AE-Artificial Emotion

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Abstract: This paper proposes the concept of "Artificial Emotion"(AE). The goal of AE is simulation, extension and expansion of natural emotion, especially human emotion.
The object of AE is machine emotion and emotion machine. The contents of AE are emotion recognition, emotion measurement, emotion understanding，emotion representation，emotion generation, emotion processing, emotion control and emotion communication. The methodology, technology, scientific significance and application value of artificial emotion are discussed

Keywords: Artificial emotion, Machine Emotion, Emotion Machine

1. INTRODUCTION

Human have both "reason" and "emotion", and moreover, "reason" and "emotion" could be either coordinated or contradictory. In the real world, the generation of intention, decision-making,   problem-tackling, choice of behavior and expression of movement of human are dominated and controlled by both "reason" and "emotion" simultaneously, and they are often the result of the interaction between "reason" and "emotion".

Usually, intelligence means reason, intellect and capability etc., such as the capability of working out a solution to a problem by knowledge reasoning. Emotion means feeling, mood and sentiment etc. For example, a baby is almost always happy when he/she sees his/her mum.

If we say Artificial Intelligence (AI) is mainly used for studying the simulation, extension or expansion of human intelligence for developing "machine intelligence" and "intelligent machine", then, may we establish a new discipline for "Artificial Emotion" as a sisterly chapter to "Artificial Intelligence"?

2.   CONCEPT OF ARTIFICIAL EMOTION

Emotion of human related to their psychological activities and physiological state. Such as pleasure, anger, sorrow, joy, love, hatred, kindness, grievance, etc., they have much closer relations with human senses, perceptual knowledge and thinking in images. For instance, "falling in love at the first sight" when a man courts a woman, "the first impression" one can generate while shopping.

Emotion of human are manifested in their expression, posture, sounds, language, movement, and behavior, such as lighting up with pleasure, dancing for joy, crying one's heart out, facing others with frowning brows and angry eyes, etc.

The emotion of human could be recognized and understood from their expression, posture, sounds, language, movements and behavior. However, "emotion" and "expression" have not necessarily simple, linear and one-to-one relations, sometimes, they have actually complicated, non-linear, and multi-to-multi relations.

Human emotion and human reason are influenced and conditioned each other. On the one hand, human emotion exerts significant influence upon the level of human reason. A person filled with sentiment of revenge and hatred may lose his/her reason and harm others when he/she is seriously disgruntled; while a person in deep love usually appears to have a very low intelligence when he/she makes a judgment on his/her lover for right and wrong. On the other hand, human reason has a strong binding power over human emotion, and a highly reasonable person cannot be very much shocked, perplexed and lost, he/she is thus not biased, not blinded by lust for gain, and does not make reckless moves.

Animals have emotion too. For instance, cat, dog and horse often show the emotion of happiness and loyalty to their masters by shaking their heads or wagging their tails.

The artificial emotion means the simulation, extension and expansion of natural emotion,   especially, human emotion.

The concept of Artificial Emotion (AE) has two aspects:

2.1 Machine Emotion

This means the study of how to utilize machines such as computers and robots to simulate and recognize the natural emotion of humans or animals, to generate and represent machine emotion similar to natural emotion, for example, the various computer application systems and automation systems with machine emotion, such as the computer aided design system for new product and electronic business system with artificial emotion.

2.2 Emotional Machine

That means to develop emotional machines that can simulate, extend and expand natural emotion, such as human emotion or animal emotion. Such as, the computer with artificial emotion, the virtual or real emotional robot, For example the virtual TV anchors and film actors and actresses, with artificial emotion, such as pleasure, anger, sorrow, joy, love, hatred, kindness and grievance etc.

Therefore, the goal of research and development of artificial emotion is to simulate, extend and expand natural emotion, especially human emotion, and the object of research and development of artificial emotion has two aspects: machine emotion and emotional machine

3. CONTENTS OF ARTIFICIAL EMOTION

According to the goal and object of research and development of artificial emotion, the initial framework for the contents of the discipline of artificial emotion is as shown in Fig. 1.

3.1 Emotion Recognition

To study the theory, methods and technology of machine emotion recognition, that means by computer to recognize and identify the kind and type of emotion, such as pleasure, anger, sorrow, joy, love, hatred, kindness, grievance etc. from the two dimensional or three dimensional image and pattern expression, posture, sound, language, movements and behavior of human or animal.
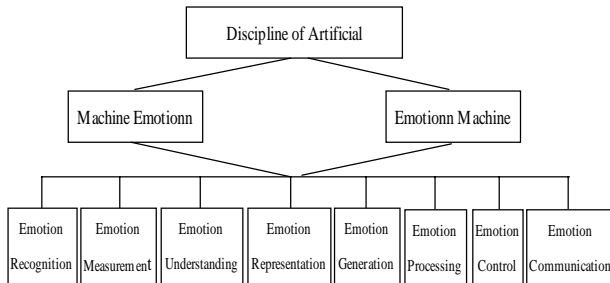

Fig. 1 Framework of the discipline of artificial emotion

3.2 Emotional Measurement

To study how to measure the profundity and intensity of artificial emotion, and to establish theoretical models, index systems, calculation methods, measurement technology for qualitative and quantitative emotional measurement, such as indistinct measurement method and technology and probable measurement method and technology.

3.3 Emotion Understanding

Based on emotion recognition and emotion measurement, further study the theory, method and technology of machine emotion Understanding, that is used to mine and discover the profound and delicate meanings of artificial emotion.

3.4 Emotion Representation

To study the theory, method and technology for emotion representation in machine, it is used to represent artificial emotion in computers and robots such as by means of expression, posture, sound, language, movements and behavior to represent pleasure, anger, sorrow, joy, love, hatred, kindness, grievance etc.

3.5 Emotion Generation

On the basis of emotion representation, further study theory, method and technology of machine emotion generation, it is use to simulate or generate artificial emotion in computers and robots, and to develop virtual or real emotional robots, and computer application systems with artificial emotion.

3.6 Emotion Processing

The study of the theory, methods and technology for multi-media, multi-mode artificial emotion information processing and utilization, it includes acquisition, transformation, processing, fusion, inference and utilization of emotional information.

3.7 Emotion Control

The study of the theory, method and technology for emotion control and control emotion, the emotion control means that how to design and implement the control systems with artificial emotion, and the control emotion means that

how to control the intensity and profundity of artificial emotion in machine.

3.8 Emotion Communication

The study of the theory, method and technology for artificial emotion communication, that means broad - band communication and two-direction exchanges of multi-media, multi-mode artificial emotion information. The emotion communication is active, visual and intuitive communication.

4. METHODOLOGY AND TECHNOLOGY FOR ARTIFICIAL EMOTION

In order to study and develop artificial emotion, it needs to use the methodology and technology of the related various disciplines, and to develop new methods and technology.

4.1 Methodology and technology for emotion recognition

Emotion recognition needs to use psychology behavioral science, linguistics and pattern recognition, scene analysis etc., and to develop the methods and technology for emotion recognition by computer to recognize expression, movements, language, posture and other two-dimension, three-dimension or multi-dimension emotion pattern and scene.

4.2 Methodology and technology for emotion measurement

Emotional measurement needs to use experimental psychology, mathematics, informatics and measurement technique, etc. and to develop qualitative and quantitative emotion measurement methods and technology for uncertain, inaccurate emotion information, such as the emotion measurement method and technology based on fuzzy mathematics or probability theory.

4.3 Methodology and technology for emotion understanding

Emotion understanding need to use psychology, behavioral science, linguistics, sociology, and natural language understanding, data mining, knowledge discovery, and to develop the method and technology of emotion meaning mining and discovery.

4.4 Methodology and technology for emotion representation

Emotion Representation needs to use psychology, behavioral science, linguistics, and knowledge representation, image expression, etc. and to develop the method and technology of multi-media, multi-dimension emotion representation.

4.5 Methodology and technology for emotion generation

Emotion Generation needs to use psychology, behavioral science, linguistics, and computer graphics three-dimensional animation, virtual reality, etc. and to develop method and technology for artificial emotion generation in computer and robot etc.

4.6 Methodology and technology for emotion processing

Emotion processing needs to use psychology, behavioral science, linguistics and information processing, transform

utilization etc., and to develop the method and technology of multi-media, multi-mode artificial emotion information processing and utilization.

4.7 Methodology and technology for emotion control

Emotion control needs to use psychology, behavioral science, linguistics, cybernetics and the method and technology of automation control, robotics, etc., and to develop the method and technology of emotion control and control emotion.

(8)Methodology and technology for emotion communication

Emotion Communication needs to use psychology, linguistics, sociology, and informatics, image communication, phonetic communication, etc., and to develop the broadband, active information push-pull, two-direction communication method and technology of multi-media, multi-mode emotional information, for internet, intranet and extranet.

So that, the research and development of artificial emotion are based on the combination and integration of multiple disciplines, it is shown as in Fig.2.
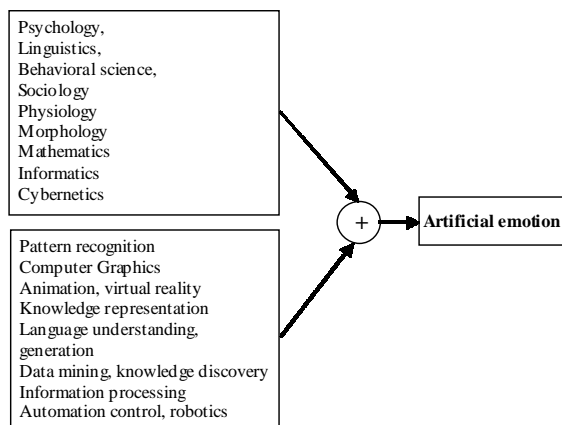

Fig.2   Methodology and technology for artificial emotion

5.   SIGNIFICANCE AND APPLICATION OF ARTIFICIAL EMOTION

The research and development of artificial emotion have important scientific significance and wide application value, for example:

(1) Artificial brain, new type computer and right brain computer with artificial emotion, etc.

(2) Humanoid robots with artificial emotion, such as virtual or real TV anchors, film actors and actresses, hospital nurse and restaurant server etc.

(3) Machine animals with artificial emotion, e.g., artificial fish, artificial bird, machine cat, machine dog and other electronic pets etc.

(4) Household electrical appliances with artificial emotion, e.g., TV set and acoustics equipment that can choose programs according to human emotion.

(5) Computer aided design with artificial emotion. Such as the CAD system for clothes with emotion recognition and understanding ability, through man-machine emotion alternation, understand the emotional inclination and individual characteristics of customers, so as to design individualized products for their satisfaction.

(6) Computer management system with artificial emotion,

such as office automation system, electronic administration system with artificial emotion, etc.

(7) Control system with artificial emotion

Usually, the control systems in the engineering and technology domain should have no emotion, but in some social and cultural domains, the control systems with artificial emotion are required, e.g. the recreational robots that can control the beats of music and dance according to emotion of audience and viewer.

(8) Communication systems with artificial emotion, such as e-mail and telephone system electronic commerce system with ability of emotion communication etc. they can exchange emotion in the communication process, the friendly emotion communication is helpful for happy cooperation of two sides, bat confrontational emotion communication maybe make cooperation fail.

6. CONCLUSION

(1)This paper proposes the concept of "Artificial Emotion"(AE). The goal of AE is simulation, extension and expansion of natural emotion, especially human emotion. The object of AE is machine emotion and emotion machine.

(2)The framework of "Artificial Emotion"is given. The contents of AE are emotion recognition, emotion measurement, emotion understanding，emotion representation，emotion generation, emotion processing, emotion control and emotion comunication.

(3)The methodology, technology, scientific significance and application value of artificial emotion are discussed.

Artificial emotion is a new frontier discipline with important scientific significance and extensive application value. Full of challenges, AE both needs combination and assembly of multi-discipline, multi-method and multi-technology, and promotes further exchange and development of various related disciplines.

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