1 INTRODUCTION

Aff ective computing is an increasingly important discipline consisting of technologies and methods to facilitate intelligent interaction between devices and human. Many modern consumer electronic devices, systems, and services enhance user experience through machine understanding of affect by analysis of emotion, cognition, perception, as well as consumer behavior.

Technological advances in the 21st century have brought about ever-increasing sophistication and miniaturization of consumer electronic devices and systems. Consumer electronics manufacturers very often release new versions of their products with an increasingly complicated user interface to support new features and improve user friendliness. These companies not only have to address ever-increasing expectations of customers’ demands, but also have to create a niche in the market so as to stay ahead in the competition. Therefore, there is an added pressure on these companies to pack their products with new features and make them easy to use in a much shorter time. This poses a severe challenge to these companies as they have to provide their customers with what they expect and more.

Among numerous functions and feature in different consumer electronic products, some with affective computing technology could be far more capable than merely detect a smiley face on a point-and-shoot camera, as we come across in daily life. Manipulation of information related to a user’s emotion can be found in many areas of consumer electronics. To give a couple of examples, an audio system can automatically select the type of music that suits the mood of a person under stress; a baby monitor can alert the parent through a wireless link when the baby requires attention.

The close relationship between affective computing technologies and consumer electronics cover many areas. We trust this IEEE Transactions on Affective Computing special section will give readers a comprehensive discussion on various technological challenges associated with consumer electronics, and how a wide range of appliances and services can be supported by applying both existing and emerging technologies. We trust that in the future similar topics on affective computing for consumer electronics will be covered in future issues of the IEEE Transactions on Affective Computing, as laboratory works are being prototyped for eventual commercial realizations. In this special section, three papers are very carefully selected such that each targets very different areas for both business and consumers.

The consumer electronics industry is extremely competitive given the fact that there are so many types of products launched in short periods of time. Marketing therefore becomes a vital element for promoting new products. Successful marketing entails far more than traditional strategies widely adopted throughout the industry; gauging consumer sentiments from the cyberspace is becoming an increasingly important area when targeting the online shopping segment. Appropriate marketing strategies can be optimally developed through prediction and modeling of buying behavior, which is often influenced by the potential buyer’s emotional state. Opinion mining and change of emotion analysis provides a new horizon for quantitative analysis of consumer emotional states using model learning methodologies.

Emotion-aware technology for video games is another important area where affective computing is widely used. This also involves the use of body area network (BAN) for various sensors to be connected to the player. Intra-body communications technology is used in more than game innovations. More generally, a user interface can be made more user-friendly with the aid of affective evaluations of the user in many consumer electronic appliances. A diverse range of devices and systems that require the human-machine interface to function can be supported by wireless BAN that can do far more than a traditional handheld infrared remote control unit. After all, comprehensive user control of many consumer healthcare appliances and audio/visual systems needs more than a combination of buttons alone. Affective and cognitive responses certainly provide a more versatile means of controlling many of these consumer electronic products.

Social networks have entered the realms of consumer electronics in recent years as the rollout of cloud computing takes many portable devices onto the Internet for storage and remote access of infor-mation. Consumers exchange their ideas and experiences on social networks, which in turn influence their own buying behaviors. In response, many B2C businesses are also making their presence felt on social networking tools. Affective computing allows better understanding of how human emotions and behaviors influence consumers’ buying patterns. An example is the generation of personalized web recommendation through utilization of fuzzy ontology algorithms. Quantitative analysis of a consumer’s emotional states can provide an effective means for predicting user emotion for information retrieval.
2 SUMMARY OF FEATURED PAPERS

2.1 Quantitative Study of Individual Emotional States in Social Networks

Emotions are feelings that accompany perception and thinking, which exist everywhere and every moment in our life. Indeed, as emotions stimulate the mind some 3,000 times quicker than rational thought, in most of our decision processes rational thought inspires interests but it is often emotion that finally leads to decisions. The body of emotional analysis works includes those which deal with the computational treatment of opinion mining, (user-level) sentiment analysis, and subjectivity analysis. Researchers have considered various types of emotions, such as the six “universal” emotions: anger, disgust, fear, happiness, sadness, and surprise; or simply three levels of emotional states: positive, neutral, and negative. Understanding users’ emotions can benefit many potential applications. For example, to design a brand new human-computer interaction: If a computer can detect that the user is happy or upset, it could switch to a different mode of interaction, while, if a marketer is aware of users’ emotional changes and the emotional influence between users, he could design targeted marketing strategies and provide better after-sale services.

From the social network perspective, emotion is also a very important factor. For instance, excessive emotions like intense anger have tremendous power to damage/change the complex structure (relationships) of a network. In the first paper, the authors present a quantitative analysis of how an individual’s emotional state can be inferred from his/her historic emotion log and how this person’s emotional state influences (or is influenced by) his/her friends in the social network. Through statistical analysis of the dynamics of human emotions, the authors discovered several interesting patterns, which they used to investigate the propagation of emotional states of individuals and collective sentiments. Their hypothesis that human emotions can be quantitatively analyzed has been validated in both mobile-based social network and online virtual network environments.

2.2 Galvanic Interbody Communication for Affective Acquiring and Computing

The second paper features a new technology for natural connection to improve the capability of a machine to make the acquaintance of its users. The ultimate goal is to contribute to the next generation of human machine interfaces and enable machines to deal with challenging problems/decisions (such as affective evaluations, ethical quandaries, and other innovations) in a self-governing manner. However, current technology poses serious problems concerning comfort and convenience. One of the promising tactics is to acquire users’ electrophysiological parameters to deduce emotional information for situational reasoning.

The paper introduces an interesting and new technique —Intra Body Communication IBC—to the area of the affective computing in order to deal with the main obstacle of connecting sensors scattered on the human body. The technique integrates the human body in the communication channel. It thus provides a comfortable and convenient method to fetch electrophysiological parameters for determining the user’s emotion. For example, a generic MP3 machine which is aware of its user’s sensation can evolve beyond a music player and deliver music consistent with the user’s mood. The IBC does not merely transport the music, but also assists in collecting the emotional and affective information of the user, transforming the MP3 into a personalized disc jockey and providing appropriate music at the right moment.

We can find the basic principles of IBC in the article, as well as studies to demonstrate the technique for sending the physiological information by using the conducting properties of the human tissues. The authors also unleash the vantage of IBC to reduce obtrusiveness in critical long-term occupation safety applications such as a driver alert system, an Emotion RECognition System-II (EREC-II), or in Intelligent Tutoring Systems.

The readers can have a quick glance of future devices as well, which open up a new era for consumers to interact with machines. Minimal user intervention is required for machines to serve considerately and efficiently. We could expect an evolutionary experience with daily electronic devices. Good sensational experience is perceived rather than follows preset rules of logic. This innovative IBC technology sparks the creative functions on consumer electronics and is able to bring the consumers’ joyfulness with devices to new heights.

2.3 Generation of Personalized Ontology Based on Consumer Emotion and Behavior Analysis

B2C e-businesses spend significant amounts of effort getting to know consumer sentiments through the use of social media. Business owners know that consumer emotions and web browsing behaviors can greatly influence not just their own buying patterns, but also those of their acquaintances, who often are known through contacts in cyberspace. Increasingly, sophisticated consumers will take time to browse through online resources before making a purchasing decision, particularly on high value products and services. Gathering and distilling useful consumer information can be a tedious process; some form of automation toward extracting useful consumer information will ultimately benefit both consumers and business owners.

In this paper, the authors set out to discover and model consumers’ emotions and web surfing behaviors for the purposes of providing a behind-the-scene personalized web recommender for consumer applications. Specifically, they propose a semantic web usage mining approach for discovering periodic web access patterns from web usage logs that have been enriched with information on consumer emotions and web surfing behaviors through self-reporting and behavioral tracking. In addition, they construct their knowledge base using fuzzy temporal and resource representations that contain both behavioral and emotional cues. Their use of fuzzy representations can better describe real-life temporal concepts (e.g., periods of the day). Experimental results indicate that both consumer emotions and behaviors provide important cues for effective personalized web recommendation services.
Further, since most computation-intensive tasks are performed in advance, the inner workings of the system appear transparent to the end users. Of course, not every consumer would feel comfortable having their web access logs analyzed due to privacy concerns, so the authors also highlight this aspect of their research and consumers can choose whether or not to use the system at their discretion.

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Guest Editors

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