



Master thesis

How can sensing techniques redefine our interaction with plants ?

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1 Introduction

1.1 Background motivation

1.2 Context and overview

1.3 Problematic

1.4 Research domain

1.5 Contributions

2 State of the art

2.1 Plant as sensor

2.1.1 Human-Plant Interaction

The human plant interaction has been studied.

Plants have a lot of benefic effects on human. The study from Charles Hall and Melinda Knuth [1] explain all the benefits of plants on our human system. Urban green

2.1.2 Plant as sensors Plant transformed into sensors

2.1.3 Silicon Made sensors

2.1.4 Sonification on micro-controllers

MCUs* [2] is a kind of small computer. Those devices can be used to generate sound. The most common way of doing electronical music is to use MIDI† [3]. MIDI has been created in order to create music with digital computer. MIDI do not describe directly the audio signal but the human actions to create the signal (such as turn the knob left, push the slider...). MCU are able to produce those kind of directives [4][5]. However, the MCU can produce MIDI but MIDI does not directly generate sounds. A synthetizer is needed to create the sound described.

For our use case of embedding the device, we look at MCU that were able to directly generate the signal from a DAC‡. Projects had been conducted with many microcontrollers such as a small 8 bits AVR microcontrollers (ATmega32) [6]. This paper does not include limitation of such a product but we can guess that the 8 bits microcontroller is limiting the sound quality. A larger project from Shaer and al. [7] is including an Arduino Mega controlling the visual effect of the project, but also the interaction sensors. The Arduino Mega is then sending MIDI information to Teensy 3.2. The Teensy is then generating the sound. The project is still too large to be fully embedded but the Teensy 3.2 is a promising compute unit. The Teensy 3.2 is running at 72 MHz, way faster than the ATmega32 that is operating at 16MHz. The frequency is essential when trying the produce sound signals.

2.1.5 Commercial products

2.2 Internet of Plants

2.2.1 Distributed instruments

2.2.2 Sonification using software

* Micro-controllers

† Musical Instrument Digital Interface

‡ Digital to Analog Converter

3 Plant as sensor

3.1 The electronical interface

3.2 Human interaction

3.2.1

3.2.2 User study

3.3 ...

4 Internet of Plants

4.1 Overview

4.2 Communication

4.3 Server

4.4 Deployment and application

4.5 Conclusion

5 Conclusion

References

Here are the references in citation order.

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