

The Strength and Weakness of Gesture input for Human-computer Interaction

Bijay Gaudel
SL1816018

Introduction

Gestures are the physical interaction that flows useful information without touching the target object. In addition, the nature of these gestures are generally an important element in determining the quality of feeling for the action. That's why gesture is what is transmitted and apprehend. Thus we can use the definition of gesture articulated by Kurtenbach and Hulteen (1990):

“A gesture is a motion of the body that contains information. Waving goodbye is a gesture. Pressing a key on a keyboard is not a gesture because the motion of a finger on its way to hitting a key is neither observed nor significant. All that matters is which key was pressed”.

Computerization of the whole society brings us a new way of interaction, that is Human-computer interaction. Relative to computer hardware and software with the rapid development of human-computer interaction technology, a keyboard is the symbol of the text age. It still occupies a dominant position in human-computer interaction devices. Although the graphical interface has been brought in a mouse, handle, touch screen, etc., but they are still not effective and natural enough. When virtual as quasi-reality^[1] becomes more and more well known, people naturally think of gesturing. In this present cutting-edge technology, to give gesture as input command for the computer to do some task is very common. For example swipe up the screen to unlock the mobile, swipe right to go to another screen, face recognition to unlock the screen etc. are the very common examples of gesture input and if these gestures are recognized by the system then it works very well.

Gestures in the Everyday World

If we consider human-human interaction rather than a computer, We can quickly realize that we utilize a wide range of gesture in our daily communication. We can beckon, wave, fend off to make use of formal sign languages. Normally, we use lots of gesture in our daily life such as pointing to object poking, touching, moving objects or changing object shape and direction or we can also activate the object such as controls, or handing object to others. Cadoz (1994) uses function to group gestures^[1] into three types:

- semiotic: those used to communicate meaningful information.
- ergotic: those used to manipulate the physical world and create artifacts.
- epistemic: those used to learn from the environment through tactile or haptic exploration

Types of Gesture^[2]

Iconic: Iconic gestures basically represent the description of the physical appearance. For example, imagine the gesture by you when you have to tell someone the wall was great.

Deictic, or Pointing: These gestures are used for particularly giving the direction or pointing towards the object.

Metaphoric: Metaphoric gestures gives the metaphorical meaning. For example typing making G gesture on the screen to open Google is one example.

Beat Gesture: these gesture just keep the rhythm of music or beat of sound.

Gesture Recognition

A gesture recognition system offers a natural, innovative and modern of non-verbal communication. It has a broad area of application in the interplay of human-computer. For gesture recognition, user gives a gesture as input data and sensor detects the gesture, then it decodes the gestures into some useful signal that machine can read, after this sensor send this signal to machine and machine evaluates whether the given signal is appropriate enough to perform some task or not and gives the output.

Types of Gesture Recognition

Hand Gesture Recognition: Hand Gesture Recognition does not required to touch between computer and hand by using some symbol by combination of finger and hand. We can use lots of sign language by finger.

Facial Gesture Recognition: Facial Gesture Recognition works on the basis of human emotions. The goal is to make computer understand human emotion effectively. For example, camera auto detecting smile face to capture picture.

Sign Language Recognition: Sign Language Recognition helps to communicate deaf people so well. sign language gesture recognition system can translate some symbol into text. Some system detect v shape finger up as winner is an example of sign language recognition.

Gesture as input

When we see back a decades ago almost not even the one technology company had used a touch-less screen on their any product but now with the advancement in the technology and demand of high-end product by user pushes the company to make robust, beautiful and more advance human-computer interaction like touch-less screen and intelligent system product. Like system can understand what users express in different sign language. Gestures are different from traditional graphical user interaction.

Some Technology to Apprehend Gestures

There are many technologies and sensor to recognize gesture as input data here are some examples^[2]:

Electric Field Sensing: this method compares changes of signal over the time, signal collected from the sensor compares with the recognized gesture.

Capacitive Sensing: This technique is used to measure the distance between sensor and an object. Works on the basis of capacitance of capacitor.

Dynamic of the body and movement of the body are measured and digitally recorded.

Strength of the Gesture Input

Gestures are much reacher then conventional graphical user interface or input technologies. Gesture helps to make a creative interaction with the computer and no need for traditional input devices. whether it is a signed gesture or others. Gestures are mainly based on the sign language rather than cultural and traditional languages. That's why people can easily master the gesture with less effort.

It fills the gap between graphical user interface and natural language interaction and can accomplish many task with the help of both hand at a time which increase the efficiency of the human computer interaction interface. It also protect users against vandalism. For example a doctor at work in OT, where touch-less interface removes concern about the sterility, which means gesture input directly or indirectly facilitates our health too. Gesture input are less tired some then typing on the keyboard which removes the physical overburden for long term users.

Weakness of the Gesture Input

Although gestures are very useful, easy-to-learn, and highly captivating topic in the research field of computer science and engineering, there are some limitation and weakness of using gesture input. Different user can make same gesture in a different way, which causes difficulty in identifying motions of the gesture. For example we can draw 'O' from two different direction: anticlockwise and clockwise direction; or we can make the same gesture of different size and little bit of different shape which causes difficulty on recognition of gesture and makes the process slow. Many gesture recognition system do not read the motion correctly due to some constraint like dark or noisy background. Gesture recognition relies on the user interface and addition of some unique interface may cost high amount and increase the size of the device.

Conclusion

This report mainly focuses on the process of gesture recognition and strength and weakness of gesture recognition. It includes what is gesture and it's type and what are gesture recognition type and how gesture is comprehend by the machine. On the basis of these topic I discussed about the strength and weakness of the gesture input.

References

- [1] Rebag, James M, Takeo Kanade. DigitEyes: vision-based human hand tracking[C]. Technical Report CMU-CS 93-220, School of Computer Science, Carnegie Mellon University, 1993.
- [2] Garner, W.(1974). The Processing of Information and Structure. Potomac, Maryland: Lawrence Erlbaum.
- [3] Gesture Control Technology: An investigation on the potential use in Higher Education (March 2016) Li Zhao, IT Innovation Specialist, IT Innovation Centre.