

Extending Mobile App Pre-Launch Service with Emotion Context

Abstract

This paper reports a mobile application pre-launch scheme that is based on user's emotion. Smartphone application's usage and smartwatch's internal sensors are exploited to predict user's intension. User's emotion can be extracted from the PPG sensor in the smartwatch. In this paper, we extend previous App pre-launch service with user's emotion data. Applying machine learning algorithm to the training data, we can predict the application to be executed in near future. With our emotion context, we expect we can predict user's intension more accurately.

Motivation & Objective

App Pre-Launch Service using only Smartphone has following challenges

- ✓ There is a lack of accuracy when the number of apps executed by the user is smaller than the criteria for app pre-launch

Correlation between smartphone app usage and user's emotion

Happy	Stress	Enthusiastic
Angry Birds	Facebook	Gallery
NetFlix	Twitter	News
Youtube	WhatsApp	Life organizer
Music	Skype	SMS
FM Radio	Google Chat	
Chrome, Firefox, Dolphin, Tunny, Android browser		

J. Alvarez-Lozano, V. Osmani, O. Mayora, M. Frost, J. Bardram, M. Faurholt-Jepsen, L. V. Kessing, Tell me your apps and I will tell you your mood: Correlation of apps usage with Bipolar Disorder State, PETRA'14, 2014.

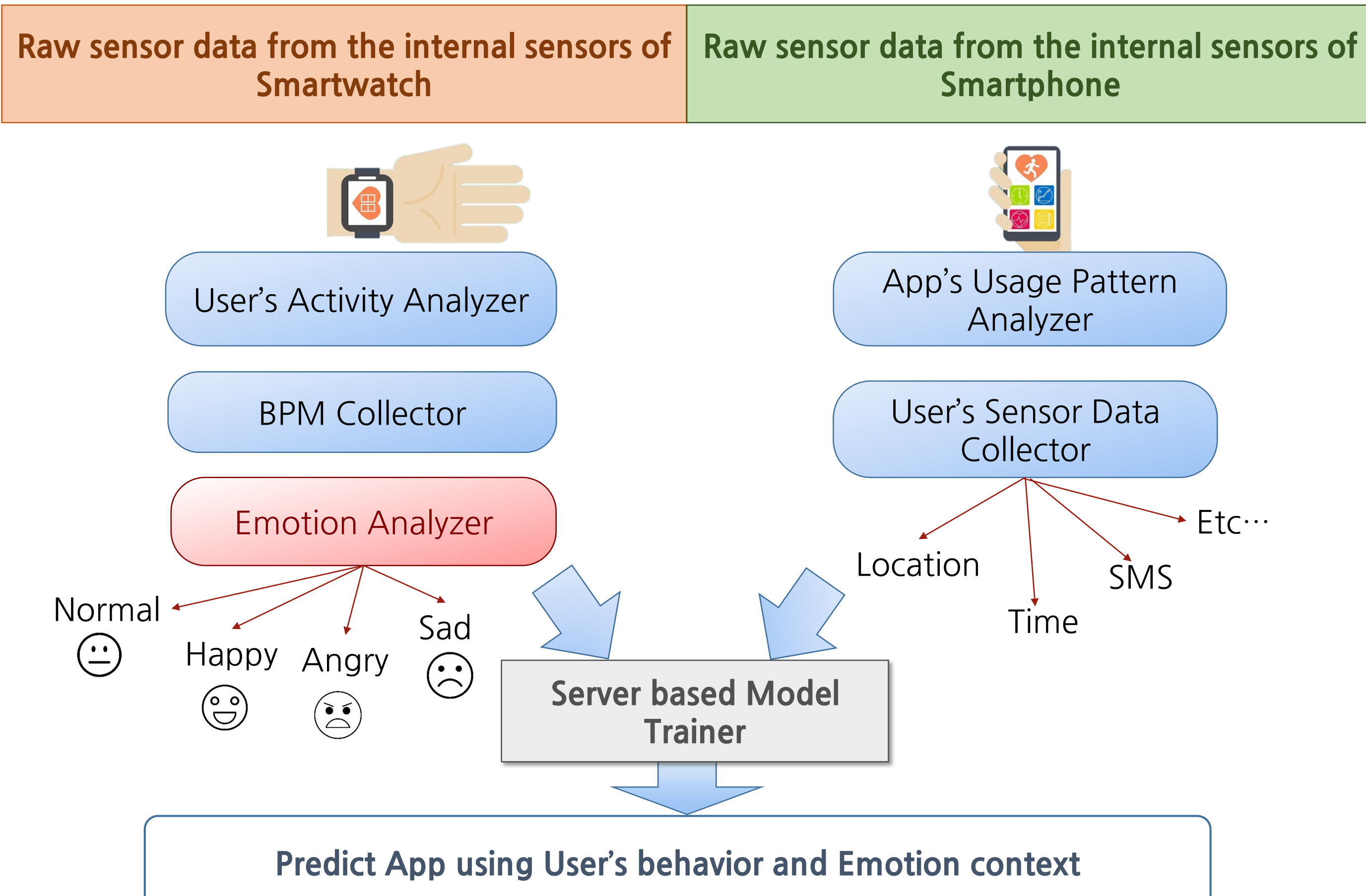
Proposed Solution: Use Smartwatch for Emotion recognition

- ✓ Possible to collect PPG data unobtrusively in real time

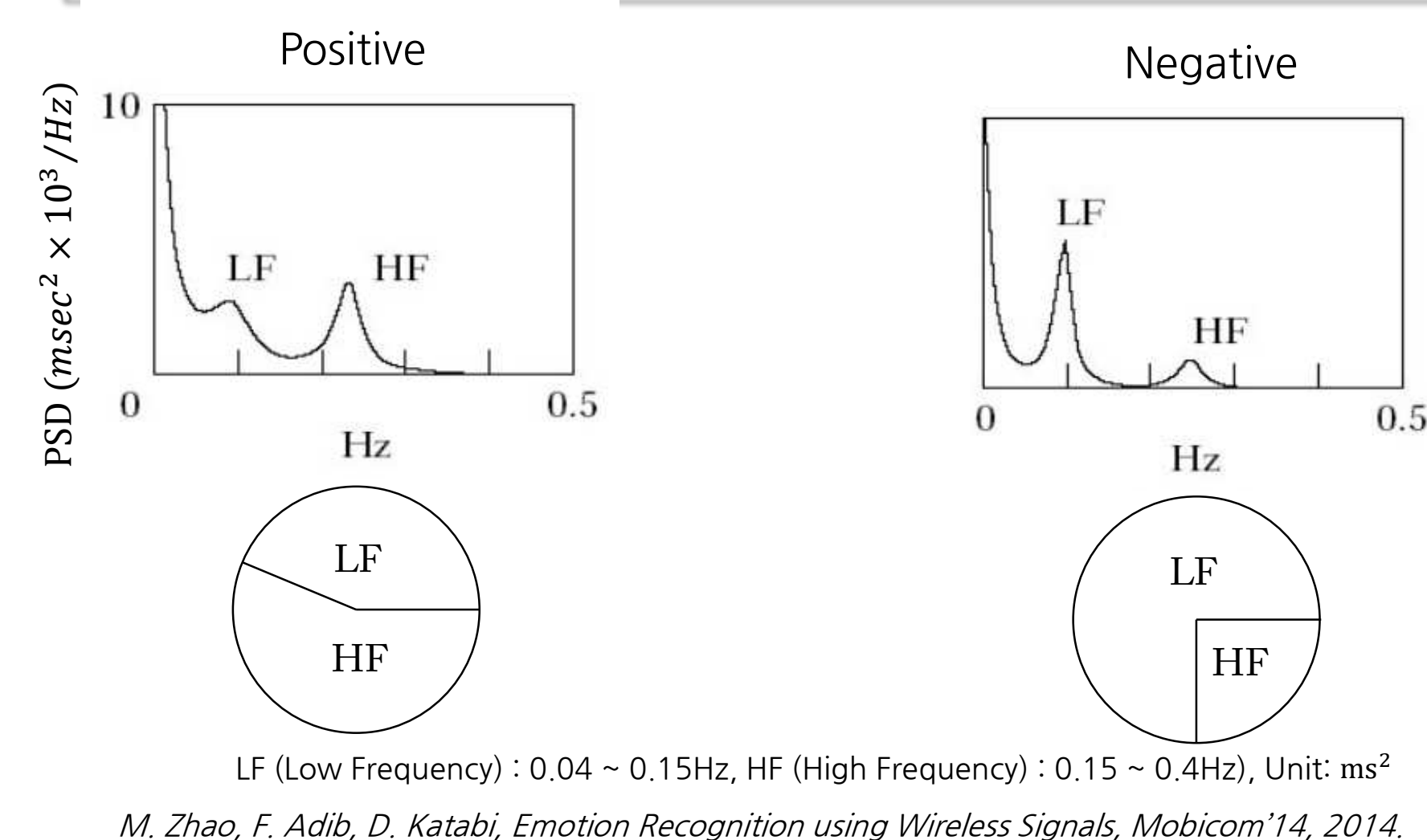
App Pre-Launch Service with Emotion context is designed to

- ✓ Analyze user's emotion unobtrusively in real time
- ✓ Improve accuracy of app pre-launch service

Architecture & Design

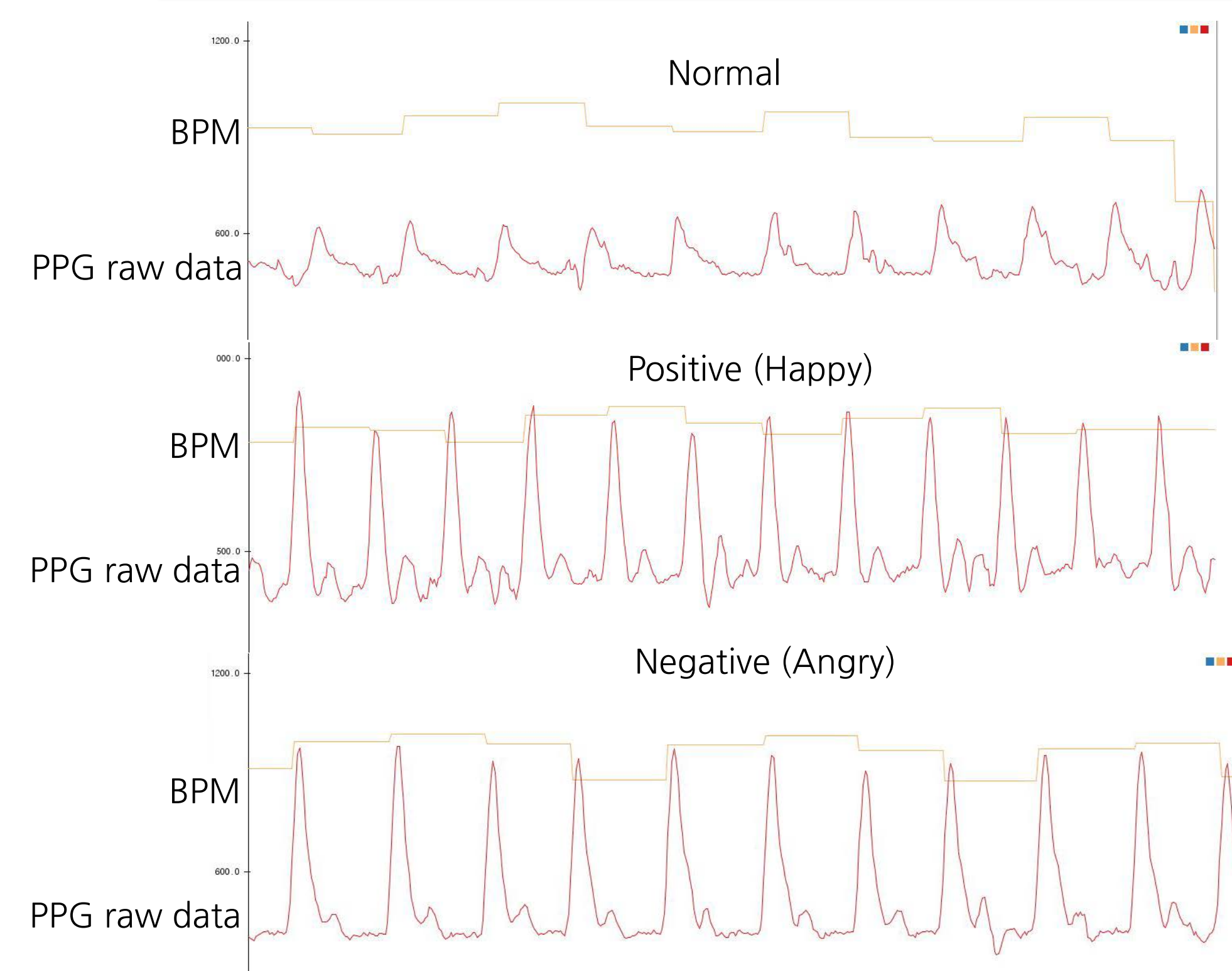


Emotion Recognition System



When the value of LF(Low Frequency: 0.04 ~ 0.15Hz) / HF(High Frequency: 0.15 ~ 0.4Hz) ratio increases, the value of LF becomes relatively large, which means that the parasympathetic nerve is dominant. In contrast, when the value of LF / HF is decreased, the value of HF is relatively increased and the action of sympathetic nerves is dominant can see. This means that the condition of the subject is comfortable or has improved mood, so it is judged as positive.

Preliminary Work



BPM(Beat Per Minute) and PPG raw data are collected by Arduino Uno(Atmel, CA) and Pulesensor(TS11574S) and analyzed with Matlab(Mathworks, CA). (upper) In the graph of Positive(Happy), when the LF / HF value becomes larger, it indicates that the value of the HF is relatively large, which is considered to be a positive state. Conversely, the value becomes smaller as in the Angry state, it indicates that the value of LF is relatively large, which means that the emotion became worse.

Emotion	LF (ms ²)	HF (ms ²)	VLF (ms ²)	LF/HF ratio
Normal	1.370e+04	3.36698e+03	1.4959e+06	3.7386
Happy	1.4451e+04	4.2002e+03	7.8470e+05	4.2410
Angry	1.9636e+04	5.3830e+03	1.4432e+06	3.0262

Conclusion & Future Work

In this paper, we proposed a method of preloading a predicted app by learning user's usage pattern of smartphone and smartwatches heart rate data. Our preliminary implementation shows that we can identify emotions from the smartwatch's PPG sensor. Future research is to analyze the accuracy of predictive models by realizing the design of this study with more data. It is expected to be utilized in future smartphone system OS optimization and mobile interface.