eMotion: Emotion Management and Mood Recognition Framework

Zuzana Bobotová [1], Dávid Černák [2], Veronika Gondová [1]
Tomáš Matlovič [1], Tomáš Pavlovič [1], Ján Šmihla [1*]

Slovak University of Technology in Bratislava
Faculty of Informatics and Information Technologies
Ilkovičova 2, 842 16 Bratislava, Slovakia
`emotion.fiit@gmail.com`

Emotions influence people's everyday decisions, choices, and relationships. During the day we have to deal with many emotions, which can be triggered by various situations or objects. Mood is rather a longer state of the person, which can last for a days or even weeks. Although the emotions are generally short-lasting events, they also affect the overall mood, which have a bigger impact on the quality of our life and 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 the emotions 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 an application for emotion management and mood recognition. 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. They are presented using the charts. Furthermore, we propose a method for mood recognition using the machine learning techniques. We can detect user's negative mood and help him to deal with it by suggesting him some of his favourite activities.

There are several approaches of detecting emotions automatically. We can divide them by the input they use: EEG [3], ECG, electrodermal activity, speech and voice intonation, facial expressions, body language and text [5]. Based on how they work and what try 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. Pay It Forward is application which recommends good deeds the user could do to become happier.

There are more options how to present results of the collected data to the user and also many ways how to relieve the negative mood. Therefore, we created a questionnaire, which was filled by 492 participants - 289 women and 203 men. The most of them were from the two age categories: people between 20 and 26 years (340 participants) and people between 15 and 19 years (110 participants). We asked people whether they experience negative emotions often, whether and how they would like to solve it. Figure 1 shows a result of the first two questions - people feel stress in their life and they would like to solve it. In the Figure 2 is a result of the key question which strengthen our conviction that charts are the way we should give

a feedback to the user. Our product spans across all three earlier mentioned categories and in addition we introduce completely innovative approach in the field of the emotion management.
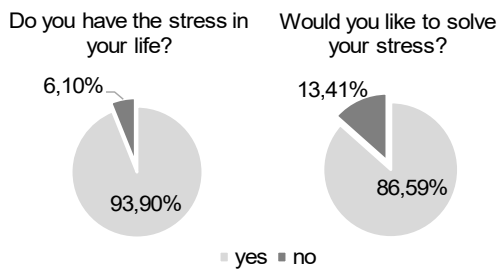

Figure 1. Answers on the questions about stress in people's life
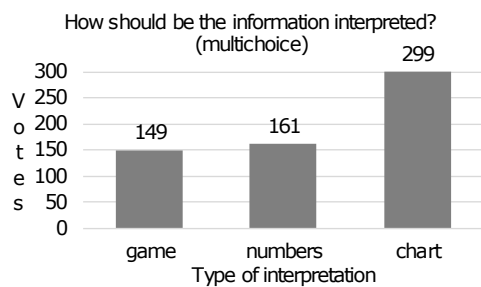

Figure 2. Answers on the question about interpretation of the information

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), and 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 those sensors only. We proposed an architecture that enables a simple connection to any new sensor into the mobile application and an automatic processing of this data, as well. Inspired by the fact that emotions and mood are influenced by the personality traits [1] too, we started a cooperation with the team of psychologist.

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

– Level of socialization (frequency of texts/calls, texts sentiment, calendar events, WiFi, BT)

– Mood (questionnaires, model)

– Physical activity (GPS, accelerometer)

– Heart activity (HRV)

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

Architecture of our framework is composed of two main components. The first part is a web application implemented in Python (Django) that is primary designed for data processing. Real time data are effectively stored using Redis. Web application also provides chart analysis for the user. The second part of the system is a mobile application for Android platform. It is used to collect mobile usage data and also allows pairing and collecting raw data from biometric sensors (AM3, PO3). In addition user can analyse calculated statistics using charts and also get recommended activity. Communication between mobile and web applications is handled by the API.

We have evaluated our approach by conducting two controlled experiments. First one was with approximately 40 participants. During the experiment they were using our mobile application and the data were labelled using the short questionnaires. Second one was only with 3 people where the biometric sensors were also used to label the context data from the mobile phone.

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. 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.

References

[1] Buss, A.H., Plomin, R.: *Temperament (PLE: Emotion): Early developing personality traits*. Volume 3. Psychology Press, 2014.

[2] Lerner, J.S., Keltner, D.: Beyond valence: Toward a model of emotion-specific influences on judgement and choice. *Cognition & Emotion*, 2000, vol. 14, no. 4, pp. 473–493.

[3] Petrantonakis, P.C., Hadjileontiadis, L.J.: Emotion Recognition From EEG Using Higher Order Crossings. *IEEE Transactions on Information Technology in Biomedicine*, 2010, vol. 14, no. 2, pp. 186–197.

[4] Rachuri, K.K., Musolesi, M., Mascolo, C., Rentfrow, P.J., Longworth, C., Aucinas, A.: EmotionSense: a mobile phones based adaptive platform for experimental social psychology research. In: *Proceedings of the 12th ACM international conference on Ubiquitous computing*, ACM, 2010, pp. 281–290.

[5] Shivhare, S.N., Saritha, S.K.: Emotion Detection From Text Documents. *International Journal of Data Mining & Knowledge Management Process*, 2014, vol. 4, no. 6, p. 51.