

UNIVERSITY NAME (IN BLOCK CAPITALS)

# A music player user interface based on head-gestures and 3D audio feedback

by

Jonas Hinge

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# *Abstract*

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Music applications on smartphones makes listening to your favourite music accessible and mobile. Although the possibility of listening to music at any time and place immediately seems like a positive development this could introduce other challenges. E.g. biking and controlling a music application will conflict in the sense that biking demands hands on the handlebars and eyes on the road, and a smartphone application demands hands (or at least one hand) and eyes for navigating resulting in an increase of the users cognitive load.

At the same time emerging accessories with built in sensor hardware e.g. Google Glass or Intelligent Headset (<http://intelligentheadset.com/developer/>) offer alternate ways of using gestures in form of GPS location, rotation, acceleration, speech etc.

Encouraged by the biking scenario challenge and todays emerging and accessible mobile technology - alternative ways of controlling a music application should be explored. In this project an alternative way of navigating using head gestures and audio feedback is explored.

Results?...

Conclusion?.....

# *Acknowledgements*

The acknowledgements and the people to thank go here, don't forget to include your project advisor...

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# Abbreviations

**LAH** List Abbreviations **Here**

# Chapter 1

## Introduction

Mobile and wearable devices has been a growing area in computing in recent years. Compared to desktop computers these devices have introduced new standards for when and how people interact with especially mobile applications. Suddenly people are able to check the news, navigate via interactive maps, post social messages, listen to music, etc., while they are on the move. At the same time emerging hardware in mobile devices and wearable computing expands application complexity and interaction possibilities.

This mobility factor introduces challenges when interacting with these devices. Although screen resolutions and physical sizes of mobile devices are increasing, the visual work space is limited i.e. screens easily becomes cluttered with information and the input keyboard can be an interaction challenge when moving. More importantly, when moving around e.g. in the traffic, interacting with a mobile device at the same time can create cluttering in form of distractions e.g. "eyes off the road" or "hands occupied" and in the worst case cause accidents.

Solutions for these cluttering challenges could lie in the interaction between users and mobile devices. The emerging hardware (e.g. sensor technology) and software opens up for alternative input modalities e.g. head gestures, gaze tracking, speech recognition making hands-free interaction possible. At the same time output modalities such as audio and haptic feedback could liberate the eyes from the screen.

### 1.1 Problem statement

Considering mobile interaction cluttering challenges this project will be based on the concrete scenario where people are biking while listening to and controlling their music library. As biking requires eyes on the road and hands for steering the input/output



modalities should preferably not include eyes and hands. Instead head gestures for input and 3d audio for output will be evaluated.

More specifically the following questions should be answered:

Can a user interface based on head gestures and 3d audio compete with existing user interfaces for music players (e.g. touch and vision-based) with respect to for instance a) navigation and control efficiency b) learnability, c) general usability (cognitive/perceptive load), c) suitability to real-world hands-occupied situations.

With the chosen combination of input and output modalities, there is a high risk for the system to misinterpret normal everyday actions performed by the user as commands for controlling the system ("behavioural cluttering" (Janlert et al., in press)). How can features in the user interface prevent unwanted manipulation of the system?

## 1.2 Project goal

The goal of this project is to examine if head gesture based input and audio output modalities in combination can compete with a traditional touch and vision based input/output interface and show which advantages, disadvantages and challenges that arise when using and designing such interaction techniques. More precisely a mobile system that recognises these alternative interaction methods should be designed and implemented in a music application. Test users will compare this new way of controlling a music application with a traditional music application in form of comfort, efficiency and learnability in a closed lab test and a "real world" scenario.

## 1.3 Project structure

...

## 1.4 Related work

Venn diagram: Introducing the academic areas... - Head gesture interaction - Audio feedback/menu - Accessible hardware/mobile devices - Eyes-free focus - Hands-free focus - Real-world scenario/application evaluation

Related work: Split up in academic research areas

Pascoe et al. investigated HCI issues when people are on the move and trials showed that a vital factor was to minimize the amount of distraction for interaction modes [1].

Visual displays can be obtrusive and hard to use in bright daylight, plus they occupy the users visual attention [2]

Kajastila and Lokki has done a user study comparing auditory and visual menus controlled by the same free-hand gestures where the majority of the participants felt that an auditory circular menu was faster than a visual based menu [3].

Brewster et al. showed that novel interaction techniques based on sound and gesture can significantly improve the usability of a wearable device in particular under "eyes-free" mobile conditions and that head gestures was a successful interaction technique with egocentric sounds the most effective [4].

William W. Gaver, a pioneer in audio interfaces, has explored several aspects of using sound in interfaces including the intuitiveness of presenting complex information to users in the form of audio [5]. Similarly Graham explores the advantages in reaction time when using auditory icons [6]. In [7] Gaver presents the use of spatial sound icons. In doing so, he draws forward the unutilized potential of creating natural interaction through spatial audio.

Table: Summing up references that handles specific research areas

## Chapter 2

# Design

### 2.0.1 Interaction model

Horizontal 180 degrees head movement, nod/shake...

### 2.0.2 Sound design

Several studies show that circular auditory menus are the way to go because of horizontally positioned sounds , HRTF, 3D audio...

## Chapter 3

# Implementation

SDK's, APIs, Processing sensor data...

## Chapter 4

# Evaluation

...

## Chapter 5

# Discussion

Other scenarios e.g. visual impaired people, car driving...

## Chapter 6

## Conclusion

...

## Appendix A

# An Appendix

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