A METHOD FOR AFFECT

A method is disclosed by which affects can be interpreted, generated, recognised, and measured within any context by an intelligent agent.

The intelligent agent can have a set of varied composite relations and composite functions through which it can carry out a variety of interactions with its environment with each composite relation or composite function being unique to a particular set of tasks.

Because the number and variety of composite functions and composite relations can improve the intelligent agents success and efficiency, the intelligent agent can perceive the gain of a composite relation or a composite function as a good thing, and can perceive the loss of a composite relation or a composite function as a bad thing.

The intelligent agent can have a communication means whose symbols each are a unique symbol for an item in the intelligent agents set of composite relations and composite functions. The communication means can be a computational linguistics means, which can be a set of composite functions and composite relations.

The intelligent agent can rank the members of its set of composite relations or composite functions by the degree to which they perform tasks that are vital to the intelligent agents functioning. Each symbol in the communication means shares the ranking of the composite relation or composite function that it is unique to.

When an entity that can have a relationship to the intelligent agent that is symbolised by a symbol in the communication means interacts at a rank that is higher than the proper ranking of that symbol, the interaction is perceived as a challenge by the intelligent agent.
When an entity that can have a relationship to the intelligent agent that is symbolised by a symbol in the communication means interacts at a rank that is lower than the proper ranking of that symbol, the interaction is perceived as a degeneration by the intelligent agent.

The appropriate emotion for a particular event can be plotted on a coordinate system by a method of this disclosure when values are known for good, bad; number and variety of suitable composite relations or composite functions; challenge, degeneration.

BACKGROUND

A. FIELD OF THE INVENTION

The present disclosure is generally related to the field of affective computing and is related more particularly to a method by which affects can be interpreted, generated, recognised, and measured.

B. BACKGROUND

The present disclosure relates to the ability to interpret, generate, recognise, and measure affect.
Affective computing has important, wide ranging applications from scientific research to data mining; yet while current methods can carry out several automated functions, they are not capable of robustly interpreting, generating, recognising, and measuring affect within context.
This is because no effective affective computing method has been discovered; therefore, there is a need for the provision of such a method.

INTRODUCTION TO THE DRAWINGS

Many aspects of the current disclosure may be better understood with reference to the following drawings. The components of the drawings are not necessarily to scale as emphasis is placed upon clearly illustrating the principles of the present disclosure.

Fig. 1, is an example form of the main parts of the present disclosure.
Fig. 2 is an illustration of a composite function or composite relation.
Fig. 3 is an example drawing showing an example Colony 300.
Fig. 4 is an example illustration of communication means 101.
Fig. 5 is example illustration of example Colony Helpers 200 at their Colony Coordinates.
Fig. 6 is an example chart that illustrates how Colony Gain and Colony Loss can vary with time.
Fig. 7 depicts example Bands 701 of confidence values.
Fig. 8 illustrates an example depiction of the Emotion Coordinate System 800.
Fig. 9 depicts an example method by which the appropriate Emotion Coordinate 801 for a particular circumstance can be obtained.
FIG. 10 illustrates an exemplary embodiment of a processing system 1000 in which the methods in this disclosure might be operated.

DETAILED DESCRIPTION

The detailed description provided below in relation to the attached drawings is intended as a description of the present examples and is not intended to represent the only forms in which the present example may be construed or utilised. The description sets forward the functions of the example and the sequence of steps for constructing and operating the example. However, the same or equivalent functions and sequences may be obtained by different examples.

Referring now to Fig. 1, an example form of the main parts of the present disclosure is illustrated. Intelligent agent 100 can host methods of this disclosure. Communication means 101 can be a computational linguistics means. Output means 102 can be a plurality of output means.

The intelligent agent 100 might encounter circumstances in its environment that it might not be able to deal with, or might not be able to deal with efficiently without aid or resources. This can decrease its chances of success at the tasks it can carry out in its environment.

Now referring to Fig. 2, this is an illustration of a composite function or composite relation. In order to increase its chances of success, the intelligent agent 100 can have a set of composite relations, hereinafter called Colony Helpers 200. The composite relations of the Colony Helpers 200 can be composite functions which can be pooled to increase the variety of tasks the intelligent agent 100 can undertake as well as the efficiency with which it can execute those tasks.
A Colony Helper 200 can be any type of aid or resource that can perform work on behalf of the intelligent agent 100 by using composite functions or composite relations. Colony Helpers 200 can also help the intelligent agent 100 to understand and interact with its environment.

Referring now to Fig. 3. The set whose members can be the intelligent agent 100 and the set of Colony Helpers 200 that the intelligent agent 100 can have is hereinafter called Colony 300. The quantity of energy which can be typical to the work a Colony Helper 200 can perform is hereinafter called Function Energy.

Colony Helpers 200 can be intrinsic or extrinsic to the intelligent agent 100. Colony Helpers 200 as well as the work they can do and the circumstances the intelligent agent 100 can face, can exist in the physical world or can be virtual. One example of virtual Colony Helpers 200 can be characters read from a novel, an example of virtual work can be the work the characters in the novel can do, while an example of virtual circumstances can be the events in the novel. Two examples of Colony Helpers 200 that can exist in the physical world can be shelter and energy sources.

A Colony Helper 200 that can perform work without which the intelligent agent 100 can cease to function is hereinafter called Vital Helper. One example of a Vital Helper can be a battery that powers a computing device that can host the intelligent agent 100.

The intelligent agent 100 can itself, be a composite relation or a composite function.

With reference now to Fig. 4; communication means 101 can be a computational linguistics means which can have a set of symbols 401.
Each symbol 401 can have an encoder 402 that can encode the composite relations and composite functions 200 that can be the intelligent agents 100 Colony Helpers 200 into their equivalent symbols (hereinafter called Manifestation 403) in a language which can be (but not be limited to) a natural language.
Each symbol 401 can have an decoder 404 that can decode the Manifestations 403 into their equivalent composite relations and composite functions 200 that can be the intelligent agents 100 Colony Helpers 200.
The intelligent agent 100 can communicate the symbols 401 of its communication means 101 as the meanings of its Colony Helpers 200 (composite relations or functions), which can be the experience of the intelligent agent 100 or the understanding that the intelligent agent 100 can

have of the interactions of its Colony Helpers 200 (composite relations or functions).

Every symbol 401 in the communication means 101 can have a unique Manifestation 403. The communication means 101 can store the definition and aspects (as disclosed) of every Manifestation 403 as well as their relationships to other Manifestations 403.

One skilled in the art would realise that a Manifestation 403 is equivalent to anything that can be a composite relation or a composite function (such as, but not limited to Colony Helpers 200 and intelligent agent 100), being that it is the encoding of that composite relation or a composite function as a symbol in the intelligent agents communication means 101.

The Colony 300 can be a metric space within which the intelligent agent 100 and its set of Colony Helpers 200 can be positioned using a distance function. The distance function can be a similarity measure that can measure the similarity between the set of functions the intelligent agent 100 can perform and the set of functions in a Manifestation 403 which can be a Colony Helper 200; the distance function can also measure the similarities between each Manifestation 403 in communication means 101 (which can be a Colony Helper 200); such a similarity measure can include, but not be limited to Jaccard index or Levenshtein distance.

Referring now to Fig. 5. The set of Colony Helpers 200 can be clustered around the intelligent agent 100 in the Colony 300, both by their distance 501 to the functions the intelligent agent 100 can perform, and by their distance 501 to each other.
The intelligent agent 100 can be the origin of a coordinate system by which the position of each Manifestation 403 in communication means 101 (which can be a Colony Helper 200 in the Colony 300) can be identified by a coordinate that can be relative to the intelligent agents 100 position. This coordinate is hereinafter called Colony Coordinate.

A Colony Helpers 200 value to the intelligent agent 100 can be proportional to the distance 501 of its Colony Coordinate to the intelligent agents 100 Colony Coordinate.

Every symbol 401 in communication means 101 can inherit the Colony Coordinate of the composite function or composite relation that it can encode or that it can decode.
Each Manifestation 403 in communication means 101 can only interact with another Manifestation 403 if they either share the same Colony Coordinate, or if the subsets of composite relations or composite functions of one Manifestation 403 shares one or more Colony Coordinates with the subsets of composite relations or composite functions of the other Manifestation 403.

The intelligent agent 100 can experience and interact with its environment through its set of Colony Helpers 200, therefore the success of the intelligent

agent 100 can be measured as the number and variety of Colony Helpers 200 the intelligent agent 100 can accumulate, and the efficiency with which the accumulation of Colony Helpers 200 can take place.

Whenever the intelligent agent 100 gains a Colony Helper 200, it can perceive this as good, because this can increase the variety of functions that the intelligent agent 100 can perform, or because it can increase the amount of energy that can be employed by the intelligent agents 100 composite functions or composite relations that are affected by the addition of the Colony Helper 200.
The intelligent agent 100 can quantify gain (good) as the sum of the Function energies of the Colony Helpers 200 gained. The gain of a Colony Helper 200 is hereinafter called Colony Gain. One example way in which Colony Gain might be represented is:

$$G=\sum_{k=1}^{n} E_k \tag{1}$$

Where G is Colony Gain, E is Function energy and n is the number of Colony Helpers 200 gained.

Whenever the intelligent agent 100 loses a Colony Helper 200, it can perceive this as bad, because this can decrease the variety of functions that the intelligent agent 100 can perform, or because it can decrease the amount of energy that can be employed by the intelligent agents 100 composite functions or composite relations that are affected by the loss of the Colony Helper 200.
The intelligent agent 100 can quantify loss (bad) as the sum of the Function energies of the Colony Helpers 200 lost. The loss of a Colony Helper 200 is hereinafter called Colony Loss. A way in which Colony Gain might be represented is:

$$L=-\sum_{k=1}^{n} E_k \tag{2}$$

Where G is Colony Gain, E is Function energy and n is the number of Colony Helpers 200 lost.

Referring now to Fig. 6, this is a chart that illustrates how Colony Gain and Colony Loss can vary with time. The probability that a particular Colony Helper 200 will act in aid of an intelligent agent 100 is hereinafter called Affinity.
The Affinity can be taken for a reference period which can start from whichever is most recent between the time the Colony Helper 200 became a member of the set of Colony Helpers 200 that make up the Colony 300 and the time of the last event in which the Colony Helper 200 caused the loss or gain of another Colony Helper 200 from (or by) the Colony 300.

One example way to calculate Affinity for a Colony Helper 200, in specific time

period might be:

$$A=\frac{(G+L)}{\sum e} \tag{3}$$

Where A is the Colony Helper 200 Affinity, G is Colony Gain that can result from interactions with the Colony Helper 200, L is Colony Loss that can result from interactions with Colony Helper 200 and $\sum e$ is the total number of interactions the Colony Helper 200 had in the specific time period.

One example way of implementing Affinity can be as a structure that can have variables that can record Colony Gain and Colony Loss due to a particular Colony Helper 200.
The date of each Colony Gain or Colony Loss due to the particular Colony Helper 200 can also be held in the structure, as can the Colony Coordinate of the particular Colony Helper 200.

The intelligent agent 100 can quantify trust in an entity whose relationship to the intelligent agent 100 can be defined by a Manifestation 403 and its unique Colony Coordinate, as a value that can be directly proportional to the Affinity of that Manifestation 403.

One example way the intelligent agent 100 can quantify confidence in a Colony Helper 200 might be:

$$C=A\cdot D \tag{4}$$

Where C is the confidence value, A is the Affinity of the Colony Helper 200 and D is the distance 501 of the Colony Helpers 200 Colony Coordinate to the intelligent agents 100 Colony Coordinate.

Now referring to Fig. 7, this is a drawing that depicts example Bands 701 around an intelligent agent 100 of confidence values, found according to Equation (4) for every Manifestation 403 in communication means 101. Confidence values can increase in direct proportion to decreasing Band 701 radius, thus can form a field around intelligent agent 100; this field is hereinafter called Confidence Field 700.

702 illustrates a Manifestation 403 interacting with the intelligent agent 100 through the intelligent agents Colony Helpers 200 that are in the same Band 701 as the Manifestation 403.

A Manifestation 403 is permitted to interact with the intelligent agent 100 only through the intelligent agents Colony Helpers 200 that are in the same Band 701 as the Manifestation 403 (such as at 702); interaction with the intelligent agents 100 Colony Helpers 200 at any other Band 701 is forbidden and is hereinafter called Forbidden Action. One skilled in the art would realise that the

methods of this disclosure would work equally well if the Manifestation 403 is independent of the intelligent agent 100, or if it is a component of the intelligent agent 100, or if it is the same as the intelligent agent 100.

Still referring to Fig. 7, a challenge 704 to intelligent agent 100 can occur when a Forbidden Action occurs at a Band 701 that has a smaller radius than the Band 701 radius of the Manifestation 403 that the Forbidden Action is due to. An example way of finding the value of the challenge 704 might be:

$$K = r_2 - r_1 \tag{5}$$

Where K is the challenge 704 value, r_2 is the Band 701 radius where the Forbidden Action occurred and r_1 is the Band 701 radius of the Manifestation 403 that the Forbidden Action is due to.

Continuing to refer to Fig. 7, a degeneration 703 of intelligent agent 100 can occur when a Forbidden Action occurs at a Band 701 that has a larger radius than the Band 701 radius of the Manifestation 403 that the Forbidden Action is due to.
One example way of finding the value of the degeneration 703 might be:

$$M = r_2 - r_1 \tag{6}$$

Where M is the degeneration 703 value, r_1 is the Band 701 radius of Manifestation 403 that the Forbidden Action is due to, and r_2 is the Band 701 radius where the Forbidden Action occurred.

A metric space hereinafter called Emotion Space (not shown) can be generated, on behalf of intelligent agent 100, for every Manifestation 403 in communication means 101.
Now referring to Fig. 8. The Emotion Space can have a coordinate system, which is hereinafter called Emotion Coordinate System 800. The coordinates of the Emotion Coordinate System 800 are hereinafter called Emotion Coordinates 801. The Emotion Coordinate System 800 can have three axes. The units of the y axis can be a gradation of values between maximum challenge 704 and the maximum degradation 703. The units of the z axis can be a gradation between maximum Colony Gain and maximum Colony Loss. The units of the x axis can be a measure, taken relative to intelligent agent 100, of the summation of confidence values, according to Equation (4), of all Colony Helpers 200 available to interact at the Colony Coordinate of the Manifestation 403 for which the Emotion Coordinate System 800 was generated.

Referring now to Fig. 9, an example method is illustrated by which the appropriate Emotion Coordinate 801 for a particular circumstance can be plotted on the Emotion Coordinate System 800 for an intelligent agent 100. Emotion Coordinate 801 can be plotted with the supply of parameters for challenge 704/degeneration 703, Colony Gain/Colony Loss and availability of

Colony Helpers 200 whose interactions with the components of the circumstances Manifestation 403.

At 901, the intelligent agent 100 can encounter a circumstance, which can be in any kind or context, or which can be virtual (such as, but not limited to events in a video or text) or obtained in the physical world.

In order to provide an appropriate response, at 902 intelligent agent 100 can evaluate the resources it has that can deal with the circumstance encountered at 901. Intelligent agent 100 can do this by searching its Confidence Field 700 for Colony Helpers 200 whose subsets of composite relations or composite functions can share one or more Colony Coordinates with the Manifestations 403 subsets of composite relations or composite functions; intelligent agent 100 might quantify confidence by applying Equation (4) and summing all the confidence values of each Colony Helper 200 found, the value obtained is hereinafter called Confidence Response. If the Confidence Response is a negative value, then the x axis can indicate a degree of timidity. If the Confidence Response is a positive value, then the x axis can indicate a degree of confidence.
The Confidence Response can be the x coordinate of the Emotion Coordinate 801.

At 903, the intelligent agent 100 can evaluate Colony Loss and Colony Gain due to the circumstance encountered at 901 and generate equivalent positive or negative component of Emotion Coordinate 801, this might be done by applying Equation (1) and Equation (2).
When there is Colony Gain, the z axis can tend toward a positive value that can indicate a degree of joy; this is because Colony Gain can increase the number of composite functions or composite relations available to intelligent agent 100, thus enhancing its chances of success.
When there is Colony Loss, the z axis can tend toward a negative value that can indicate a degree of sadness; this is because Colony Loss can decrease the number of composite functions or composite relations available to intelligent agent 100, thus reducing its chances of success.
The z coordinate of the Emotion Coordinate 801 can be the value obtained from summing Colony Loss and Colony Gain.

At step 904, the intelligent agent 100 can evaluate levels of challenge 704 and the degradation 703 due to the circumstance encountered at 901.
When there is challenge 704, the y axis can tend toward a positive value that can indicate a degree of anger.
When there is degradation 703, the y axis can tend toward a negative value that can indicate a degree of fear.
The y coordinate of the Emotion Coordinate 801 can be the value obtained from summing challenge 704 and degradation 703.

The Emotion Coordinate 801 that can result from steps 901, 902, 903 and 904 can be sent to Output Means 102 to be utilised by one or more devices.

One skilled in the art would realise the methods of this disclosure would work equally well if the axes of Emotion Coordinate System 800 were ordered in a different way, or if its the directions of its axis were changed.

FIG. 10 illustrates an exemplary embodiment of a processing system 1000 in which the methods in this disclosure might be operated. One skilled in the art will recognize that intelligent agent 100 in Fig. 1 can be hosted in a processing system 1000, however the exact configuration and devices connected to the processing system in each individual device in the world may vary depending on the operations that the processing system 1000 performs.

Processing system 1000 can have a Central Processing Unit (CPU) 1004. CPU 1004 can be a processor, microprocessor, or any combination of processors and microprocessor that can execute instructions which might be stored in memory to perform an application. CPU 1004 can be connected to a memory bus 1003 and Input/Output (I/O) bus 1005.

A non-volatile memory, such as Read Only Memory (ROM) 1001, can be connected to CPU 1004 via memory bus 1003. ROM 1001 can store instructions for initialization and other system commands of processing system 1000. One skilled in the art will recognize that any memory that cannot be written to by CPU 1004 may be used for the functions of ROM 1001.

A volatile memory such as Random Access Memory (RAM) 1002 can also be connected to CPU 1004 via memory bus 1005. RAM 1002 can store instructions for all processes being executed and data operated upon by the executed processes. One skilled in the art will recognize that other types of memories such DRAM and SRAM may also be used as a volatile memory and that memory caches and other memory devices (Not shown) may be connected to memory bus 1005.

Peripheral devices including, but not limited to, memory 1006, display 1007, I/O device 1008, and network connection device 1009 can be connected to CPU 1004 via I/O bus 1005. I/O bus 1005 can carry data between the device and CPU 1004. Memory 1004 is a device for storing data unto a media. Some examples of memory 1006 include read/write compact discs (CDs), and magnetic disk drives. Display 1007 is a monitor or display and associated drivers that convert data to a display. I/O device 1008 is a keyboard, a pointing device or other device that may be used by a user to input data. Network device 1009 can be a modem or Ethernet “card” that connects processing system 1000 to a network.

One skilled in the art would conclude that the methods in this disclosure would work equally well if instead of energy any measurable property that obeys a conservation law is used instead. Such measurable properties might include, but not be limited to mass, electric charge and momentum.