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# Internet Technologies for Mobile Computing

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## Implementation of an HTML5 application

<https://github.com/reidliujun/HueProject>

### 1 GROUP MEMBERS

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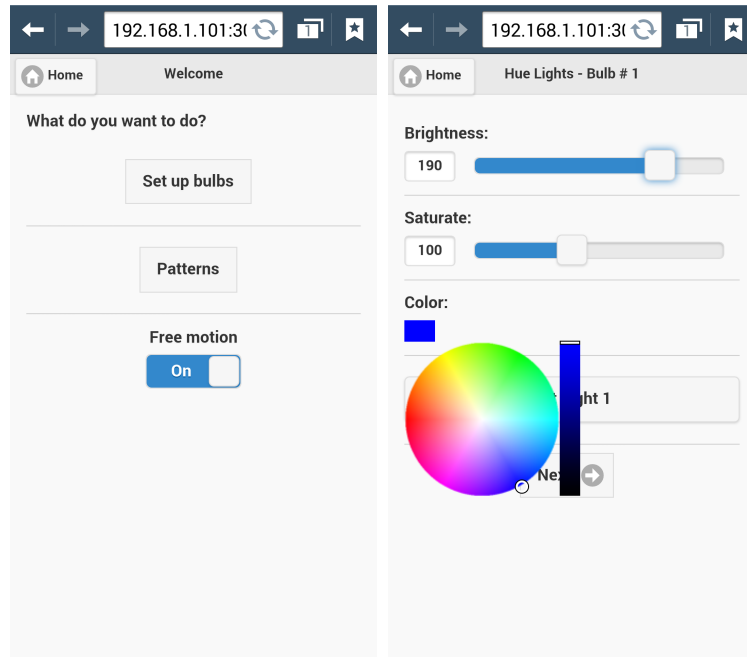
### 2 DESCRIPTION

This project aims to create a new application for the HUE lights using the accelerometer data of a mobile device to represent the movements done on it. The motion is transformed into color changes or commands in the light bulbs. The application uses HTML5 to enable compatibility between different platforms.

Three features were implemented:

- **Set-up.**- Allows to configure each bulb by setting parameters such as brightness, saturation and color.
- **Patterns.**- Provides to the user an interface to select which bulb to interact and then by performing movements such as up/down(i.e. on/off) and moving from left to right (turn more than 90° left/right horizontally) a different color is set in the bulb.
- **Free motion.**- User can perform any movement by rotating in any direction.

The User Interface is simple, it has a color selection per bulb light detected, a checkbox to select the feature to use for patterns and a toggle button to start free motion. Figure 2.1 shows the interface for our application.



(a) Main Interface

(b) Set-up Bulbs

Figure 2.1: Screenshots of the application

### 3 OPERATION MODE

Figure 3.1 presents how the user interacts with the hue lights and the movements that application must detect from smartphone in order to send the colors to show in the bulbs.

### 4 USE CASE STORY

Artists are in a constant search to express in different ways their work. Some of them rely on visual elements to provide the audience a better understanding of the context or their emotions. Therefore, we would like to offer them an innovative approach that grants them possibility to "paint" their moves. This proof of concept (PoC) makes use of an accelerometer (embedded in most of the current mobile devices) to collect information related to the device motion. The information will be translated into color changes in the light bulbs. These idea could be used in the future outside a mobile device and transfer to a wearable device, providing the artists with more suitable interfaces.

The use of technology in all situations of our life is a current trend. The technology must have a good interaction with the user needs in smart spaces. Another use case is the activation/deactivation of lights by natural/ubiquitous user movements. These movements will be represented as patterns that are able to modify the light environment surrounding the user.

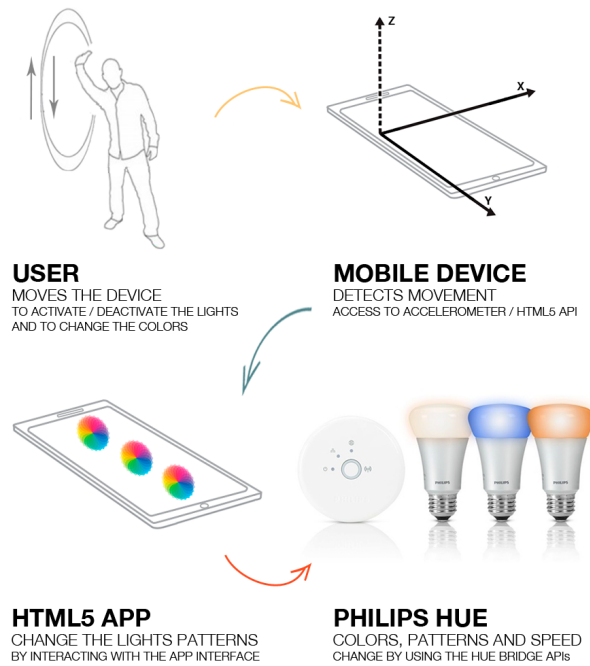


Figure 3.1: Operation of the application

## 5 REQUIREMENTS AND LIMITATIONS

In order to implement the application we required the following:

- Router
- 3 lamps for the bulbs
- Javascript, HTML5, Nodejs
- JQuery Mobile

The limitation of this application is that it was developed on a local server, therefore there will not be access through the Internet.

## 6 ARCHITECTURE

The dashed lines in the above figure represent wireless connection, for example Hue bulbs connect with the hue bridge in Bluetooth and the mobile phone connects to the wireless router in WiFi. The solid lines represent a wired connection, for example the hue bridge should connect to the wireless router with an Ethernet cable and the web server can connect to the wireless router either with a cable or its wireless adapter. The details of server and end user side are described as follows:

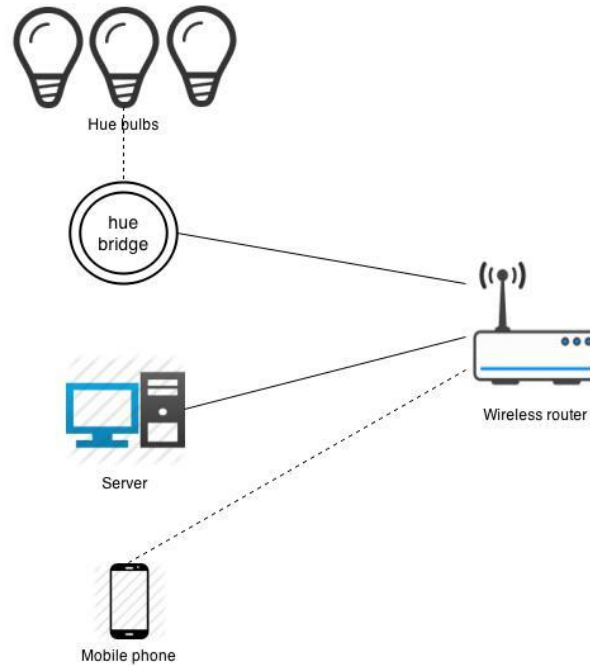


Figure 6.1: Architecture for the website

- **Server.** We used "Nodejs" as our web server. We use "ejs" module to make the server running .html format web files instead of jade format. Besides, we use "xmlhttprequest" module to handle the http get and put request to the hue bridge. In our implementation, a socket is established between the server and client browser so that the browser can set the parameters for the bulbs. However, in our testing, socket causes lots of delay in patten and free motion feature, we use the http put instead of socket. Moreover, we used Javascript to detect device modes and communicate with Hue bulbs (which is based on JSON data format). In implementation, we use the HTML5 API such as "accelerationIncludingGravity" to detect the device movement pattern. In addition, we implemented the transition of hex RGB colour domain to HUE colour domain, which achieve quite good performance in our tests.
- **Device.** We designed a website UI for mobile devices using JQuery Mobile library, which allows that our application can be simple and responsive for different devices. For simple usage, first, user need to be in the same network domain with the server and the hue bridge, and then user can directly open the webpage in a modern browser of the mobile devices such as Safari and Chrome. For further usability of our application, we could compile the web application as a local one instead of running in a browser. There are several tools that could help us to do that, a typical one is Phonegap. The web application can be compiled to both Android and IOS platforms.