Chapter 5
Emotion Model for a Robot

Gyanendra Nath Tripathi
https://orcid.org/0000-0001-9914-3789
Renesas Electronics, Japan

ABSTRACT
Humans have several kinds of intelligence like logical thinking, decision making, social and behavioral intelligence, and many more. However, above all, emotional intelligence plays a vital role to drive action and event. To analyze the need of emotion for robot, it is required to investigate emotion in human and its socio-cognitive effect on event-action relation and behavior. Emotion is not required for a robot that is programmed just to perform certain commanded tasks. However, for a socially interactive assist robot in an environment of home, hospital, office, etc., emotion is important for decision making and to perform action. Moreover, emotion for robot is helpful to define the behavior and even to personalize the robot for its owner. The chapter aims to discuss three prominent questions regarding “emotion for a robot”: 1) why we need emotion for robot, 2) what can be a probable solution as an emotion model, and 3) how emotion model can be devised for robot in a real-time environment.

INTRODUCTION: BRIEF BACKGROUND OF EMOTION

When ‘Emotion for Robot’ is considered as a philosophical discussion, it can include two main attributes one is to have a model representing the phenomenal occurrence of emotion, representing process explained on scientific basis. The second attribute is from engineering point of view, to have a model that is implementable for real time environment of robot inclusive to the first attribute. This section of chapter gives philosophical view point and theoretical scientific background of emotion. Next section of chapter will further discuss the implementation of emotion for robot from engineering view point.

PHILOSOPHICAL UNDERSTANDING OF EMOTION

As ‘Emotion’ is considered from view point of state of feeling of emotion in an individual, as a result of situation and event occurred in environment, or with virtual realization of situation and event based on

DOI: 10.4018/978-1-5225-7879-6.ch005
Emotion Model for a Robot

memory from past, and also a realization due to thoughtful consideration of its prospective occurrence in future. An analytical discussion regarding feeling of emotion in an individual becomes more subjective. Griffiths (2002) explained that ‘Emotions’ is not the ‘natural kind’, and by that he want to explain that different kind of emotions cannot be explained with single and unified theory. Further, the normative behavior of emotion(s), is detailed by Griffiths (2004) and elaborated that an objective analysis is not capable of explaining adequately due to its incomplete view point for human emotion. In a contemporary definition by Prinz (2004) explained that there is common basis of embodied phenomenon for emotion, which explains the common nature and phenomenal occurrence of emotion. In the review paper, ‘current emotion research in philosophy’ Griffiths (2013) discussed the view of memory based arousal of emotion, as it happens due to recall of event or object between long term memory, or procedural and episodic memory to working memory, and this eventual phenomenon of memory recall shows the different way the feeling of emotion occurs, which not be the same all the time.

With the advancement scientific understanding of human brain and mind, the purpose of both scientific and philosophical argument for emotion and nature of emotion(s) is to find the diverse but wholesome view. This wholesome view is helpful to propose a phenomenal model of emotion, representing feeling of emotion in human, in a real time environment of object and event. Recent philosophical argument also based on the affective neuroscience, and explains the process of arousal of emotion, Barrett (2009). Figure 1 explains the real-time environment phenomenon of emotion based on memory of emotion related to event and object.

NEUROSCIENCE OF EMOTION

Attention towards object and event driven by feeling of emotion attached to object and event, which further decide our action in the environment. An integrated sensory response system of emotion, attention, and action defines the overall behavior. Charles Darwin (1872) explained that emotion of fear to escape and aggression to attack are important for the drive action of survival and thus evolution of species. Darwin further emphasized the presence of basic emotion across species and cultures, which became a broad basis for neuroscientific findings by doing research on animal brains. However, at the same time it was

Figure 1. Figure explaining memory of emotion and event/object relation in real-time environment