	9.92548	175.363	183.094	257.675	283.183
	283.029	457.982	84.2082		150.653	160.326	215.314	297.305
	286.505	488.693	88.8873	9.12211	149.999	165.971	234.356	305.482
	281.29	424.49	91.238	14.3145	165.298	151.8	268.937	302.2
AVG	279.2829	1009.893	92.87909	22.61271	170.1664	166.3957	241.8901	294.3455
MIN	262.508	366.05	84.2082	9.12211	149.031	151.8	184.072	281.774

	beckon	fold	no	nod	please	shake	think	wave
nod14								
	296.458	389.107	105.684	47.937	173.05	171.49	202.724	319.434
	288.367	532.189	103.505	41.1035	168.421	166.777	245.574	301.861
	280.141	463.675	98.1705	29.9499	154.78	165.833	246.525	293.928
	275.989	410.346	98.6292	29.1804	177.353	168.264	286.372	297.317
	290.808	399.609	103.803	23.6131	187.106	173.895	246.544	289.609
	278.12	360.106	91.6163	26.2561	167.149	166.662	246.194	289.179
	289.404	410.587	89.4883	18.683	191.123	169.24	262.81	294.218
	290.983	404.979	92.7646	17.5995	175.147	182.734	263.442	296.549
	292.619	434.788	91.5464	16.1149	154.169	167.724	233.232	294.867
	279.887	399.014	90.7245	21.2769	147.939	168.463	206.032	294.074
	272.634	469.245	90.0471	28.2767	138.383	180.837	245.525	286.915
	295.037	438.259	86.1428	13.1657	180.402	190.15	251.203	284.931
	289.763	448.465	89.1528	9.12211	155.25	161.271	233.862	304.746
	292.924	463.668	88.982		157.08	171.32	232.63	302.276
	288.653	411.9	91.5479	9.57497	173.589	147.904	259.399	305
AVG	286.7858	429.0625	94.12029	23.70384	166.7294	170.1709	244.1379	296.9936
MIN	272.634	360.106	86.1428	9.12211	138.383	147.904	202.724	284.931

	beckon	fold	no	nod	please	shake	think	wave
nod15								
	297.876	379.792	107.362	50.1279	166.48	160.185	167.462	311.565
	13986.1	508.317	105.342	43.6006	172.42	156.073	255.59	301.525
	284.783	452.488	99.0227	32.135	158.449	169.104	205.822	295.041
	14144.3	414.865	95.8977	35.7472	176.3	158.428	258.811	297.662
	298.255	421.857	103.64	30.9516	158.342	169.284	228.196	290.546
	285.104	378.273	92.2792	34.7717	171.607	164.711	213.361	290.14
	14104.5	446.777	89.2647	21.6483	198.288	154.622	239.386	294.39
	14450.9	427.046	92.3249	24.0918	176.032	185.008	261.928	297.38
	14084.7	422.752	88.2727	14.7885	159.452	162.564	242.092	296.422
	286.964	412.936	89.3909	17.747	154.885	160.549	214.068	291.376
	14164.3	456.228	85.0903	16.815	140.464	168.431	256.192	288.759
	14124.5	436.555	81.5131	20.8866	186.831	177.94	263.494	286.423
	297.194	461.757	82.1481	14.3145	160.337	166.653	247.096	295.622
	299.73	449.543	85.913	9.57497	164.789	161.542	228.497	303.319
	295.349	425.5	89.5904		178.664	154	262.09	307.93
AVG	6760.304	432.9791	92.47011	26.22862	168.2227	164.6063	236.2723	296.54
MIN	284.783	378.273	81.5131	9.57497	140.464	154	167.462	286.423

	beckon	fold	no	nod	please	shake	think	wave
no1								
	310.317	439.094		114.65	180.569	197.928	236.048	334.644
	289.855	9216.58	16.3369	116.433	195.156	177.696	295.327	314.169
	280.002	506.405	35.2776	112.247	186.267	192.271	264.254	295.398
	275.041	425.412	40.2513	97.5802	195.284	176.985	304.466	301.982
	291.969	421.341	22.6118	96.8806	171.279	190.461	283.509	300.71
	279.886	379.573	35.7055	97.2796	191.703	182.902	258.881	296.237
	287.391	435.568	34.0544	99.5642	202.699	177.868	281.665	301.876
	286.931	427.224	25.0664	99.4946	203.749	207.511	291.099	296.655
	288.542	479.599	28.1426	102.213	172.751	182.491	280.892	294.14
	279.799	431.125	29.6682	103.891	183.929	174.38	261.154	302.203
	263.879	10706.6	31.1334	104.304	176.438	191.429	283.912	290.738
	285.535	474.95	10394.9	107.969	204.736	201.293	300.257	290.418
	284.36	473.269	37.6886	105.539	184.875	173.717	244.007	303.652
	284.338	10515.2	36.2553	105.684	176.096	184.617	264.464	306.125
	273.67	439.198	35.9916	107.362	180.449	168.357	299.172	312.954
AVG	284.101	2384.743	771.6488	104.7394	187.0653	185.3271	276.6071	302.7934
MIN	263.879	379.573	16.3369	96.8806	171.279	168.357	236.048	290.418

	beckon	fold	no	nod	please	shake	think	wave
no2								
	298.328	12150.6	16.3369	112.359	181.753	195.909	243.51	334.562
	284.362	9569.36		116.3	181.031	176.515	280.778	306.788
	278.456	11325	44.0676	109.092	174.658	188.435	269.256	296.112
	266.939	435.013	38.7817	93.7701	190.834	176.622	308.71	309.265
	288.293	433.048	29.1839	93.9631	175.161	189.795	290.955	289.928
	275.91	391.371	36.4788	94.993	180.109	180.897	262.777	293.022
	279.608	447.872	39.3248	96.7542	212.227	178.458	285.039	298.634
	277.666	439.784	33.4851	96.1537	197.768	205.189	292.761	295.032
	281.314	11668.6	36.2366	99.2774	177.395	183.222	265.813	299.654
	273.09	446.552	44.6937	99.3616	172.968	172.176	247.684	300.919
	255.244	11185.7	40.0624	101.03	166.589	190.387	267.003	294.014
	278.029	12285	10845.9	102.313	202.531	202.145	272.32	286.783
	279.467	487.678	42.5955	101.736	185.118	175.583	259.868	302.119
	279.937	10976.9	43.1658	103.505	186.672	187.073	268.709	297.516
	267.503	453.865	37.3176	105.342	200.218	172.718	295.581	307.861
AVG	277.6097	5513.09	809.1165	101.73	185.6688	185.0083	274.0509	300.8139
MIN	255.244	391.371	16.3369	93.7701	166.589	172.176	243.51	286.783

	beckon	fold	no	nod	please	shake	think	wave
no3								
	307.71	392.047	35.2776	113.848	166.874	189.92	218.693	327.287
	302.366	520.331	44.0676	110.937	178.714	173.672	280.427	309.246
	291.286	457.232		108.603	169.402	187.858	247.616	298.191
	14513.8	446.727	41.2052	95.1366	177.667	173.549	295.278	303.326
	304.72	445.104	24.6286	95.9542	162.974	185.689	279.621	292.436
	292.2	402.499	28.1189	98.6086	177.454	180.201	247.523	293.434
	14471.8	449.974	21.6173	95.4731	202.888	174.316	274.339	295.416
	14836.9	451.055	29.1215	96.1112	188.322	200.664	285.671	298.337
	14451.1	427.658	26.0153	97.0291	173.402	175.921	266.247	298.275
	290.687	404.319	33.5474	95.2877	166.943	173.058	240.22	294.449
	14534.9	463.496	26.9326	95.6409	161.203	186.456	271.001	293.538
	14493	435.251	36.9235	98.3963	196.935	195.495	280.453	287.223
	297.306	455.548	29.6785	96.9007	178.936	182.616	267.719	294.118
	297.001	458.639	27.8469	98.1705	178.679	183.573	254.901	302.717
	287.048	416.75	37.3816	99.0227	186.539	167.009	292.225	309.1
AVG	5998.122	441.7753	31.59732	99.67464	177.7955	181.9998	266.7956	299.8062
MIN	287.048	392.047	21.6173	95.1366	161.203	167.009	218.693	287.223

	beckon	fold	no	nod	please	shake	think	wave
no4								
	310.159	394.454	40.2513	113.225	171.651	191.994	229.912	335.044
	302.918	524.535	38.7817	111.801	174.485	175.233	277.622	307.353
	289.681	460.651	41.2052	108.624	168.316	188.9	252.71	298.575
	290.593	444.427		93.9818	179.994	175.127	298.043	302.846
	305.257	430.857	32.1711	94.1384	170.624	186.955	292.594	293.542
	292.749	388.259	27.6402	97.7083	173.43	182.005	252.052	293.213
	302.787	437.66	18.8694	95.2252	203.268	176.912	283.198	297.61
	15220.8	436.966	33.4938	94.6133	183.851	200.514	285.41	299.26
	303.198	432.24	27.5418	96.8917	170.191	177.332	265.677	298.389
	292.655	397.931	37.7711	97.1945	166.037	176.769	241.325	296.152
	285.072	466.937	28.002	96.6567	159.808	188.594	271.18	291.889
	302.003	436.293	30.3687	97.642	196.108	201.127	278.25	287.126
	298.134	449.992	27.6107	94.5358	176.738	180.323	266.134	300.598
	298.429	462.429	26.7416	98.6292	177.307	189.046	255.959	303.408
	287.839	411.088	39.2081	95.8977	186.748	165.076	291.424	308.948
AVG	1292.152	438.3146	32.11834	99.11764	177.2371	183.7271	269.4327	300.9302
MIN	285.072	388.259	18.8694	93.9818	159.808	165.076	229.912	287.126

	beckon	fold	no	nod	please	shake	think	wave
no5								
	308.734	428.186	22.6118	119.618	186.71	196.712	231.832	333.042
	293.865	9066.17	29.1839	118.358	200.038	180.334	280.263	310.283
	282.898	497.034	24.6286	115.628	194.98	195.967	261.634	297.376
	281.66	419.972	32.1711	104.07	200.834	180.299	303.531	302.148
	296.852	415.401		99.3476	176.359	192.772	280.786	295.539
	286.154	375.372	34.4857	100.198	201.307	184.242	262.273	300.794
	292.088	429.46	22.378	103.186	202.336	181.446	281.988	303.432
	292.278	421.435	26.6564	103.05	203.89	210.828	296.668	299.531
	293.423	468.547	25.5816	100.773	166.176	187.343	295.932	296.253
	284.182	422.294	23.9828	101.647	173.385	176.808	274.534	301.216
	269.718	506.773	27.0976	102.172	174.843	194.347	300.054	291.469
	291.013	464.621	49.5828	102.879	197.667	205.509	289.137	290.095
	289.413	465.469	32.8131	107.024	176.664	177.937	252.619	304.189
	289.538	501.844	29.7398	103.803	172.698	189.102	270.385	313.151
	279.022	431.449	32.4285	103.64	178.846	169.907	306.957	309.213
AVG	288.7225	1020.935	29.52441	105.6929	187.1155	188.2369	279.2395	303.1821
MIN	269.718	375.372	22.378	99.3476	166.176	169.907	231.832	290.095

	beckon	fold	no	nod	please	shake	think	wave
no6								
	306.586	424.892	35.7055	109.804	178.205	191.254	221.031	327.666
	291.819	9107.47	36.4788	108.825	193.466	178.744	272.454	300.914
	279.754	489.407	28.1189	103.965	181.389	191.258	251.858	289.634
	276.9	414.048	27.6402	95.8532	191.79	179.449	292.937	294.079
	295.742	410.003	34.4857	88.8871	167.537	190.109	271.716	288.654
	281.099	369.9		90.993	190.779	182.272	254.399	293.055
	288.724	423.887	28.5297	90.8776	191.059	178.706	273.624	298.134
	288.847	416.405	20.5545	90.6214	196.205	207.46	287.956	293.052
	291.321	463.933	21.167	90.682	158.469	182.845	281.457	290.011
	281.954	417.619	16.9411	90.6074	166.436	175.135	260.795	293.829
	269.338	498.857	21.2523	90.8864	170.484	191.231	288.496	284.706
	290.018	460.442	10256.3	90.179	190.257	202.501	286.445	282.179
	288.077	460.876	32.0304	91.3435	169.459	176.403	241.382	300.469
	288.775	494.223	27.4165	91.6163	164.365	185.819	260.495	309.721
	278.802	427.227	37.4022	92.2792	171.699	167.889	295.136	303.827
AVG	286.5171	1018.613	758.8588	94.49467	178.7733	185.405	269.3454	296.662
MIN	269.338	369.9	16.9411	88.8871	158.469	167.889	221.031	282.179

	beckon	fold	no	nod	please	shake	think	wave
no7								
	303.058	408.529	34.0544	111.221	181.267	189.106	213.919	324.372
	291.208	8841.73	39.3248	105.392	175.831	174.736	265.341	302.798
	282.09	474.664	21.6173	105.64	171.599	193.364	248.303	291.001
	275.919	402.248	18.8694	90.5358	194.601	175.458	291.107	295.67
	294.261	397.751	22.378	89.6796	171.746	188.582	265.154	288.69
	281.007	360.696	28.5297	89.1467	175.682	179.597	254.29	292.611
	288.999	412.425		96.1214	188.181	174.847	268.441	297.501
	289.776	404.86	39.2916	93.4218	199.752	207.528	295.113	295.874
	291.262	446.205	35.7863	87.8182	160.802	183.44	259.989	292.996
	281.194	402.819	20.2333	92.9092	158.098	172.461	245.212	296.254
	270.888	482.915	31.0567	88.5286	155.211	188.665	269.392	284.818
	289.528	445.449	33.6355	90.2983	184.886	199.342	268.803	283.592
	287.668	448.871	23.4746	90.7969	167.792	170.741	245.139	298.119
	287.804	479.163	28.9173	89.4883	166.351	184.059	272.27	300.297
	278.14	413.61	29.7127	89.2647	173.835	161.263	307.568	303.187
AVG	286.1868	988.129	29.06297	94.0175	175.0423	182.8793	264.6694	296.5187
MIN	270.888	360.696	18.8694	87.8182	155.211	161.263	213.919	283.592

	beckon	fold	no	nod	please	shake	think	wave
no8								
	313.043	419.688	25.0664	114.128	187.122	194.779	214.285	325.324
	301.024	8920.6	33.4851	106.125	182.275	183.412	265.772	303.536
	287.574	486.289	29.1215	107.757	180.516	201.79	247.089	293.374
	288.234	413.75	33.4938	93.2685	201.488	184.297	290.584	296.728
	304.791	408.509	26.6564	91.5667	174.101	196.573	266.705	291.608
	292.451	369.055	20.5545	92.257	190.998	189.142	251.015	304.918
	299.852	422.86	39.2916	94.4582	197.224	184.749	270.123	301.767
	300.464	414.932		95.9955	207.035	215.395	293.989	298.336
	301.96	458.901	13.7301	90.775	162.849	190.688	268.9	296.642
	291.4	414.429	12.7071	92.5606	159.985	181.681	258.134	297.683
	278.538	495.897	15.9127	90.5845	160.337	196.72	280.359	287.961
	299.723	456.256	36.4413	90.884	192.059	208.347	271.148	289.563
	298.194	458.18	21.9904	91.3986	170.469	180.038	246.485	304.272
	298.387	490.836	29.242	92.7646	169.403	192.075	269.237	307.287
	287.141	423.636	21.7082	92.3249	175.524	171.062	303.413	308.7
AVG	296.1851	1003.588	25.67151	95.78987	180.759	191.3832	266.4825	300.5133
MIN	278.538	369.055	12.7071	90.5845	159.985	171.062	214.285	287.961

	beckon	fold	no	nod	please	shake	think	wave
no9								
	312.229	414.184	28.1426	112.145	192.085	195.172	212.634	323.744
	301.001	8833.92	36.2366	104.895	178.05	183.86	265.773	304.88
	288.902	480.642	26.0153	105.888	176.815	202.448	249.185	294.17
	288.546	409.801	27.5418	93.913	207.34	184.841	291.192	296.895
	304.638	404.848	25.5816	91.5813	179.985	197.805	266.015	293.11
	292.072	368.052	21.167	89.7921	185.903	190.417	256.245	296.138
	300.302	420.046	35.7863	95.4837	200.51	184.363	269.834	304.056
	302.327	411.637	13.7301	93.8696	207.29	217.705	298.749	298.991
	301.806	453.466		88.2093	165.646	193.302	262.008	297.927
	290.445	410.981	12.1736	92.24	162.591	182.456	246.51	297.961
	277.817	489.75	11.6035	87.4054	158.353	197.817	272.002	288.517
	299.335	451.819	29.3318	90.0624	196.451	209.788	271.275	289.818
	298.239	456.015	13.1778	89.1615	172.663	181.092	248.207	303.704
	298.601	484.939	23.9373	91.5464	173.323	194.607	275.633	306.45
	287	421	17.064	88.2727	178.354	170.39	309.138	309.438
AVG	296.2173	994.0733	22.96352	94.29769	182.3573	192.4042	266.2933	300.3866
MIN	277.817	368.052	11.6035	87.4054	158.353	170.39	212.634	288.517

	beckon	fold	no	nod	please	shake	think	wave
no10								
	309.319	442.294	29.6682	108.88	182.613	194.592	222.424	326.419
	294.146	9451.79	44.6937	107.761	185.255	182.736	276.762	306.488
	282.377	11160.7	33.5474	102.503	178.386	194.137	254.412	287.809
	280.414	428.358	37.7711	91.2918	193.337	183.519	294.347	294.166
	299.891	425.157	23.9828	94.1961	174.321	194.571	275.415	292.87
	284.882	385.124	16.9411	91.6955	186.402	186.016	257.722	292.91
	291.794	438.746	20.2333	89.8954	215.466	182.065	278.164	299.544
	291.832	430.564	12.7071	91.1889	195.233	210.857	288.432	299.013
	294.4	11494.2	12.1736	88.8999	180.058	186.32	261.201	292.295
	285.957	435.624		89.1296	172.961	180.672	239.17	295.217
	269.876	11025.3	12.2306	88.0425	163.804	195.214	269.608	296.434
	291.951	479.03	10695.1	89.4951	200.913	207.79	281.712	290.127
	292.697	477.149	22.3802	88.264	185.027	183.168	242.234	303.859
	294.327	10822.5	15.4561	90.7245	189.803	190.989	263.499	305.598
	282.53	444	18.53	89.3909	190.151	175.727	287.972	309.5
AVG	289.7595	3889.369	785.3868	93.42388	186.2487	189.8915	266.2049	299.4833
MIN	269.876	385.124	12.1736	88.0425	163.804	175.727	222.424	287.809

	beckon	fold	no	nod	please	shake	think	wave
no11								
	312.255	401.256	31.1334	108.312	192.858	197.061	215.264	322.002
	301.106	538.461	40.0624	103.024	167.663	187.26	265.547	304.61
	289.056	468.521	26.9326	101.416	160.445	189.842	259.867	293.88
	288.37	404.864	28.002	90.993	191.663	190.392	297.444	296.351
	303.902	396.743	27.0976	88.961	180.862	198.482	266.38	292.272
	292.603	360.66	21.2523	87.8218	170.737	195.956	269.12	291.29
	299.933	411.746	31.0567	88.5966	199.599	185.008	277.465	301.564
	301.002	402.756	15.9127	88.9087	183.221	206.878	300.485	297.735
	301.727	440.073	11.6035	86.4391	165.57	192.691	255.906	296.462
	290.838	400.118	12.2306	86.7856	160.273	187.234	232.605	295.669
	279.838	475.992		86.47	151.662	197.452	265.853	287.674
	300.246	441.08	22.5984	85.6667	194.293	207.53	270.539	286.451
	297.953	448.816	33.918	84.8919	170.022	178.556	253.04	302.459
	298.81	471.69	18.4269	90.0471	170.327	191.57	276.559	305.885
	288.69	412.62	13.8228	85.0903	178.484	165.859	289.104	308.02
AVG	296.4219	431.6931	23.86071	90.89492	175.8453	191.4514	266.3452	298.8216
MIN	279.838	360.66	11.6035	84.8919	151.662	165.859	215.264	286.451

	beckon	fold	no	nod	please	shake	think	wave
no12								
	10427.6	370.026	10394.9	111.199	182.761	190.143	203.632	321.142
	11274	494.727	10845.9	100.927	10245.9	181.032	10460.3	10460.3
	11013.3	452.581	36.9235	103.664	186.248	195.849	249.959	10952.9
	11376.6	403.448	30.3687	10256.4	193.902	183.689	293.701	10810.8
	11098.9	391.201	49.5828	10661	165.756	191.279	264.352	10438.5
	11049.8	342.184	10256.3	88.2305	195.187	187.156	258.186	298.742
	11350.8	404.765	33.6355	89.9531	10706.6	178.695	275.049	302.021
	11574.1	398.703	36.4413	92.1449	197.291	209.516	298.292	10504.2
	11338	408.636	29.3318	83.0861	10626.9	185.34	280.827	10881.4
	11198.3	376.968	10695.1	87.2982	10427.5	181.701	260.98	293.613
	11389.6	469.896	22.5984	85.7361	10288	190.866	292.415	10683.8
	11363.8	415.885		10449.3	10526.3	199.616	10373.4	10493.2
	11148.4	431.925	23.8633	87.2609	10570.8	171.644	11013.2	300.242
	11098.9	478.176	28.4861	86.1428	10695.1	185.752	273.441	10235.5
	11160.8	389	10277	81.5131	10775.8	159.73	301.745	10460.3
AVG	11190.86	415.2081	3768.602	2164.257	6398.936	186.1339	2339.965	7162.444
MIN	10427.6	342.184	22.5984	81.5131	165.756	159.73	203.632	293.613

	beckon	fold	no	nod	please	shake	think	wave
no13								
	311.091	398.456	37.6886	107.83	188.043	200.314	217.568	323.868
	303.549	537.092	42.5955	99.7617	173.924	190.141	264.378	302.796
	290.128	466.221	29.6785	99.4549	166.627	189.394	262.806	293.461
	289.405	406.389	27.6107	88.2482	190.247	192.694	298.542	297.024
	306.242	396.444	32.8131	88.52	186.259	201.308	267.159	290.621
	291.266	360.424	32.0304	85.5299	174.11	191.304	271.775	292.333
	302.129	410.557	23.4746	87.5322	200.241	187.499	276.632	301.719
	304.962	403.37	21.9904	88.8885	186.029	206.746	292.656	298.714
	303.61	438.729	13.1778	83.4835	171.078	190.848	253.743	298.804
	293.236	399.284	22.3802	82.518	164.784	191.113	227.076	295.997
	282.279	474.544	33.918	81.0045	155.132	200.178	262.049	288.835
	301.971	439.389	23.8633	86.2072	193.07	209.69	269.792	288.095
	299.669	448.27		84.2082	173.935	177.173	250.429	305.475
	300.078	468.697	13.0335	89.1528	174.243	193.046	267.846	304.645
	290.3	412.3	17.778	82.1481	182.347	166.36	283.719	310.383
AVG	297.9943	430.6777	26.57376	88.96585	178.6713	192.5205	264.4113	299.518
MIN	282.279	360.424	13.0335	81.0045	155.132	166.36	217.568	288.095

	beckon	fold	no	nod	please	shake	think	wave
no14								
	313.115	412.353	36.2553	112.396	193.296	195.515	210.596	323.535
	303.392	8826.13	43.1658	103.825	180.793	185.777	265.532	305.445
	290.75	478.427	27.8469	104.665	178.155	202.399	247.918	293.058
	289.281	408.751	26.7416	94.9602	206.656	186.42	289.012	295.798
	306.756	403.853	29.7398	92.7562	182.141	199.679	264.885	292.962
	291.746	368.512	27.4165	89.6895	186.002	191.38	257.027	297.637
	301.509	418.844	28.9173	96.3268	195.989	185.876	270.143	305.035
	303.734	410.531	29.242	94.721	203.369	218.565	300.688	301.112
	303.89	451.921	23.9373	87.0672	166.635	194.473	261.76	299.368
	293.487	409.939	15.4561	90.6894	163.302	184.389	244.333	298.411
	281.363	487.511	18.4269	84.8984	158.341	199.198	272.757	288.847
	302.175	450.849	28.4861	88.6698	192.871	211.514	272.238	290.426
	300.362	455.985	13.0335	88.8873	172.055	182.397	248.962	305.529
	300.868	482.814		88.982	173.354	195.415	277.944	307.766
	290.9	421	15.209	85.913	178.047	172.71	308.213	311.02
AVG	298.2219	992.4947	25.99101	93.62979	182.0671	193.7138	266.1339	301.0633
MIN	281.363	368.512	13.0335	84.8984	158.341	172.71	210.596	288.847

	beckon	fold	no	nod	please	shake	think	wave
no15								
	320.513	429.722	35.9916	114.222	186.825	196.751	217.291	329.822
	305.856	9124.09	37.3176	107.742	202.448	187.482	280.096	309.1
	291.996	498.793	37.3816	106.411	191.231	201.723	252.417	296.318
	291.99	421.924	39.2081	101.122	200.33	188.481	293.457	298.668
	309.534	417.759	32.4285	94.71	177.306	201.059	273.284	297.894
	295.205	378.348	37.4022	94.0288	198.677	191.517	257.126	301.788
	303.587	431.594	29.7127	93.3748	199.673	188.827	277.337	307.877
	303.761	423.119	21.7082	95.3486	202.226	218.398	292.849	302.853
	306.027	472.603	17.064	89.8506	168.158	195.114	286.951	301.555
	295.069	425.714	18.5315	89.8999	177.634	185.689	263.525	299.79
	282.921	508.938	13.8228	87.989	179.917	200.922	295.259	292.035
	304.394	468.236	10277.4	91.2966	199.721	213.966	296.162	295.345
	302.737	469.603	17.7787	91.238	177.305	186.335	248.379	310.176
	304	502.836	15.2093	91.5479	172.201	197.791	265.062	320.538
	293.076	435		89.5904	176.811	177.5	296.744	316.159
AVG	300.7111	1027.219	759.3541	95.89144	187.3642	195.437	273.0626	305.3279
MIN	282.921	378.348	13.8228	87.989	168.158	177.5	217.291	292.035