

Visual Detection of Position and Orientation of Mobile Devices in an Instrumented Room

Project Thesis (3 months)



Project Description:

The Fluidum project investigates interaction with different types of information in instrumented environments. The instrumented room in the basement of Amalienstrasse 17 is equipped with several displays. To allow interaction between those, their position and orientation need to be identified at any time. This includes stationary as well as mobile displays.

The initial position and orientation can be obtained through the 'Flash and Peep' metaphor (former project thesis). This technique only offers spatial attributes at one time. Thus, it is sufficient for stationary displays but not for mobile ones. The idea is to keep track of these as well. One approach is to use the two steerable high-resolution cameras mounted on the ceiling in the instrumented room. Using two cameras ensures the stability of this technology by having a certain degree of redundancy.

Using computer vision algorithms in combination with a specialized visualization on the mobile's screen, its position and orientation can be obtained. In this case it is important that the visualization does not interfere with the displayed content. One option would be to display colored lines at the display's borders in an appropriate way. For this scenario, several computer vision techniques exist: (1) the HSL filtering method in order to reduce the image to the desired color values and (2) the Hough transformation to find lines in an image. One further problem is to distinguish displays. If they all display the same scheme on their screen the system will not be able to differentiate. Thus, the work should also focus on detecting multiple devices.

For this project thesis, the student is expected to implement a procedure based on the description above. Several code parts – such as the camera control and image capture – already exist. In addition, s/he needs to find a concept in order to differentiate between multiple displays.

Required skills:

Object-oriented programming language, Computer vision

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Project Thesis

Start: immediately

Keywords:

Camera-based Tracking, Steerable Cameras,
Display Location and Orientation, Ubiquitous
Computing, Mobile Devices