Research Proposal: Engagement Sensing for Mobile Games

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1. INTRODUCTION

In the proposed study, we seek to validate a method of assessing the engagement level of mobile game players by fusing multiple sensors from smartphone (touchscreen and accelerometer), wearable device (physiological sensors) and external camera. Engagement is an essential element in game design and particularly important for mobile games as an alternative game is always just an easy download away. Specifically, it is not enough to just motivate users to install and begin playing a game; if the engagement is not maintained at a high level, users can quickly switch to other games or applications as they have so many options available in the app stores. Hence, the engagement of players can be used as a metric to evaluate the success of a game.

Measuring engagement is a challenging task because it is a subjective concept and usually requires fine-grained highly disruptive interviews or surveys to determine accurately. For such fine-grained and accurate engagement assessment, the survey needs to be taken very regularly (every minute). Such frequent surveys are not only cumbersome but also likely to affect the gaming experience, especially when multiple data points need to be collected from a single participant. In addition, it is very difficult for game developers to use the self-assessment method to accurately measure the engagement levels of real users after a game is released.

We are building a sensing system that can enable iterative and automatic player engagement evaluation throughout the game development process which can benefit them in various ways. We envision two use cases in which game developers and designers can leverage such a system: (1) early formative evaluation for the development of design improvements; and (2) adaptive update and customization for already released games. Additionally, accurately determining the engagement level of users can be used, beyond just games, as a trigger for providing personalized content and interaction modalities in other applications. For example, an advertisement could be triggered when the current engagement level of the user is low to suggest new content or applications.

2. CURRENT WORK

In our current work, we took an experimental approach to evaluate EngageMon, our multimodal engagement sensing system (shown in Figure 1) and provide a comprehensive analysis of engagement sensing approach. We consider engagement as a multifaceted concept that covers emotions, cognition, and physical behaviors of gamer that occur during a game session. To develop a system for evaluating this multifaceted metric automatically, we leverage various sensors including physiological sensors, touch-screen, and depth camera which have been studied in prior works and shown to be useful to infer at least one of the three engagement components.

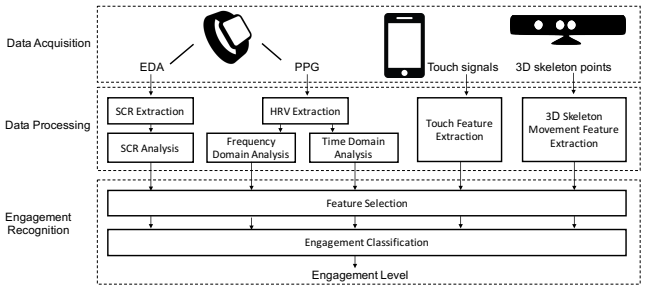

Figure 1: Overview of EngageMon

We conducted a study to identify useful sensing modalities and features affecting the engagement level of gamers (using a dataset collected from 54 in-lab game players playing six different games, with and an additional dataset collected from another ten players in a more natural setting), and show that it is possible to accurately sense the engagement level by fusing multiple sensing modalities. Specifically, using all three sets of sensors, EngageMon was able to achieve an average accuracy of 85% and 77% under cross-sample and cross-subject evaluations respectively.

3. DISCUSSION

While our current system setup shows high classification accuracy for the six games chosen across three genres, our survey with game developers and designers suggests that there are various customizable factors in the game design and testing phase. For example, we noticed from our evaluations that sensing features used for game engagement levels differ form varying game types. A challenge regarding the generalization of our system that yet remains is how we can easily identify a set of effective common features that can be utilized across a more general set of games.

The goal of this current work is to demonstrate the potential of using sensing data to classify a gamer's engagement levels. EngageMon currently utilizes a physiological data collection sensor, a Kinect camera, and the touch interfaces on the smartphone. However, we believe that there are other sensing modalities that we could potentially leverage. For instance, mobile phone's front camera for tracking the facial expression of player which could provide useful information to improve the performance of engagement detection further. Furthermore, the engagement level detection accuracy of EngageMon can be greatly improved in future work by combining the sensing signals with additional contextual features extracted from the game itself.