Vrije Universiteit Brussel

Proposal bachelor thesis

Title: Crowd-Controlled Microcontrollers Using JavaScript.

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Includes preparation course: No

Context

We are in the age of "Internet-Of-Things" where you can buy a small computer for 25$, called a microcontroller, that is connected to the Internet [1]. One of the first applications that often spring to mind for these devices is automation and remote control of houses (temperature, lights, curtains…) or media systems. These examples only include one microcontroller, while at such a low price the possibilities of having multiple such microcontrollers interacting and collaborating with each other are endless.

In particular, it is interesting to use these collaborative microcontrollers in order to perform crowdsourcing. By placing them in geographically different places and by providing a simple hardware interface (e.g. a couple of big buttons), passengers can be attracted in order to engage with the application. This allows you to get input from many different users, without having to explicitly ask them for their cooperation. In contrast to the entire app business, where you first have to get users to willingly download an app on to their phone in order to get input.

Yet, developers are not always eager to start implementing such crowdsourced collaborative applications. The reason thereof is that coordinating these multiple devices is tedious, even more so when you want to make a robust application that continues working when disconnected from the web.

Last year, we developed a JavaScript library [2] that implements the Cloud Types model [3]. By simply using the Data Types of the library, the data is automatically synchronized between al participating devices while it can even be used when disconnected from the Internet. This allows the developers to make robust offline available collaborative applications, without having to worry about all the tedious aspects of it.

Proposal bachelor thesis

In this bachelor thesis the student will use the Cloud Types library in order to develop a crowd-controlled application on a microcontroller (Raspberry Pi [1])

using JavaScript. The basic idea is to use sensors in order to allow and attract passengers to perform a short interaction with the application. The accumulated effect of all these interactions is then shown using actuators, resulting in crowd-controlled microcontrollers. A **basic example** is the following art application, which consists of:

- A screen or a set of LED's that display a grid of colors.
- Some buttons that allow the users to navigate through the grid and an up and down vote button.

The idea is that users can navigate through the grid and up or down vote a cell. This will increase/decrease the intensity/color of the desired cell. The result is a changing color palette controlled by the crowd from different places.

Prerequisites

A good knowledge of (or at least a great interest in and willing to learn independently):

- JavaScript, HTML and CSS
- Microcontrollers (Raspberry Pi)
- Creativity ;)

Requirements

The student is required to fulfill the following requirements:

1. Implement a web interface for the described basic example, so that it can be controlled from the browser. The student will use the Cloud Types library in JavaScript in order to easily synchronize the different clients and front-end HTML/CSS/JavaScript in order to implement the interface.
2. Implement an interface to the application using sensors and actuators on the Raspberry Pi. This again requires using the Cloud Types library in order to automatically synchronize the data with all the other clients (hardware clients and web clients), but now the synchronized data will be displayed by and controlled by sensors/actuators.
3. The basic application is given as an example of what is meant by a crowd-controlled application, but the student is strongly encouraged to use its creativity to come up with something more original. You can use all sorts of actuators/sensors in order to display and interact with the crow-sourced "state".

Contact

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References

[1] http://www.raspberrypi.org/

[2] https://github.com/ticup/CloudTypes-paper
[3] Sebastian Burckhardt, Manuel Fähndrich, Daan Leijen, and Benjamin P. Wood. 2012. Cloud types for eventual consistency. In *Proceedings of the 26th European conference on Object-Oriented Programming* (ECOOP'12), James Noble (Ed.). Springer-Verlag, Berlin, Heidelberg, 283-307. DOI=10.1007/978-3-642-31057-7_14 http://dx.doi.org/10.1007/978-3-642-31057-7_14