

DIGITAL SYNESTHESIA: USING MOBILE TECHNOLOGY TO INTERACT WITH OUR
WORLD

BY

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EXECUTIVE SUMMARY

The current state of mobile interfaces is nearing a bottle-neck from two distinct points of view. On one side, the bulk of the human-device interface is resting on touch and sight with some audio and haptic cues (these cues only in the form of vibration). In addition, the industry's obsession with ever smaller devices is reaching its peak where screen size will not be big enough for comfortable multi-touch interaction. So we see a resurgence of bigger screens and bigger devices. On the other side, we have not seen a breakthrough in mobile experience for some time, with most advances in technology being slightly incremental. I believe this is not only due to the physical constraints but also because our current expected experience when using our mobile devices is not ambitious enough to demand a breakthrough in the interaction paradigm.

This thesis intends to address both the interface and the experience sides of this trend. First by understanding that what I want to be able to do with my mobile technology is to be in closer contact with the world around me instead of isolating myself in my closed virtual world. For this I will create a radically new experience based on the augmentation of our natural sensory system, either by supporting one of our existing senses and looking for ways to make it more powerful or by creating a whole new sense using electronic sensors to detect information that our bodies are not capable of sensing naturally. This will create a new paradigm of usability that we currently don't have by allowing us to interact with the world *through* our devices in new ways.

The other side of the problem addressed by this thesis will be finding a way for the mobile device to communicate this new information to our bodies in ways that don't necessarily use sight or touch. New ways of interacting with our devices can be by using our tactile sense in a much broader way, generating vibrations signals in different parts of our bodies, generating hot and cold areas in our skin, creating sound through bone-conduction or pulsing tiny amounts of electricity directly to our body.

Some work has been done in this area but never compiled under a general user experience philosophy. Some projects have looked at sensors and computation to map color to sound for color-blind people or to generate electrical signals from visual data that a blind user can detect through the tongue. But these projects have not looked at the possibility of opening up these ideas to the general public in such a way that it may enhance day to day living in more generic contexts. What I plan to do is demonstrate how valuable it will be to open up our interaction paradigm to the world and to our bodies in such a way that those same principles can be applied to many different and more specific contexts and usage scenarios.

The evaluation of this work will be done by conducting a series of activities where users will wear devices that will generate additional sensory feedback loops. These activities will be analyzed by comparing results with and without the devices and by testing users that may be familiar and un-familiar with the general task. A qualitative result will be obtained from discussion with the subjects about the wearable technology in general and a quantitative result will be obtained from the data collected during the tasks.

With this dissertation I look to understand and help map a new direction for the future of Human-Mobile Device interaction.

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ABSTRACT

The computation power that our mobile devices have gained in later years has surpassed that of the powerful computers of a few years ago. As this capacity keeps growing, the demand for better and more fulfilling mobile experiences has remained stagnant. A major reason for this is that the interaction capabilities of our devices are limited to the physical constraints of the device itself. This thesis looks to identify new and radically different mobile experiences while at the same time develop an interaction paradigm that will support the new experiences without and be independent of the physical constraints of the device.

The new experience will be based on the concept of digital synesthesia or a way of using our current technologies to directly affect our sensorial systems in such a way that the brain will interpret the new input as a new sensory capability. One of the key questions of this research is precisely how capable is our brain in mapping new inputs that could be turned on and off and how will it assimilate these inputs when used for long periods of time. This thesis will also shed light on what kind of activities will be find this kind of interaction valuable, by creating scenarios where users will be able to use their mobile devices as an additional sense.

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RESEARCH QUESTIONS

The main questions to be addressed revolve around the ability of the brain to interpret new information represented through existing sensory stimulus and the depth of assimilation that a user will demonstrate while trying these new technologies.

THE BRAIN AND THE NEW STIMULI SHORT TERM

1. Can a user understand the changing data when felt through and unrelated sensory input?
2. How accurate is the interpretation of the data when experienced in this new way?
3. What differences in accuracy and efficiency are there between interpreting data through reading values on a screen and feeling the data with this new approach?

THE BRAIN AND THE NEW STIMULI LONG TERM

1. Will the brain learn to ignore the new input or will the input eventually feel as natural as any of the original senses?
2. Will there be feelings of “phantom input” where the user will feel the effects of a stimuli that is not present.

BIOLOGICAL AND METAPHORICAL APPROACHES

I identify two major ways of approaching this research. Because I’m trying to communicate data to the body through unconventional sensory pathways, it makes sense to use those parts of the body that would possess greater physiological characteristics to receiving specific types of input. I call this the Biological approach since it looks primarily at the body and its capabilities.

Another way of approaching my research is to identify cultural constructs that refer to the body and sensory perception. Feeling “Butterflies in the stomach” or “Chills down the spine” are concepts that are rooted already in a person’s subconscious that might prove valuable when trying out the ideas of this thesis. I call this the Metaphorical approach.

1. Is the Metaphorical approach strong enough to create a successful experience?

USER ADOPTION

1. How comfortable are the users when using these kinds of devices?

2. How valuable is the device when used towards the completion of a task for both experienced and novice users?

BACKGROUND

DEVICES THAT ALTER PERCEPTION

MEDICAL DEVICES

THE MILITARY AND SITUATIONAL AWARENESS

RELATED PROJECTS

RESEARCH PLAN

Initially I have been freely exploring a variety of sensors and their ability to communicate with an Android device. As I learn, I have looked for user scenarios in which these sensors can be used to give the user some information that either could not be perceived or that the accuracy of our existing sense would be unable to give that level of detail. Once familiar with different sensors and technologies, a series of activities will be defined in which a user will complete a task while aided by the system.

Some of the activities may include Navigation Aids, games or sports, decision situations like driving or piloting, general user interface with household devices and remote perception of a context. Two or Three of these situations will be chosen depending on which group will help illustrate the widest breath of possibilities of the system and technology as well as a diverse sample of situations relevant to the users.

When a suitable system is developed for user testing, a first trial will be conducted with users of different backgrounds and tested in a one-time use of the technology in a specific activity. A second trial will be based on repeated use of the system to establish the effects of a continued use.

TIMELINE

REFERENCES

BIO