



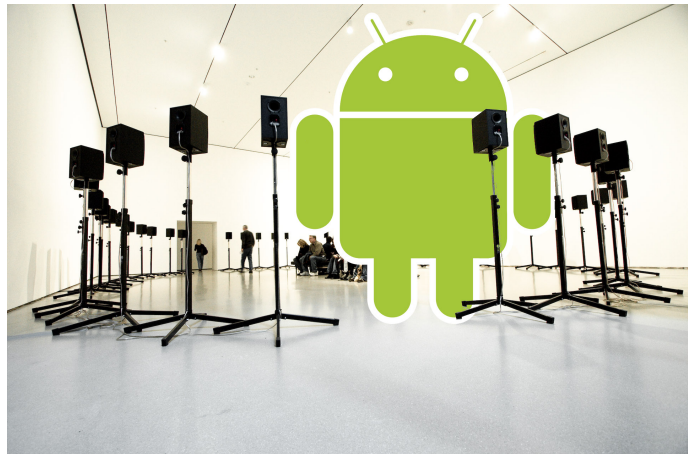
Semester Thesis:

Smartphone Localization Using a Surround Speaker System

This document describes the subject and the general time schedule of the semester thesis of Pascal Voser, beginning in the autumn term 2012. Adaptations or changes can be agreed upon by the advisors.

The current generation of gaming consoles introduced a variety of new controller concepts that lay the foundations for new gaming experiences but also for new ways to control other electronic devices such as media center PC's. These concepts are leveraging sensors such as gyroscopes and stereo cameras to better track the motion of the controller or the user. These input devices had a great impact on how game consoles are used today and it is likely that these control concepts will transcend the world of gaming and become a part of everyday life.

The ability to accurately localize a controller in 3D space is still a challenge. The Kinect sensor for example has a limited resolution that translates to localization. Also, objects can only be tracked within the field of view which might be an inconvenient limitation. Ultrasonic localization is a well studied topic and we plan to bring this technology to the living room using state of the art smartphones and surround sound systems but no dedicated hardware.



The goal of this thesis is to develop a robust and accurate localization technique using only a smartphone and a standard surround sound system. An Android application that not only implements the localization technique, but also facilitates easy setup and configuration will be the result of this work. Towards the end, Pascal will evaluate the performance of the implemented system and identify the fundamental tradeoffs and limits of the system.

Requirements: Good programming skills and creativity are advantageous. The student should be able to work independently on this topic.

Contacts

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Detailed Project Outline

We denote the following primary tasks mandatory (on the right side you find a rough estimate for the time that we allocate to the respective task):

- Literature research about existing localization schemes (★)
- Investigate relevant hardware characteristics and limitations (★)
- Experiment with signals, detection and computational complexity (★★)
- Implement localization scheme in an Android application (★★★)
- Evaluate localization performance (★★)
- Implement a cool demo application showing off your localization (★★)
- Write a report documenting the development process and the final status of the application and discuss the findings. (★)
- Prepare a presentation about the results of your work (★)

The Students' Duties

- One meeting per week with the advisers to discuss current matters
- Regular check-ins into the provided *revision control system* (Subversion)
- A final presentation (15 min) of the work and results obtained in the semester thesis
- A final report (English or German), presenting work and results