Emotion-oriented eCommerce

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ABSTRACT

Emotion-oriented eCommerce is a new and fascinating research field that poses many opportunities to understanding the purchasing behaviour of online consumers. Computational models can be easily applied to analyze and assess predictive behaviour in an eCommerce environment. Intelligent emotion recognition techniques using computational intelligence are presented. The purpose of this particular study is to develop a model for emotion-oriented eCommerce systems. Developments within this field of study were noted. Electroencephalography has been identified as the preferred method of emotion technique.

Author Keywords

Emotion-oriented eCommerce, computational intelligence, electroencephalography **(**EEG**),** simulation.

INTRODUCTION

Electronic commerce is becoming an increasingly popular tool used in the marketing and selling of products and services. In the online business world, electronic commerce is an integral part of the online shopping experience 1. eCommerce is capturing the attention of entrepreneurs and consumers globally. Due to the success achieved by many of the well known eCommerce companies like eBay and Amazon, eCommerce is seen as an essential ingredient in the commercial market 2.

Emotions influence consumers' processes and eShopping behaviour 3. Understanding human moods and emotions is an important factor in predicting the purchasing behaviour of the consumer. Designing an interface involves more than simply trying to make the website look good. It is not only about presenting what product or service you have to offer but it is also about how you want the consumer to feel if they are to purchase this product or service. The main concept behind creating an emotion-oriented eCommerce website is eliciting an emotional reaction that would lead to a purchasing decision. Every aspect of the website should appeal to the emotions of the consumer.

Computational Intelligence (CI) techniques are more suitable for emotion recognition. It is defined as "the study of adaptive mechanisms to enable or facilitate intelligent behaviour in complex and changing environments" 4. Computational models are used to facilitate studies on the modelling, interpretation and analysis of human behaviour. CI possesses the ability to understand the beliefs, motives, intentions, perceptions and inference involved in human perception and behaviour. Appropriate techniques for emotion recognition are Fuzzy Systems, Genetic Algorithms, Neural Networks, and Swarm Intelligence.

EMOTION RECOGNITION

Researchers are using a number of techniques which captures the emotions of the user. Emotion recognition involves assigning computers with the ability to observe, interpret and generate affect features 8. In an eCommerce environment, the intent of emotion recognition is to improve the quality of communication between the customer and eCommerce system.

Many theorists have discussed what emotions are and the role it plays in our daily lives. Humans do experience various dimensions of emotions on a daily basis. When designing an eCommerce website it is important to recognise emotions of consumers in order to build a good interface for human to computer interaction.

A user would use a computer in order to achieve a particular result - typing a document, accessing email, or purchasing a product. The extent to which an interface encourages or limits the user's satisfaction, will in due course affect their emotional state 4.

Zhang et. al. 9 believed that Maslow's basic hierarchy of needs should be revisited in order to determine what humans want or what they need in their lives and then employ technologies to support humans' higher needs in the needs hierarchy. When the needs of the consumer are satisfied, greater is the chance of a positive emotional reaction. The factors that interfere with satisfying these needs would cause negative emotions. In emotion-oriented eCommerce, the design of the interface requires good understanding of the consumers' needs.

A user's previous emotional state can also affect the experience of subsequent emotions 10. There are a number of internal and external disturbances that may affect the emotions of a potential customer. Internal disturbances may include processor speed, user's lack of

technical experience, system malfunction due to a computer virus, etc. External disturbances would refer to the elements around the customer's environment that will affect their emotional state, e.g. loud music playing. The goal of the emotion-oriented eCommerce system is to facilitate the switch from negative and unwanted emotions to a positive emotion which will be more receptive to purchasing a product or service.

Measuring the emotions of the consumer is a valuable component in interface design and usability testing. The knowledge of consumers' emotions will enable the system to respond appropriately, thus satisfying the needs of the consumer.

Scheirer et. al. 12 described an approach to building computers that recognises aspects of user frustration. Social interfaces should be able to recognise and respond to emotions shown by users in order to effectively execute real-world interpersonal interaction strategies 11. Emotional signals, whether visual or auditory responses, are important during the social communication process.

There are a number of ways humans express their emotions. Leon and Nikov 8 summarizes the key technologies in emotion recognition starting with input signals, data collection and processing, emotion recognition based on computational intelligence modelling and emotion expression.

Speech Recognition – People express their feelings by the acoustic features and by the content of what they want to say (words, phrases and syntactic structures). The user's tone and intonation would depict the emotional state.

Facial Expression – Expressions like a smile or a nod are used to carry out a semantic function, to communicate emotions. The basic emotions described by Ekman 13 can be related to movement in the mouth, cheeks, eyes, eyebrows and forehead.

Motor Behavioural Patterns - Behavioural measurement methods are based on the ability of the body to respond physically to an emotion (e.g. changes in muscle tension, coordination, strength, frequency) and that the motor system acts as a carrier for communicating affective state 14.

Body Gestures and Movements – There are different positions of the body and it changes over a period of time. It conveys different meanings, for example. a clenched fist may indicate an emotion of fear, anger, or excitement.

Biosignals - A series of biological changes occur when people have emotions. Biosignals such as heart rate, skin conductivity, respiration, temperature, pulse, electrical activity in the muscles, brain activity, etc. can be used to identify the emotional states in a user.

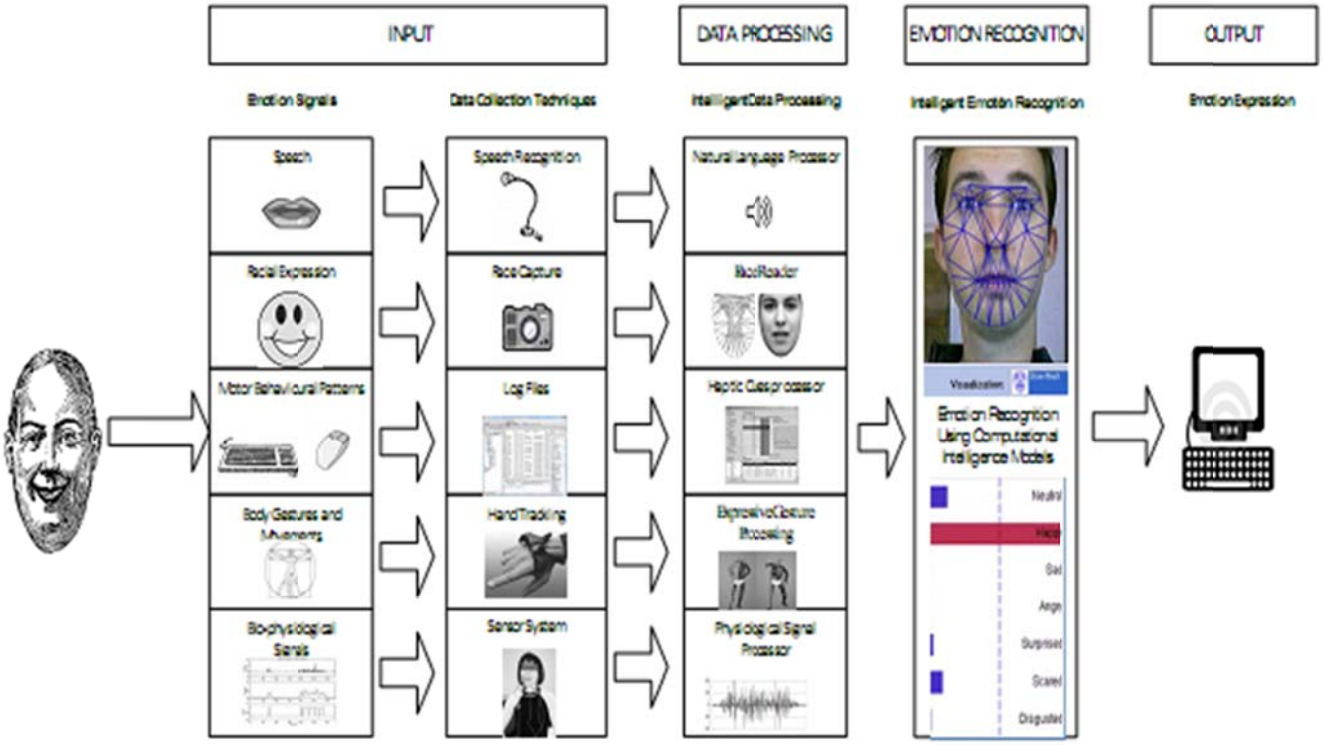

Figure 1. Intelligent Emotion Recognition 8

SIMULATION MODEL

Computational Models of emotion would assist in building models of intelligent behaviour. In an emotion-oriented eCommerce environment, if the customer is confused or angry whilst using the system, this is an indication that there is some form limitation in using the system. Designers are immediately alerted that design modification needs to be done as the system is creating negative emotions in the customer.

The use of Neural Networks (NN) provides the opportunity to gather and identify which combination of design elements will elicit a positive reaction from the customer. Neural Networks are able to adapt weights to a particular environment and retrain easily. Once the desired goal is achieved, the system will know that the intended target was met.

A model for simulation of emotion-oriented eCommerce systems following the basic control structure shown in **Figure 2** is proposed. The target rules identifies what the system should do and the input variables refers to the design elements required for the design of an emotion-oriented eCommerce System.

Electroencephalography (EEG) was selected to measure the emotional responses of the customer when faced with an eCommerce environment. EEG measure the frequency and amplitude of electrical activity generated from the human brain. The benefits of utilizing EEG measurements to determine emotions are non-invasive, simple to understand and can quickly be processed 15.

In this study EEG would be used to assess the user's experience in an eCommerce environment. It will assess the user emotional experiences by recording customers' reaction during the interaction with an eCommerce website. By measuring the consumers' state of mind, emotions and other subconscious responses, EEG signals can assist experts in understanding precisely how consumers really think, act and behave. This theory can be extended to any online shopping environment. EEG allows for the gathering of detailed information on a user's emotional relationship to a particular product or service by measuring electrical activity in different parts of the brain in response to certain stimuli like eCommerce website elements.

The combination of design elements (typography, layout, navigation, graphics arts and images, video, theme and audio) would be trained by the neural network to form the interface layer. The output variables are the EEG signals given by the eCommerce customer. These signals would give an indication of the type of decision the customer would possibly make, whether positive or negative. Positive feedback, may lead to the eventual purchasing of a product, whilst negative feedback will lead to product evaluation and system design modification. The decision made by the customer, will establish if further emphasis need to be placed on the input variables.

SIMULINK was used to create the model for simulation of the emotion-oriented eCommerce System. The SIMULINK control diagram shown in **Figure 3** is made up of six (6) subsystem blocks. These blocks individually carry the elements and processes needed to carry out the simulation as outline in **Figure 2.**

The six (6) main areas that establish the proper technical design for implementation are as follows:

1. Design Elements – incorporates the design elements and the interface of the eCommerce system. The design elements chosen for analysis are typography, navigation, layout, graphics and images, video, theme and audio.

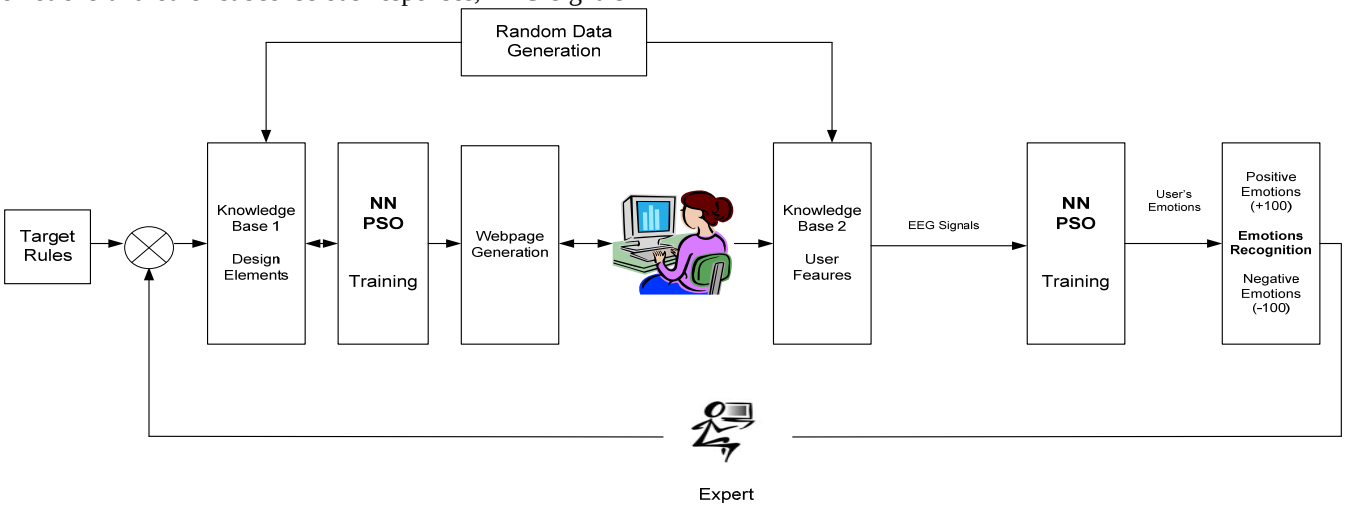

Figure 2 - Simulation Model for Emotion-Oriented eCommerce Systems

1. *DE-NN (Design Elements Neural Network) – receives the values generated by the design elements subsystem block and trains the network to get one value.*
2. *EEG User Features– incoporates the EEG Signals, Alpha, Beta, Delta, Theta and Gamma that can be used to determine a positive or negative emotion.*
3. *UF–NN (User Features Neural Network) - receives the values generated by EEG User Features subsystem block and trains the network to get one value*
4. *Emotion Recognition – if a positive value is received, the value is analysed as a positive emotion. If a negative value is received, the value is analysed as a negative emotion.*
5. *Expert - receives the positive or negative value and determines whether the loop should continue until a positive value is achievedelements subsystem block and trains the network to get one value.*

The results of the simulation will be used to predict the behaviour of consumers in a dynamic environment like eCommerce.

CONCULSION AND FUTURE WORK

Emotion-oriented eCommerce is relatively a new field of study which presents many opportunities to research the ability of the computer to recognise and respond to the users' reaction.

The business community would reap the benefits from understanding and applying the right combination of tools in an effort to satisfy the needs of the customer.

Consumers are emotional beings and the emotions which they exhibit will affect their purchase decision. Designers should focus on designing an eCommerce interface that would elicit positive emotions. Intelligence can be viewed and understood from many perspectives. This paper highlights the study of emotion-oriented eCommerce using computational intelligence. EEG has been the identified as the preferred method to identify the emotional states of the consumer. A model for simulation of intelligent emotion-oriented eCommerce systems is proposed. This model has been identified as an important tool for supporting the experimental study and design of emotion-oriented eCommerce systems.

Future work in this study would involve website development, performing experiments in a controlled environment and comparative analysis.

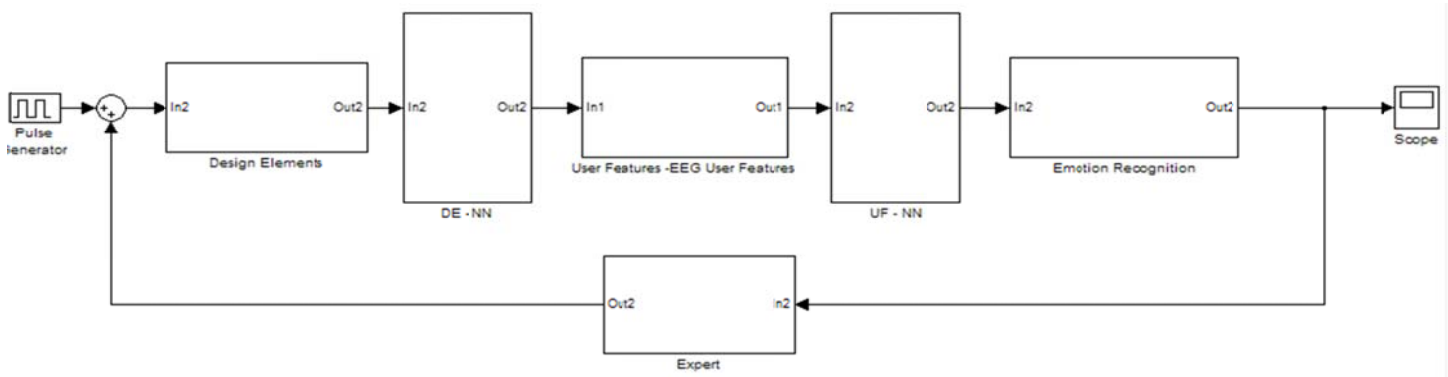

Figure 3 - MATLAB-based Control Structure for Emotion-Oriented eCommerce Systems

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