An Experimenter's Third Eye: Using the SenseCam as Ground Truth for Unsupervised Evaluations

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ABSTRACT
In this paper we show, how SenseCam images are able to extend and validate the emerging automated logging evaluation technique.

Categories and Subject Descriptors
H.5.2 [**Information Interfaces and Presentation**]: User Interfaces—*Evaluation/methodology*

General Terms
Observation techniques, field study

1. INTRODUCTION
User evaluations of applications are obligatory in almost every HCI-related design approach. Field studies are worth the hassle, even if they are time-consuming and difficult to conduct [1]. To overcome these issues, new observation techniques are developed. One of them is automated logging, which uses sensors to capture the users' interactions. In this paper we describe how the SenseCam extends the logging and helps to validate the logging methodology in a user study. The final goal is to allow completely unsupervised evaluations.

2. CONCEPT
A common smart phone contains several sensors: GPS positioning, speed, and heading, an accelerometer, a compass, a proximity sensor, a light level sensor, a microphone, and a camera. Additionally, the timestamp and duration of possible touch screen usage can be detected. All these sensors can be used to automatically determine and log a user's behaviour in an evaluation setting.

To investigate logging as a feasible evaluation technique we conducted a field study with 15 participants. As scenario we selected a mobile personal navigation application we developed, where we have some serious interest in the evaluation. The map-based application is called PocketNavigator[1] and has tactile feedback integrated [2]. This is intended to guide a user without the need to look on the display. We have the hypothesis that the tactile feedback would lead to less navigation errors, less disorientation events, and a reduced need to watch on the visual display.

[1]`http://www.pocketnavigator.org/`, last visited August 26, 2010.

Figure 1: The observation of the participants through the SenseCam revealed that some tend to physically align the map shown on the device to the environment. This results into confusions for the automated detection of disorientations.

Coming from the hypothesis we designed three dependent measures. Navigation errors are detected by calculating how far the user is off the shortest path between two waypoints (i.e., used sensor: GPS). Disorientation is detected by observing the user's heading towards the next waypoint (i.e., used sensors: GPS, compass). The device posture is measured by relying on the accelerometer and the values roll and pitch. To determine a ground truth, every participant was asked to wear a SenseCam. Additionally we shadowed the participants, taking written notes on the three determined dependent measures.

At this informal stage we find it sufficient to investigate the observation method through simple reviewing. Therefore we developed an application, which is able to display every recorded value in a meaningful way. In example the users position and heading is displayed on a map, the device posture is encoded as the user's icon colour, and disorientation is shown as two-coloured indicator (i.e., red means disoriented, grey means non-disoriented). Additionally the SenseCam image taken in this specific situation is shown.

3. RESULTS AND DISCUSSION
As result we can report, that the SenseCam serves well as ground truth and observation device. According to our informal results the logging performed well in practice. For navigation errors we found that a noisy GPS signal can result into false positive indications of the logging framework. Through the SenseCam we observed that users tend to physically rotate the device to align the map to the environment (see Figure 1). This results in false positive detections for disorientations.

In our future work we plan to do another more formal validation of the logging methodology against the gold standard observation method in field studies: video recording. Beside this we plan to release our logging framework and the Context Player to the research community to foster the investigation of other scenarios and applications, e.g. travel reconstruction.

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5. REFERENCES

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