Human Emotion and Machine Emotion: The Studies of Emotion in AI Area

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Introduction

- Does AI have the emotional characteristics of humans?
- Is the emotion of AI equal to the emotion that defines by human beings?
- This paper attempts to step out of the anthropocentric perspective, examine the boundary and relationship between human emotion and machine emotion, and inject a new theoretical perspective into the AI artistic practice.

Stine Deja/ Foreigner/Video/2018

- Section 1. What is emotion
- Section 2. Whether machines can have emotions
  Why do humans endow machines emotions?
  Machines can't have emotions
  Machine emotion
- Section 3. The Studies of Emotion in AI Area
- Conclusion.

1. What is emotion

- From a neurobiological point of view, the source of emotion lies in the tight interaction between the amygdala and the cerebral cortex.

Two major emotion classification models:

a. Basic emotion theory

b. Emotion dimension theory

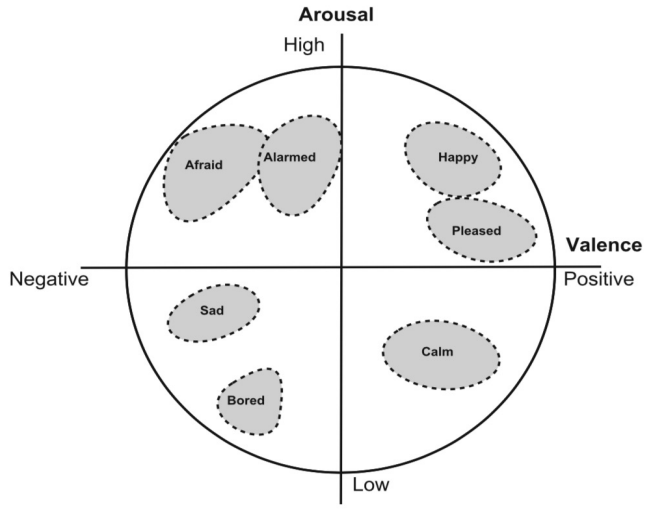
a. Basic emotion theory

- In context of psychological science, the concept of basic emotions is deemed as a classification that defines a group of similar emotions with specific color. Emotions are marked by extents such as joy, happiness, or ecstasy.

- *Basic emotions classification* :
  - Anger, Fear, Distress/Sadness, Enjoyment/Happiness, Disgust, and Surprise (Ekman, 1992).
  - Anger, embarrassment, sorrow, fear, interest, happiness, surprise, disgust (Tomkins, 1962;1963;1981;1991).
  - Empathy, envy, love, aggression, awe, respect (Minsky, 2006)

b. Emotion dimension theory

- The dimensional emotion uses some indicators to measure emotional intensity.
  - Emotions could be indicated and measured by two dimensions of a circumplex: 1) valence; 2) arousal.
  - Thayer’ s circle of emotion.
  - Plutchik emotional wheel.
  - Lövheim’ s cube of emotions.



2. Whether machines can have emotions

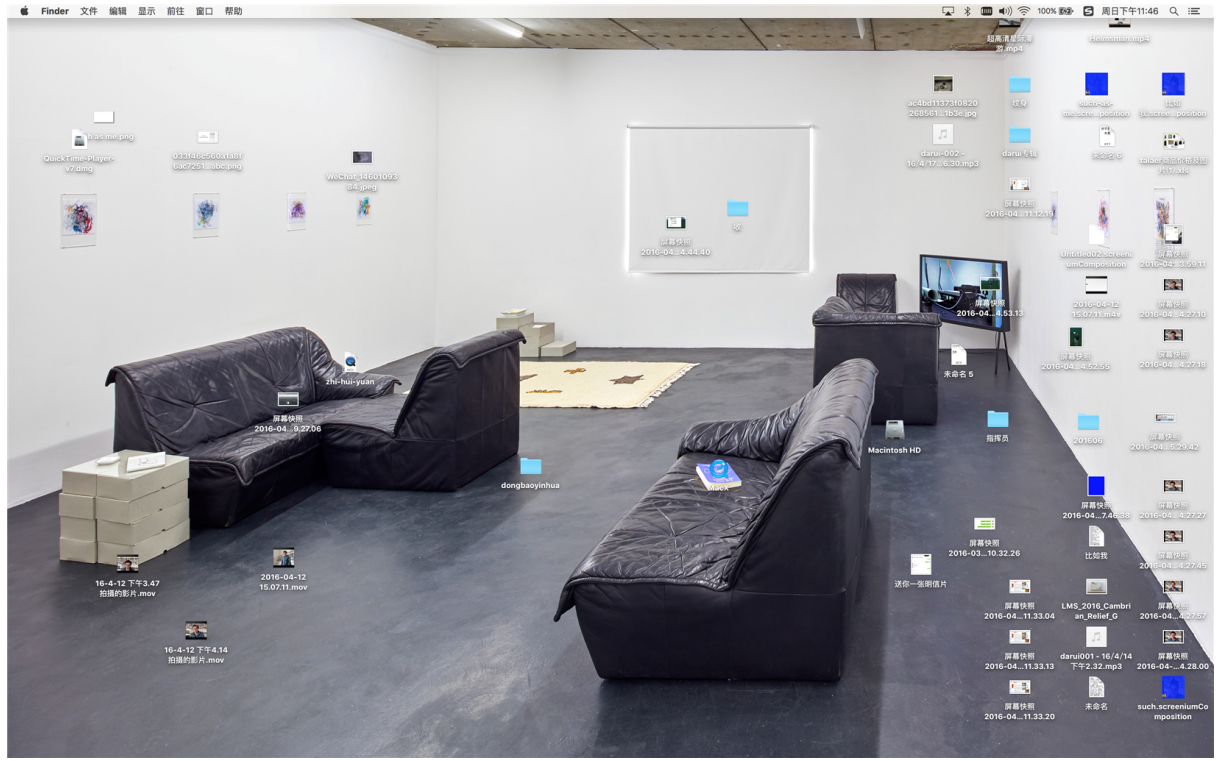
(1) Why do humans endow machines emotions?

- ***Picard (2003) identifies four motivations for human beings to endue machines with certain emotional abilities***:

a. The first goal is to build robots and synthetic characters that can emulate living humans and animals – for example, to build a humanoid robot ;
b. The second goal is to make machines that are intelligent, even though it is also impossible to find a widely accepted definition of machine intelligence;

c. The third goal is to try to understand human emotions by modeling them.;

d. The fourth goal is to make machines less frustrating to interact with. All four of Picard's motivations seem to be human-centric: hoping machines to become more human-like in appearance, intelligence, and behavior, and further exploring the intellectual pedigree of human emotions through machines.



LiN Ke/Screen Shot 2016-04-1711.46.20/ p.m./Photography, Installation, giclée print/2016

- ***From the perspective of anthropocentrism***

  Arbib and Fellous (2004) points out four reasons why people are interested in giving emotions to machines :

a. The current technology already shows the value of providing robots with ‘emotional’ expressions and bodily postures to facilitate human–computer interaction;
b. They raise the question that the value of robots in the future may not just be to simulate human emotional expression, but to actually "have emotions";
c. It, in turn, requires us to revisit the neurobiology of emotion to generalize some new concepts;
d. It suggests that building "emotional robots" can also provide a novel test-bed for theories of biological emotion.

(2) Machines can't have emotions

XU Ge/Puzzle/Cyborg Installation/2013

a. ***The emotional transmission and recognition system of the machine is related to its ability to comprehend, recognize and execute tasks.***

- As stated by Parisi and Petrosino (2010), the actions of existing "emotional robots" are controlled by symbolic, role-based systems.

b. AI is based on, but also limited to human emotions.

- Becker (2006)'s research explores the passive role of machines in human-computer interaction. According to him, machine’ s emotion is positioned only in its ability performing in activities of social networks; AI entities are artificial objects constructed according to the model of human communication and cognitive ability. They have no personality and are relegated to being interaction partners of humans.
- ECAs （embodied conversational agents）

c. *Fellous and Arbib (2005) argued that machines could not be considered as having emotions at this point, because they could not control their own behavior to make motivational choices in a given situation.*

XUE Lei/Voice interaction-Emotion, /Interactive Art, /2019

(3) Machine's emotion

- ***Arbib and Fellous (2004) divide the application of emotion in AI into two parts:***

a. one is the external aspect of emotion, which refers to the emotional expression made for communication and social collaboration;

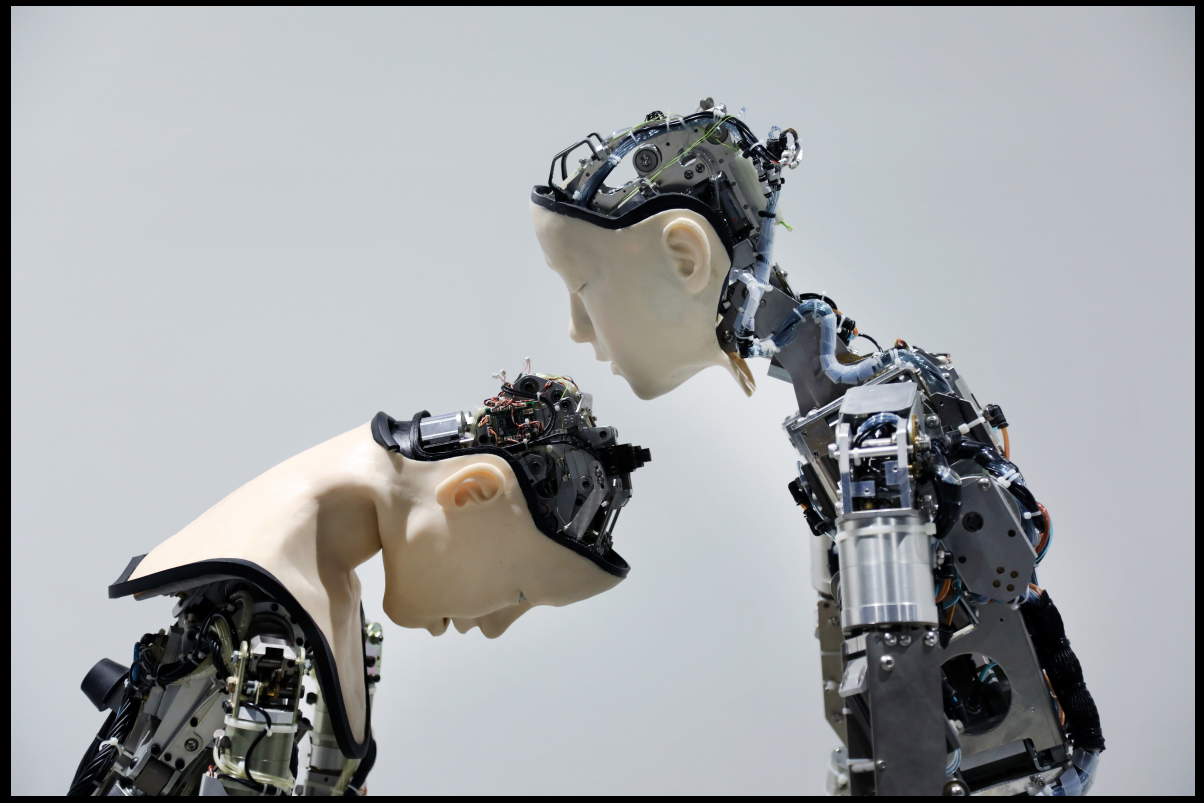
b. the other is the inner aspect of emotion, which can influence behaviors (such as action selection, attention and learning).

- Parisi and Petrosino (2010) point out that "current emotional robots can express emotions or recognize our emotional expressions, but they cannot be considered to have emotions because emotions do not play any functional role in their behavior".
- Giving a robot a mechanism of subjective emotional regulation is considered to be an attempt to truly generate "artificial emotion" (Damiano et al., 2015).
- In sum, machine emotion is not the same as human emotion.

CHEN Baoyang /I' ve seen you scared in the rain/Double screen video/2019

3. The Studies of Emotion in AI Area

- *As mentioned earlier, machines that simulate or recognize human emotional expressions are not considered to have emotions, but are considered to have "machine emotions" only when a machine, as human beings, generates an autonomic regulatory mechanism that plays a role in influencing machine’ s behavior planning.*



Justine Emard /Soul Shift /Video/2018

a. ***Some studies try to build a bridge between physiological emotions and computer computation. They try to reflect changes of some neuro-modulating substances in human bodies through number changes of computer computation, so as to present own emotion changes of machines.***

- Parisi and Petrosino (2010) built an emotional circuit with a neural network to control the behavior of the AI.
- Kugurakova et al. (2015) tried to build a human-simulated subject which has internal emotional statuses, can make responses to emotional stimulation and may show emotions such as sympathy or infringement towards the one it talks with.
- Vallverdu´ et al. (2016) proposed a similar model: "NEUCOGAR" (Neuromodulating Cognitive Architecture).

b. Some scholars tried to use some tools, such as variable fuzzy sets and fuzzy cognitive maps, to compute original data, reflect changes in machine emotions, predict these emotions, design an emotion decision making system.

- Fan et al. (2015) presented a prediction model of machine emotions based on emotional dimensions and the theory of variable fuzzy sets.
- Salmeron (2012), based on the Thayer’ s emotion model and Fuzzy Cognitive Maps (FCMs), a new method was proposed for prediction of machine emotions and design of an emotion decision making system.

Conclusion

- Scholars mainly focus on the problem whether a machine can have emotions just like humans or not.
- First of all, this paper describes the definition of emotions in the general biological sense and tries to explore whether an AI machine can own such emotion.
- Based on reviewing some theoretical and practical application of emotions in AI during recent years, the research finds that emotion cognition, emotion prediction, emotion-aided decision making or the like are still core topics in the field of emotion and machine research. However, it is also found in this paper that this field has a new trend to build a machine emotion mechanism inside AI machines.