

Project: Smart Blossom

# Development of a Blossom Shaped Lamp

Written by  
Christopher Heiden  
MatNr.: 120249

Supervisor:  
Wegener

Submission:  
2019-Dec-05

# Contents

<b>1</b>	<b>Introduction</b>	<b>3</b>
<b>2</b>	<b>Class Process</b>	<b>3</b>
<b>3</b>	<b>Project Process</b>	<b>4</b>
3.1	Ideas . . . . .	4
3.1.1	Color-changing Bracelet . . . . .	4
3.1.2	Music controll Jacket . . . . .	4
3.1.3	Blossom shaped Lamp . . . . .	5
3.2	Detailed Idea . . . . .	5
3.3	Building Process . . . . .	7
3.4	Implementation . . . . .	7
3.4.1	Coding the LED strip . . . . .	7
3.4.2	Coding the slider . . . . .	8
3.4.3	Merging code and physical components . . . . .	8
<b>4</b>	<b>Outcome</b>	<b>8</b>
<b>5</b>	<b>Annex</b>	<b>9</b>

# 1 Introduction

In a class called "Printed Interfaces", we try to create circuits that does not use common wires to link sensors and microcontrollers. Therefore, we use conductive ink, conductive rubber or other material that can close a circuit, for example.

## 2 Class Process

To teach the class the major concepts of circuits and to create one with a microcontroller <sup>1</sup>, the teacher taught the basic principles of Ohm's law, how the current flows and how to program a microcontroller. This has been done in the first 4 sessions.

In the first session, the teacher spoke about the current flow and Ohm's law. Therefore, he showed the students a virtual circuit that he could change in real-time.

In the second session, he talked about microcontrollers and how these devices can be used. He spent short time in explaining the pins and how to program them. To do so, he showed how it is possible to program everything on a projector (live coding). He showed us how to program an LED, simple moisture and a capacitive sensor. The simple moisture and capacitive sensor has been drawn with conductive ink.

In the third lecture, he taught the students more about programming, so it became more complex. However, the main focus was to introduce InkScape. With this program, we wanted to print a conductive circuit on paper.

Later he wanted us to find project ideas that we present. So, every student presented one or multiple ideas and the group talked about them. Sometimes, they discussed improvements and sometimes, they talk about the idea itself and the way to implement and build everything. Later we talked and discussed the projects more detailed, so anyone can start programming and building everything.

---

<sup>1</sup>Dies ist jetzt eine Fußnote.

## 3 Project Process

### 3.1 Ideas

#### 3.1.1 Color-changing Bracelet

Our first idea was to program and color-changing bracelet. This can change its color if someone of your friends has such a bracelet too. These can create a network, so they can communicate with each other. The network strength can be used to identify if the friend is close. Then it will change its color, so both know that a friend is close to him or her. Also, groups can be defined. Every group has its own thread and if someone from a specific group is next to you the system can change the color of this specific thread. This would just be a proof of concept, so most of the programming would be static (see Figure 1).

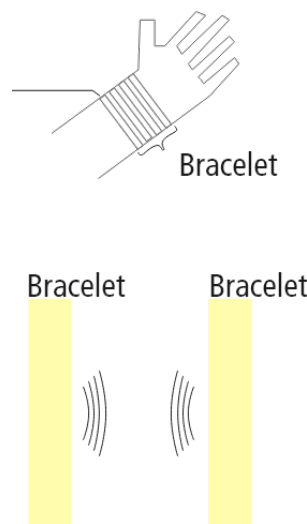


Figure 1: Shows the bracelet concept.

#### 3.1.2 Music controll Jacket

Another idea was to develop a jacket that can be used to change a song you are listening on a phone. Therefore, strips are placed on the left or right arm that can be used to change the song to make it louder or to stop the song, for example (see Figure 2).



Figure 2: Shows the concept of a jacket with interaction constraints.

### 3.1.3 Blossom shaped Lamp

A third and last idea is about lightness. The idea is to build a lamp of a blossom that can be modified by the user. Every blossom leaf has a magnet inside, so it is possible to connect each leaf. If some leaves are connected, the lamp that is in the middle of the flower blossom changes its color. Moreover, it is possible to rotate the whole lamp and to change the brightness by an analog switch (see Figure 3).

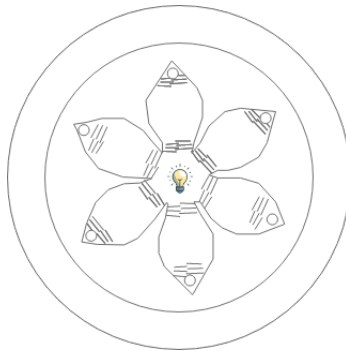


Figure 3: Shows the concept of a blossom shaped lamp.

## 3.2 Detailed Idea

At the end, we decided to develop the third idea (see chapter 3.1.3). That's why, we want to explain how it should work in detail.

The base of the prototyp will be milled, so we get a perfect shape of the the base. Therefore, we will use Autodesk Fusion 360 [?] to model it. in teh center of the base will be the blossom shaped lamp that can be opened. Around this, we want

to have a circled shaped groud. There we want to place cupper foil that is linked with a microcontroller, so the foil ca be used as a slider. This interaction will change the brightness of the lamp.

However, the major functionality is the lamp itself. Therefore, we want to laser cut the shape, so the users of the lamp can take one or several blossoms to open it. This will change the color shining of the lamp. We want to use a transparent acrylic glass. Therefore, we have to cut holes inside the glass, so the shape can change.

If all blossoms are connected, then the lamp doesn't shine at all. However, if the user open the blossom, then the lamp gets on and the color change.

To develop such a device, we want to use an Arduino Pro Mini, copper foil and programmable WS2812B leds. A three-dimensional model of the base can be found in Figure 4



Figure 4: Shows a three-dimensional base model of the blossom lamp idea.

### 3.3 Building Process

To build the prototyp, we modeled the base for the lamp (see Figure 4). Therefore, we used Autodesk. After doing so, we used a milling machine. We only had to convert the 3D model into a .iges file. The result of the milling process can be seen in Figure 5.



Figure 5: Shows the base that has been milled.

After milling the base, we had to experiment with the lase cutter and how big the holes and the distance between them should be, so we can laser cut the blossom shape later. To laser cut everything, we used Illustator [?] and a laser cutter. With Illustator we can design the shape that has to be cut. Therefore, we tried a width of 1mm, 0.75mm and 0.5mm and a distance of 1mm, 0.75mm, 0.5mm. The result can be found in Figure 7.

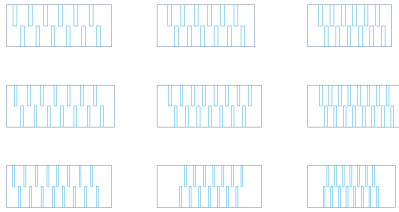
Afterwards, we could laser cut the blossom.

### 3.4 Implementation

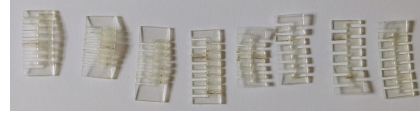
dwadwad

#### 3.4.1 Coding the LED strip

dwadwa

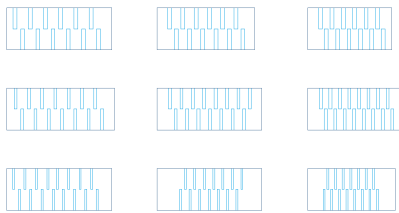


(a) Shows the test shapes from Illustrator.

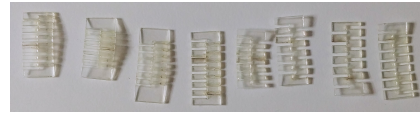


(b) Shows the laser cutted tests.

Figure 6: Shows ring design.



(a) Shows the laser cutted tests.



(b) Shows the laser cutted tests.

Figure 7: Shows ring design.

### 3.4.2 Coding the slider

das ist ein test text (see Table 1).

Code  
Show Code

Table 1: Shows the con

### 3.4.3 Merging code and physical components

## 4 Outcome

The code can be found on GitHub:



## 5 Annex

Code  
Show Code