# Artificialis Photosynthesis

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*Project Proposal Form - Hardware & Physical Computing - 13-12-2020*

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## 1. Design

In this section the overall design of our product will be discussed. First, the sketches are shown, then the sketches are explained and lastly the design is explained in terms of its functionality.

### 1.1 Sketches

Below our first sketches of the 'Artificialis Photosynthesis' can be found in Figure 1 and 2. In Figure 1 a sketch of our artificial plant can be encountered and in Figure 2 a close-up of the base with the LED strips are illustrated. The design will be explained in section 1.2.

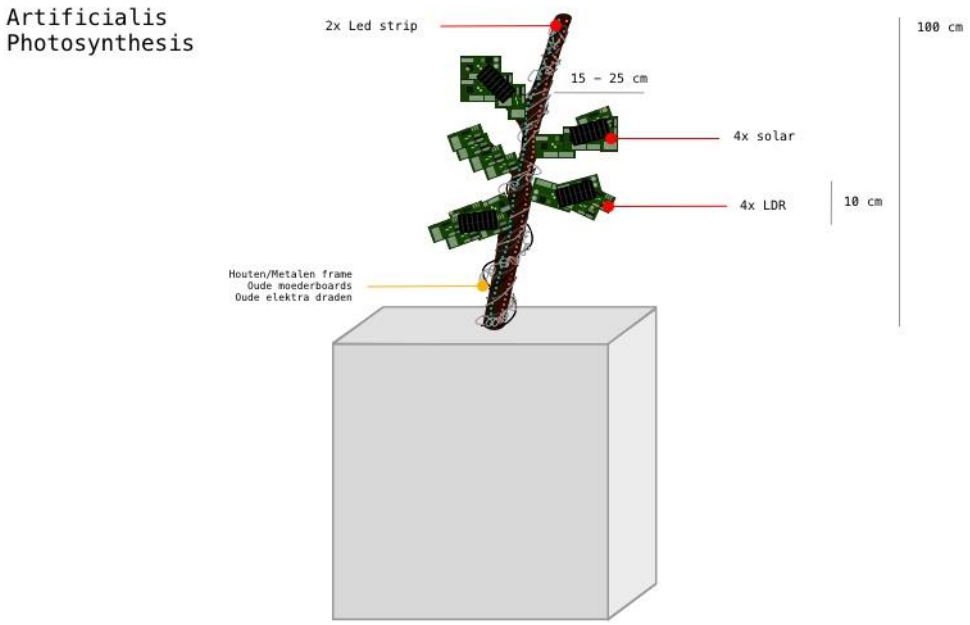


*Figure 1. Sketch of 'Artificialis Photosynthesis'*

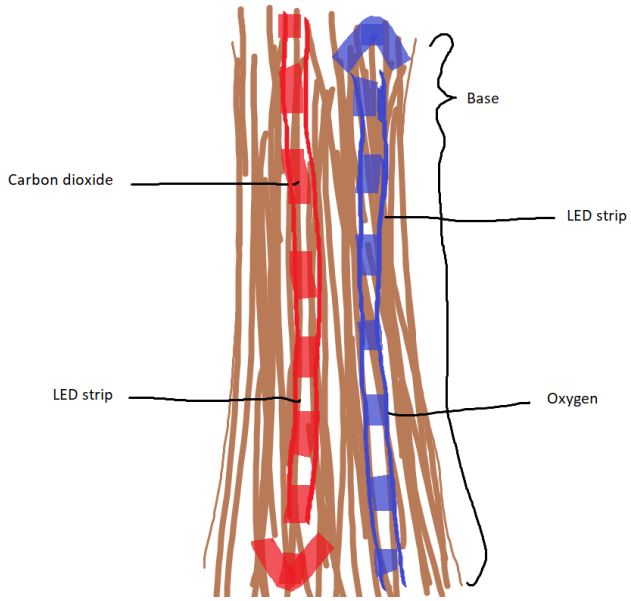


*Figure 2. Sketch of the direction of O2 and CO2 LED flow*

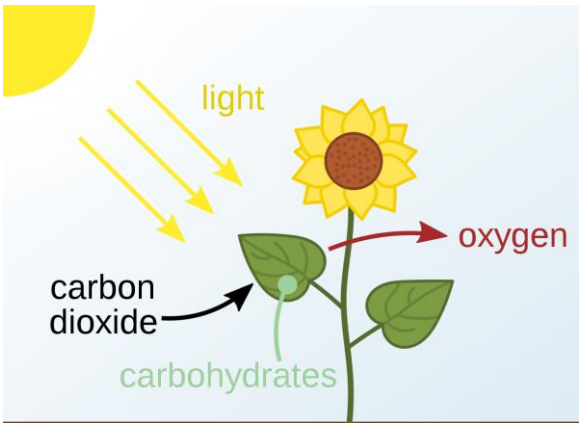


*Figure 3. Photosynthesis (picture from Wikipedia)*

## 1.2 Description

We designed an 'artificial' plant made from electronic waste, as can be seen in Figure 1. This plant will (partly) simulate photosynthesis that is present in real plants (displayed in Figure 3), which is why we called our project 'Artificialis Photosynthesis'. The design itself is still flexible in terms of materials. Nevertheless for now we will use old motherboards for the branches and wires and/ or adapters for the base. The electronic waste material will be gathered from thrift shops, room 406 and our own homes. This will be combined with newly bought solar panels and LDRs functioning as the leaves of the plant. We will also place two LED strips on the base of the plant, to indicate the oxygen and carbon dioxide flows within the plant, as shown in Figure 2. Optional is an LCD Screen which gives feedback on the input sensor.

The 'artificialis photosynthesis' has two objectives, which are both educational in their own ways. The first objective is educational in the traditional sense; the user learns how photosynthesis works in plants. This is represented by the input sensors (LDR & Solar) which function as a chloroplast, and by the way oxygen and carbon dioxide flows within the plant (LED).

The secondary objective would be to inform the user/viewer on the importance of plants and how we as humans are piling up our electronic waste. While designing, we got inspired by an article in Trouw which reported this problem of electronic waste. Since sustainability and the environment in general are important virtues to us, we wanted to implement this in our design as well as the thought behind it.

## 1.3 Functional design

We will be using four solar panels to generate enough power to provide the plant of the energy it needs to work. The solar panels will be connected in parallel, whereby the power that is generated will be 5.5v 400mA and  is saved on a 3.7 V li-Po battery. All of this will be regulated by the Seed solar charge shield. Each solar panel will be accompanied by a LDR which measures the intensity of light that falls on it. The idea is that the LDR and the LED strip work together. One LED strip will have a blue light for oxygen and the other strip will be red for carbon dioxide. The less light falls upon the LDR, the slower (the speed of consecutive sequence of the LEDs) the flow of oxygen and carbon dioxide. If we have time left, we want to add a LCD screen on the pot of the plant which demonstrates the amount of (sun)light that is present and the amount of power that is generated by the solar panels.

# 2. Spatial requirements

The size of the product is comparable to the size of a house plant, which can be put on a desk or in a window frame. Since the 'Artificialis Photosynthesis' needs light to 'live' (to work, be charged), it needs to be positioned in a spot with (a lot of) light, preferably in a window. There is not a restriction on the amount of visitors, since the product is not an interaction between the plant and the visitor. Instead, the plant reacts to the amount of sunlight, and cannot be controlled by the visitor by buttons for instance. This is because the purpose of the work is, as previously described, educational.

# 3. Technology

In Table 1. the electronic parts we are going to use for 'Artificialis Photosynthesis' are displayed. In Figure 4 the electric circuit diagram of the project can be found.

| Part | Model | Amount |
|---|---|---|
| Seeed Studio Zonnepaneel - 5.5V 100mA - 55x70mm - met JST-PH connector | SEEED-313070004 | 4 |
| GL5528 LDR lichtgevoelige weerstand | GL5528 | 4 |
| Seeed Studio Solar Charger Shield V2.2 | SEEED-106990020 | 1 |
| Li-Po Accu 3.7V 2000mAh - JST-PH | LP103450 | 1 |
| WS2813 Digitale 5050 RGB LED Strip - 60 LEDs 1m | WS2813STRIP1M60 | 1 |
| JST-PH 2.0mm Connector met Kabel - 2 Pins | JSTPH2.0CABLE2P10CM | 1 |
| JST-XH Female Connector met Kabel - 2 Pins | JSTXH-FEM-CABLE2P30CM | 4 |

| | | |
|---|---|---|
| **10Ω Resistor** | - | 4 |
| **Optional*** **LCD Display 16*2 karakters met witte tekst en blauwe backlight** | 162LCD | 1 |

*Table 1. Electronic parts of 'Artificialis Photosynthesis'*

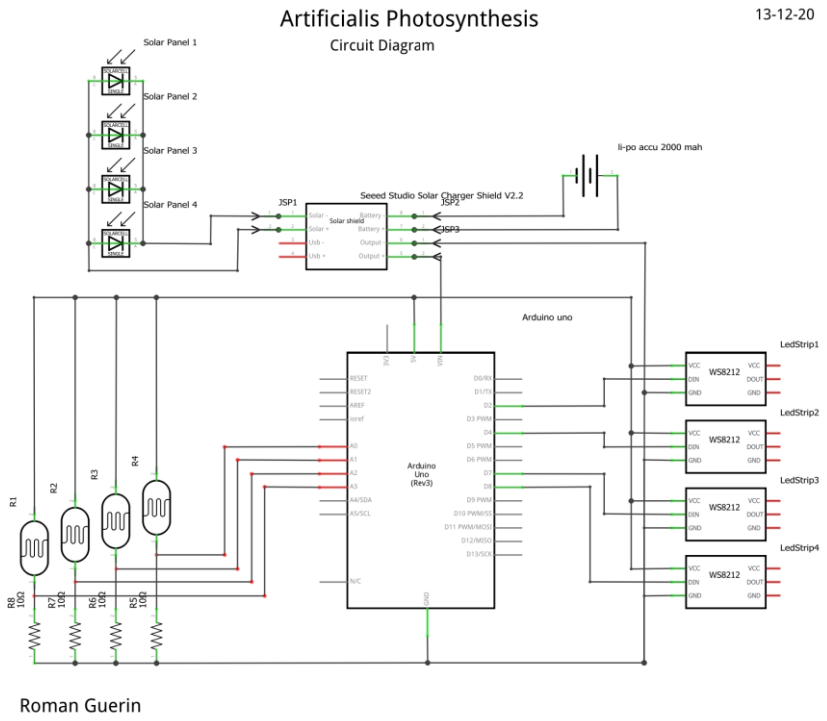


*Figure 4. Circuit diagram of 'Artificialis Photosynthesis'*

# References


Photo of photosynthesis - https://en.wikipedia.org/wiki/Photosynthesis

Trouw article - https://www.trouw.nl/wetenschap/de-wereldwijde-berg-aan-elektronisch-afval-groeit-zorgwekkend-hard~b41d41b9/