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Toward a Computational Model of Mood

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Abstract

Affective analysis plays an important role in understanding human characteristics, predicting human behavior and diagnosing mental health problems. Although a large number of affective computing model have been published, understood of mood mechanism is still a challenge because of complexity of correlations between mood, human factors and environmental influence. We therefore aim at developing a computational model of dynamic mood considering mutual influence of mood, human physical status and appraisal. In this paper, we emphasize presenting the model and simulate model according to artificial scenarios.

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Keywords: Affective Computing; Dynamic Mood; Thayer Model; Appraisal Theories.

1. Motivation

Affective states, namely emotions (in short term) or moods (longer lasting) provide valuable information about personal traits, sociability and well-being. They reflect environmental adapting abilities and warm risks of mental health problems. Moreover, affect can lead us to extend our intellectual facilities of consciousness, perception and reasoning[1]

Moods are defined as insight feelings that last for a long period of time (an hour or a day) and that often have not particular causes[8]. Different from emotion, mood is more stable and less sensitive with external stimuli. While emotions are distinguished into discrete states such as neutral, anger, sadness, fear, disgust, surprise, happiness, and contempt (Ekman model), moods are considered as continuous values that gradually mutates following time-line. Moods are usually presented by two dimensions (Positive Affect and Negatives Affect, Arousal and Valence) or three dimensions namely (pleasure, dominance and arousal (PDA) or valence, arousal and calmness) [10].

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In two decades, several computational models of mood have been proposed. A Layer Model of Affect (ALMA)[2] simulates three basic affect types that human beings can experience (personality, mood and emotion). The model was established based on appraisal theories (OCC). Christina Katsimerou proposed mood functions that allow estimating mood values from a series of temporal emotion states and applied it for mood recognition in HUMAINE database[4] Similarly, Robert P. Marinier and his colleges indicated a computational model of feeling[5]. The author argued that emotion is short term affect and mood is long term, a combination between mood and emotion generates feeling that human actually perceives. Researchers of AI department of the Amsterdam University have developed the dynamic model of mood and depression based on theories about depression, stress and coping[3] that simulated mood variation under stress events. They argued that effect of stressful effects on the mood of a person depends on personal characteristics.

Although these computational models describe psychological aspects, mood is also understood as biological factor. Hence, biological aspects like nutrition, stress, sleep and illness also impact on mood variation. Based on the combination among theory of Thayer, appraisal theories and depression theories (which are explained in next section II), we emphasized a mathematical model of dynamic mood to reflect the relationship between mood, health, and environmental adaption. Following the above idea, the paper is presented into 5 sections. Besides motivation and conclusion, section 2 describes the theoretical model. Section 3 introduces an experiment and discuses about result, section 4 presents some methods to detect appraisal in daily life base on mobile smart devices.

2. Toward a Computational Model of Mood

2.1. The State of the Art of Mood Theories

Our computational mood model was established based on three psychological theories: Appraisal theory, theory of depression and Thayer model. An appraisal theory argues that mood and emotion are influenced by stressful events and abilities of a person to cope these events. Lazarus and Folkman emphasize relationships between person and environment where stress is considered to be an appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being[6].

Aaron Beck[7] developed a cognitive theory of depression; he believed that depression is due to negative view toward the self, world, and future in particular. Depressed people have negative thought like “nobody cares about me” or “I cannot do this task”. They also use faulty information processing like selective attention, to maintain their negative views even if the situation is more positive.

Thayer emphasizes relationships between mood and activation ability and biological processes[8]. He proposed two dimensions model to assess mood Energetic Arousal (EA) and Tense Arousal (TA). EA is a dimension characterized by range of feeling from tired or sleepiness at the low end to alert and awake at the high end. The high level of EA associates positive affect tone, having motivation and ready taking action. The low level of EA indicates that there are reduced resources and need to rest, recuperate, or seek alternative energy resources[9]. In contrast, TA is a dimension characterized by range of feeling from calmness or stillness at the low end to tension and anxiety at the high end. High levels of TA are associated with negative affective tone, and low level of TA correlates to good mood with calm or peaceful states. Both TA and EA are measured following Activation and Deactivation Adjective Check List (AD-ACL)[8] and mapped into continuous a range [1, 10]. EA is a kind of go system and influenced by nutrition, sleep, physical activities and stress[16]. On the other hand, TA mediates danger and is considered as “stop” or fear system. TA is influenced by perceived danger and associates with the activated freeze response of fight to flight.

2.2. Concepts from Theories

In this model, basic concepts form three above theories summarized about will be used. From theory of Thayer, mood is presented as two dimensions of arousal TA and EA, each pair values of EA and TA reflects a status of mental. In this model, health is a concept that represents energy resource level insight body. Low health associates with lack of energy resources or health problems. High health means healthy state, all biological processes insight body are balanced, the person has enough energy toward action.