

eMotion: Game-based System for Emotion Management

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Emotions can influence people's everyday decisions, choices and relationships. We have to deal with many types of them. Positive emotions make us happy and increase the quality of our life. On the other hand, negative emotions can have a strong impact on our health.

A good example of emotion influence is a study from Lerner et. al in [2]. Authors conducted an experiment with 200 participants. The participants were in the role of merchants and their task was to trade with economists. Negative emotions such as disgust or sadness were triggered to participants while they were buying and selling various products. The results of the experiment showed a dramatic impact of emotion on the economic behavior. If people want to make smart decisions, knowing yourself and management of emotions is almost necessary for them.

In our work we present a method of emotion management embodied to the game. We monitor user emotions in real time using the context data from the mobile phone and the short questionnaires. Collected data are used to compute different characteristics about user, such as level of socialization or physical activity and are presented using the game. Furthermore, we propose a method for emotion classification using machine learning techniques. Using this method, we can detect user's negative emotions in real time and help to relieve them through the game.

There are several approaches of detecting emotions automatically. The most common distinction is by the input they use - EEG (electroencephalography) [3], ECG (electrocardiogram), electrodermal activity, speech and voice intonation, facial expressions, body

language and text [5].

Based on how they work and what they are trying to achieve, we can divide them into three categories:

1. Applications collecting data about users that try to find the cause of their negative emotions (e.g Mood Tracker).
2. Applications collecting data about the users that try to get rid of negative emotions by recommending them to do some physical activities, listening music etc. (Self-Help Anxiety Management, Pacifica, Breathe 2 Relax, Happify).
3. Applications that do not collect any data but already expect users to have the negative emotions. They focus on dealing with negative emotions. For example, Pay It Forward is application which recommend good deeds the user could do to become happier.

Since there are more options how to present user's emotion and also many ways how to relieve the negative emotions, we created a questionnaire in which we asked people if they felt negative emotions often, if they would like to resolve them, and how they would like to resolve them etc. The questionnaire was filled by 492 participants. In the Figure 1, we can see results of the key questions, which strengthen our conviction that the game is the way we should go. Our product will span across all the three earlier mentioned categories and in addition we introduce completely innovative approach in the field of the emotion management.

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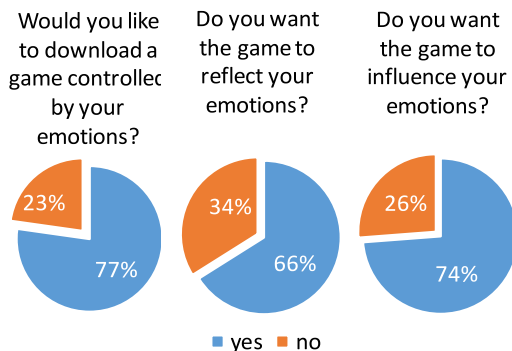


Figure 1. Results of the questionnaire supporting our application form

The main idea behind our application is inspired by the research team from the University of Cambridge. They created an application which was intended to regularly collect data about user's behavior [4]. Data included information about the user activity (through GPS and accelerometer), the socialization of user (through a number of contacts and organizing of activities) or the sentiment of communication. We also added biometric data using certificated medical sensors (such as an oximeter and an activity tracker). However, our approach is not limited to these sensors only. We created an architecture that enables a simple connection to any new sensor into the mobile application and an automatic processing of this data, as well. In addition, we have started a cooperation with the team of psychologist, because emotions are influenced by the personality traits [1] too.

Data collected by our application are used to determine four different features:

- Level of socialization (frequency of texts/calls, texts sentiment, calendar events, WiFi/Bluetooth devices),
- Mood (text sentiment, interaction with game objects),
- Physical activity (GPS, accelerometer, activity tracker data),
- Heart activity (oximeter data, activity tracker data).

User is able to explore this information using our mobile or web application.

We plan to evaluate our approach by conducting two experiments. First one will be a controlled one with three participants where the biometric sensors will be used to label the context data from mobile phone. Second experiment will be with approximately 100 participants without biometric sensors. Within this experiment we will use our game and the data

will be labelled using the short questionnaires.

One part of our application is virtual pet game. It provides better user experience from application usage. User can interact with the pet, play various minigames and create customized pet and scene. Key feature is that the pet is able to react in real time to user's characteristics (socialization level, mood, physical activity, heart activity). For example, if the user does not have any physical activity for a long time, the pet may offer him to start running.

Our system consists of two parts. The first part is web application implemented in Python (Django) that is responsible for data processing. Real time data are effectively stored using Redis. The second part of the system is mobile application that consists of two modules. The first one is Android element for data collection. The second one is responsible for a user interaction in form of a game (Unity and C#). Communication between mobile and web applications is realized through API. Mobile app also allows pairing and collecting raw data from biometric sensors (AM3, PO3).

The main goal of our work is to provide people a tool for the management of their emotions. User's mood is detected using the proven scientific researches. Our main contribution is that the application provides personalized feedback to the user. Moreover, user interacts with application in a funny form - simple game. We believe that our application will be helpful in an everyday life. We are also planning to use our application for medical treat by doctors or psychologists. Moreover, there are also other domains where the emotion recognition plays an important role, such as: e-learning, entertainment, marketing, or law.

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