HeadPhones: Ad-hoc Tiled-Displays through Head-Tracking on Smartphones

Figure 1: An ad-hoc tiled display (left, image courtesy of [1]), Amazon Firephone with 4 head tracking cameras (middle), relative positions of two phones can be determined through individual tracking of the user’s head (right).

**Thesis Description:**

Having at least one smartphone, one tablet in addition to a notebook available is becoming more and more common for mobile users. When people meet, there is a great potential to use multiple of these devices to create large ad-hoc tiled displays for collaborative activities, such as photo sharing or watching a movie (Figure 1 left). However, to date it is cumbersome to both initiate the connection between multiple displays and to accurately and dynamically determine their relative positions (registration). Common examples for registering displays relative to each other is through swipe gestures across displays. However, this method does not scale to many devices and does not allow to change the position of individual displays afterwards.

One idea to enable both the registration of many displays as well as support dynamic positioning of individual displays is to use the human head as common reference frame. More precisely, individual smartphones can track their position relative to a human head through their front cameras. Through concatenation of those individual measurements the relative positions of the smartphones to each other can be determined.

The goal of this project is to investigate how to create an ad-hoc tiled-display consisting of multiple Amazon Firephone smartphones. The relative positions of the smartphones should be determined through tracking the head of a user in front of the phones. Accurate head-tracking is straightforward on the Amazon Firephone through an accessible API.

Specifically, you should:

- Implement a web-based framework for creating a large virtual display surface across several smartphones
- Integrate the head-tracking measurements from individual Amazon Firephones into the framework
- Evaluate the registration quality (relative position of the smartphones relative to each other and relative to the head)

**Facts**

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**Examiner:** Prof. Dr. Matthias Kranz

**Type:** Master thesis / Bachelor thesis

**Time frame:** 6 months, starting any time

**Requirements:** Successful candidates will have a strong background in computer science, computer engineering, or comparable study programmes, preferable knowledge in mobile application programming (Android) and Computer Vision.

**Mandatory requirements for international students**

For international students, it is mandatory for applicants to review the notes and requirements listed at [http://www.eislab.net/en/theses/internships.html#incoming](http://www.eislab.net/en/theses/internships.html#incoming). Applications not including the required information or not adhering to the stated requirements cannot be considered without further notice.

**References**


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