

VEREATABLE  
Indoor Garden



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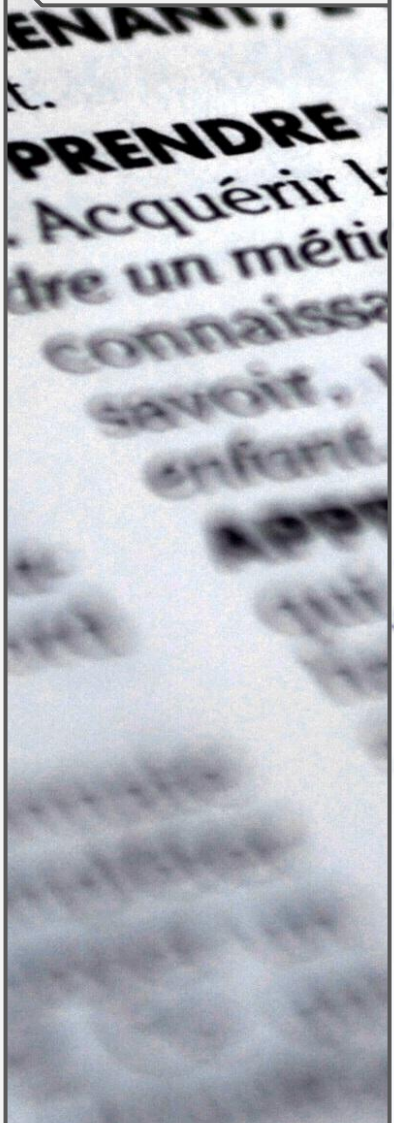
The Problem  
**DEFINITION &  
RESEARCH**

The Project  
**MANAGEMENT**

The Project  
**DEVELOPMENT**

The Future  
**IMPROVEMENTS**

The Final  
**CONCLUSIONS**





The Problem  
DEFINITION &  
RESEARCH

**APPREHENSION**, s. f. l'acte de saisir, de comprendre.

**APPREHENSION** s. f. l'acte de saisir, de comprendre.

**2. PHILOS.** Acte par lequel l'esprit saisit un objet de pensée, comprend qu'il est.

**APPRENANT, E** n. Personne qui suit un enseignement.

**APPRENDRE** v. t. [61] (lat. apprehendere, saisir)  
1. Acquérir la connaissance, la pratique de. Apprendre un métier, les mathématiques. 2. Faire acquiescer, la pratique de; communiquer l'information. Apprendre le dessin à un élève.

**APPRENTI, E** n. 1. Personne qui apprend, en apprentissage. 2. Personne en apprentissage.  $\square$  Apprenti

habile, expérimentée.  $\square$  Apprenti

comme dit-il en toute un proces

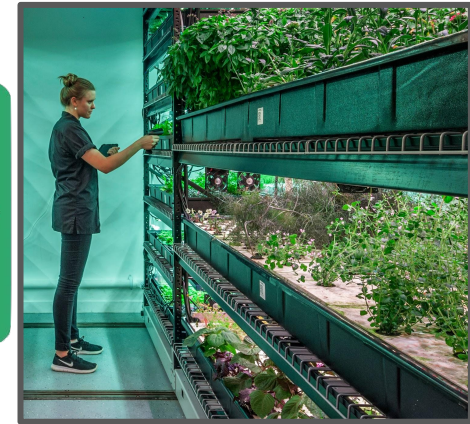
**APPRENTISSAGE** s. m. l'acte

de l'apprentissage



The Problem  
DEFINITION &  
RESEARCH

# Vertical Farming Garden



~~WASTING TIME~~

~~WASTING SPACE~~



# Requirements

Given by the project

- 🌱 Modular
- 🌱 Adaptable to different size areas
- 🌱 Use low cost hardware solutions
- 🌱 Comply with relevant EU Directives
- 🌱 Use open source software and technologies



The Problem  
DEFINITION &  
RESEARCH

# State of the Art

## Key research outcomes

- 🌱 End-user oriented home-scaled solution
- 🌱 Advanced growing techniques the way to go
- 🌱 Facing well developed, competitive market

CLICK <sup>A</sup><sub>B</sub> GROW™

 minigarden®

 ZIPGROW™



The Problem  
DEFINITION &  
RESEARCH

# Marketing & Communication

## Key research outcomes



VEREATABLE  
Indoor Garden



# Sustainability & Ethics

## Key research outcomes



The Vereatable device is made by MDF panels and recyclable food-safe PVC and has longevity of service



NSPE code of ethics.



ICC/ESOMAR International Code on Market and Social Research



Water & electricity conservation due to the aeroponic closed system.



European Union's requirements of Machinery Legislation



An interactive device that provides bio produce and an eco friendly lifestyle



The Vertical Farming Association



Low cost for high quality





The Project  
**MANAGEMENT**

# Monthly work summary

February	Introduction, Team building, Brainstorming
March	Research, Gantt chart, Sketches
April	Drawings, Materials, Interim
May	Deliverables, Refining, Prototyping
June	Developing, Designing, Testing, Final



# Risks

Improper treatment



Lack of safety measures



Quarrels





# The Project DEVELOPMENT

remove the ATmega168  
before using as a programmer

## connect

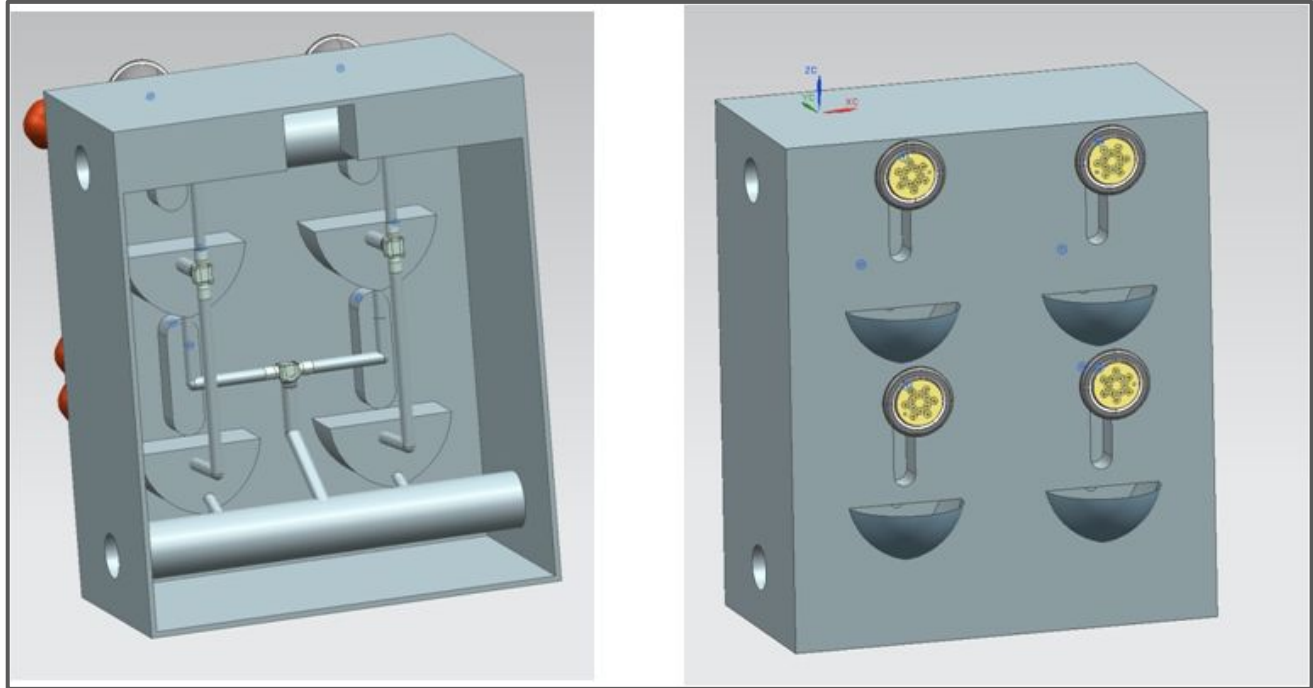
1. digital 0 - digital 0
2. digital 1 - digital 1
3. reset - reset
4. 5v - red rail (5v)
5. gnd - black rail (gnd)

Using an FT



The Project  
DEVELOPMENT

# Design and prototype (Evolution design 1st)

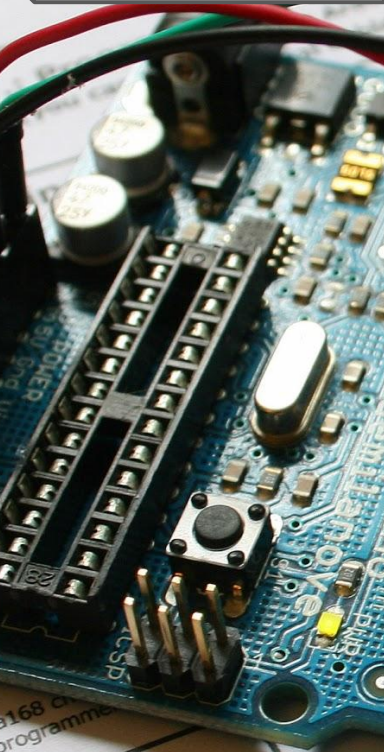


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y - red rail (5v)  
nd - black rail (gnd)

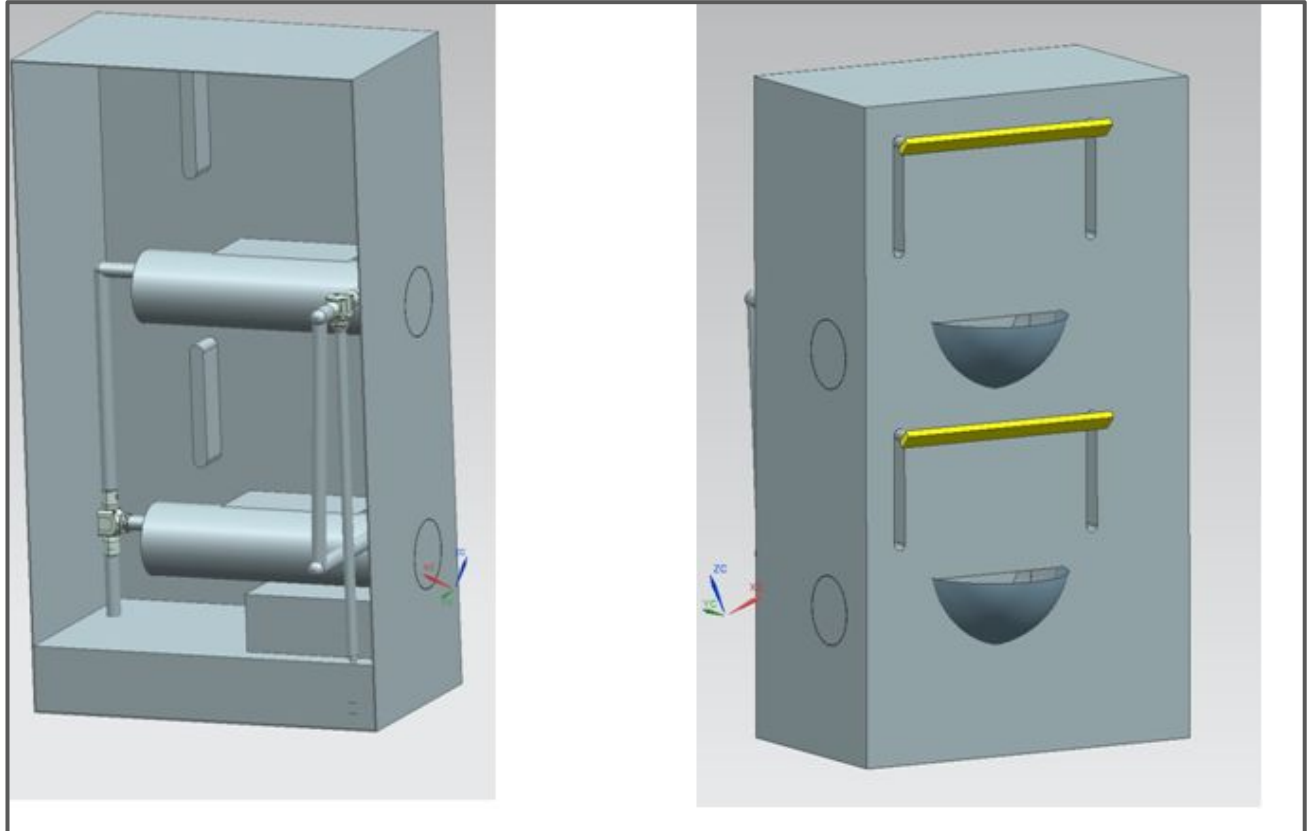
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The Project  
DEVELOPMENT

# Design and prototype (Evolution design 2nd)



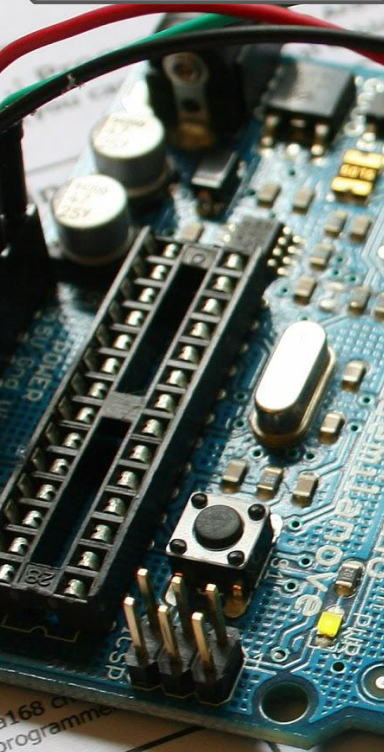
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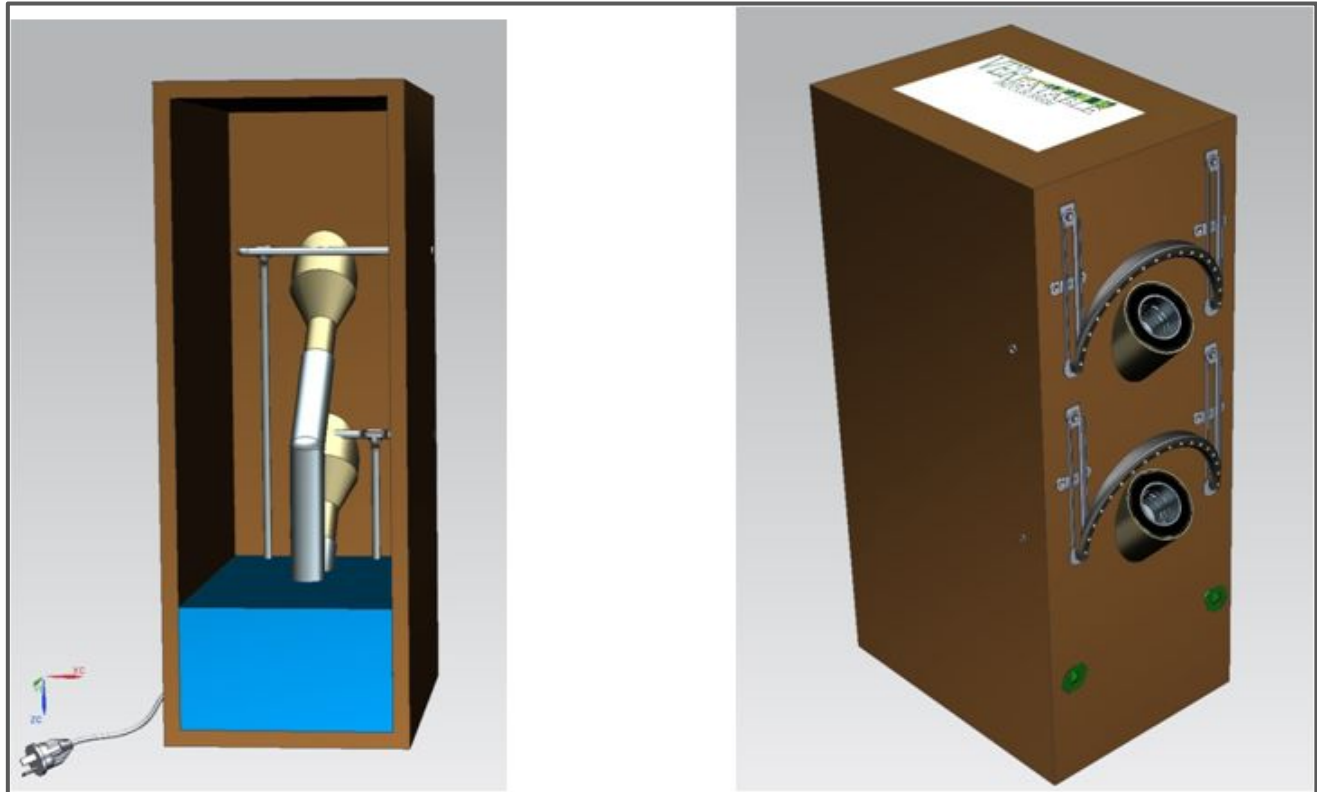
The Project  
DEVELOPMENT

# Design and prototype (Evolution design 3rd)



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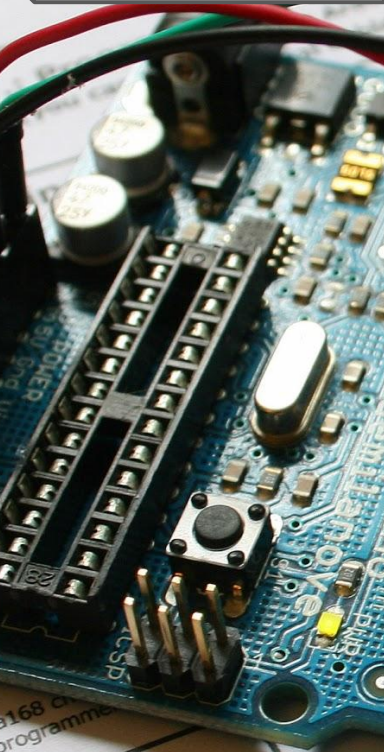
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The Project  
DEVELOPMENT

# Design and prototype

(Evolution design 4th)



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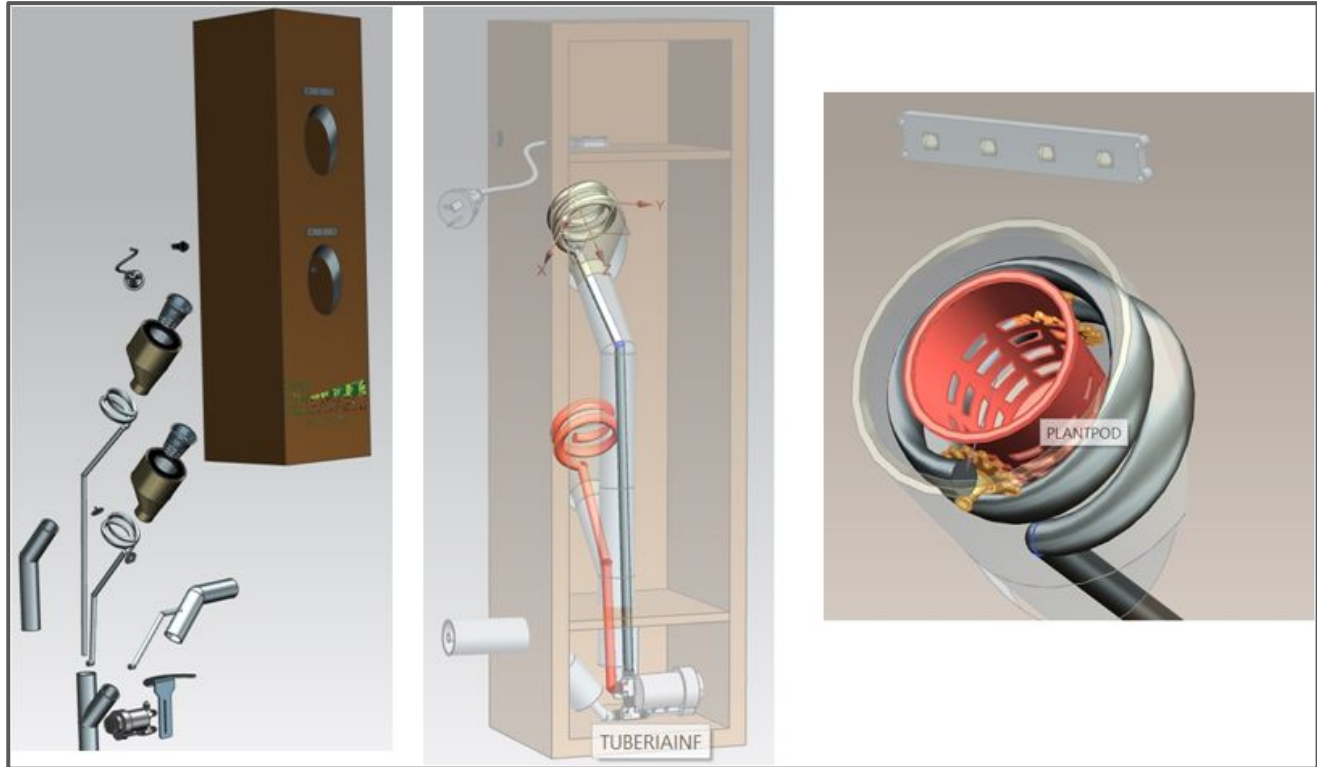
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The Project  
DEVELOPMENT

# Design and prototype (FINAL 3D)



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# Mechanical assembly At the ISEP workshop



## 1st day

- Cut wooden pieces
- Make holes

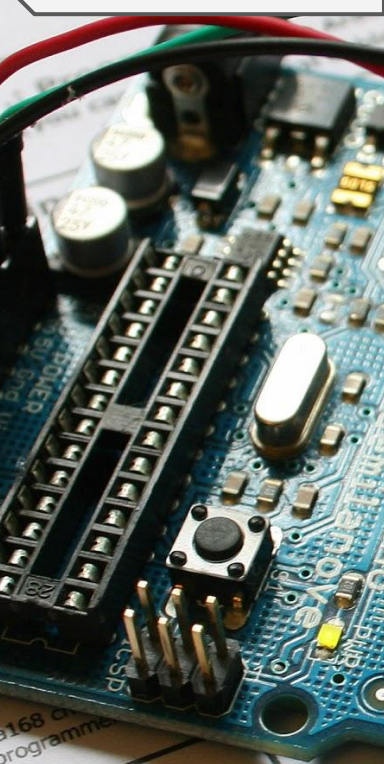


## 2nd day

- Sand the pieces
- Join the structure with screws



## The Project DEVELOPMENT

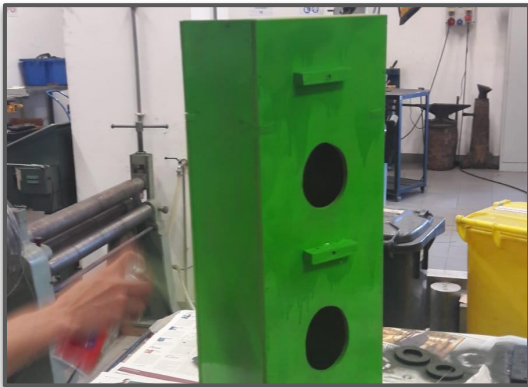


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### 3rd day

- Build the water system
- Add water system to the structure



### 4th day

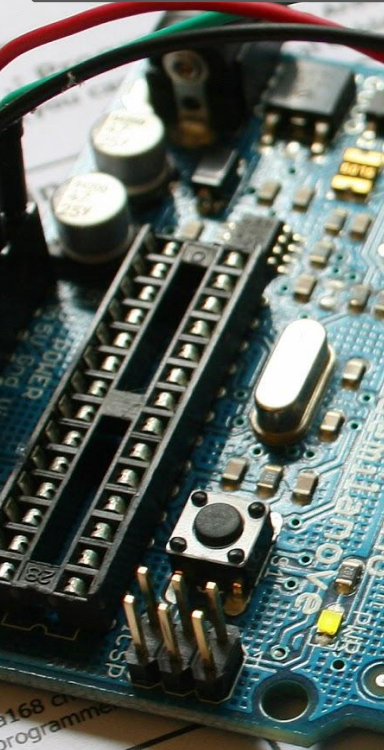
- Paint the pieces



### 5th day

- Add electrical components to the structure

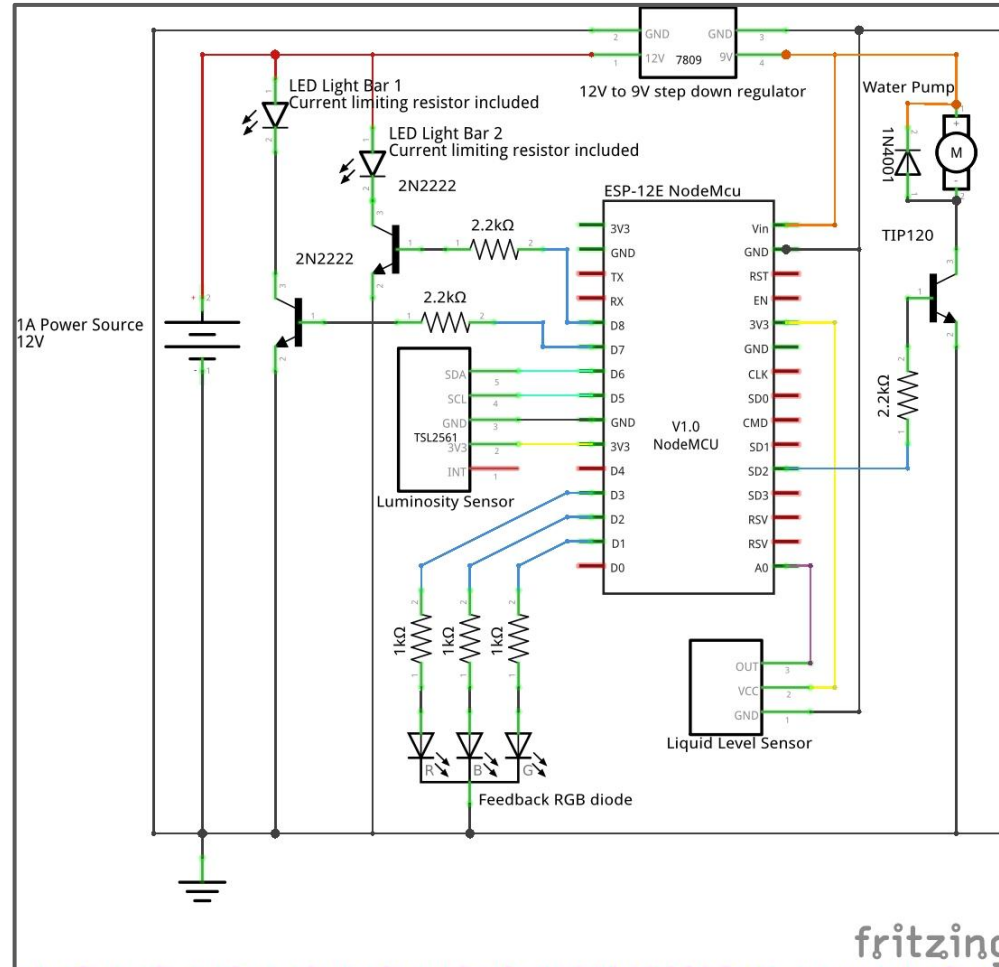
The Project  
DEVELOPMENT



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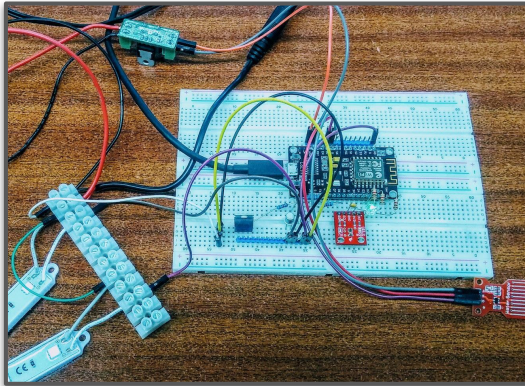
# Electric Schematics

ESP-type microcontroller offers connectivity, but lacks in pins



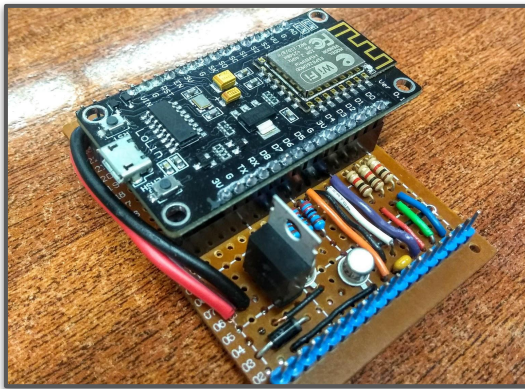


## The Project DEVELOPMENT



## Breadboard prototype

Temporary connections to avoid hard-to-repair mistakes and improve the design



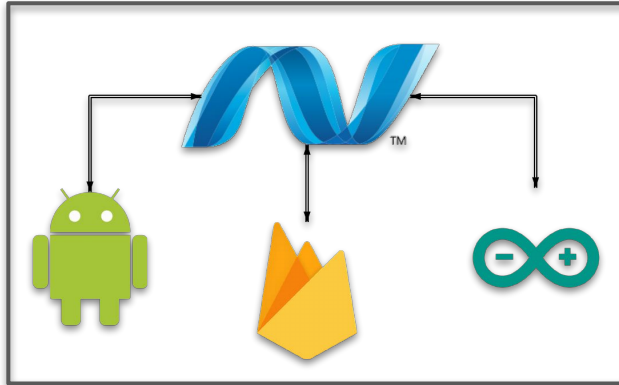
## Soldered component

Only once everything has been tried out, compact, permanent assembly is done

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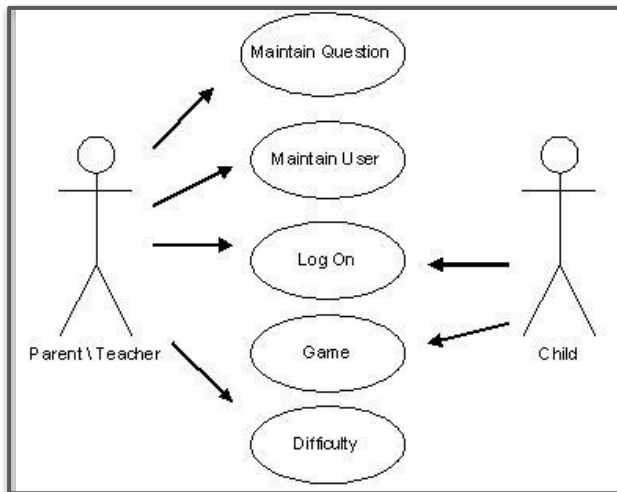


## The Project DEVELOPMENT



## The system

Software working on  
many platforms  
cooperating



## Use cases

- Register / Login
- Monitor plants
- View sensor data
- Change settings

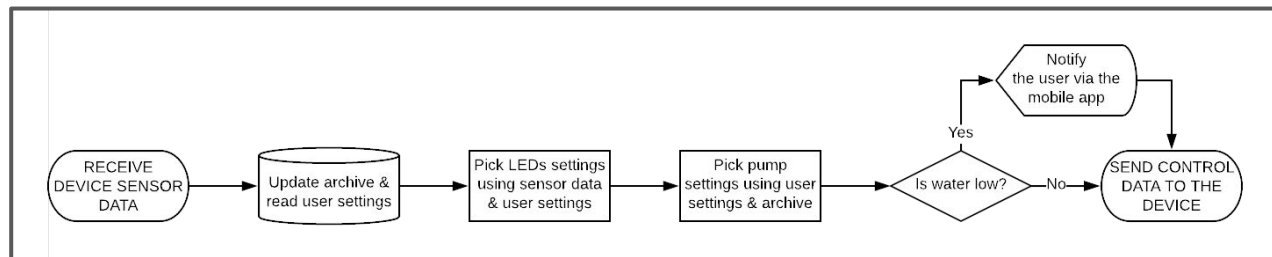
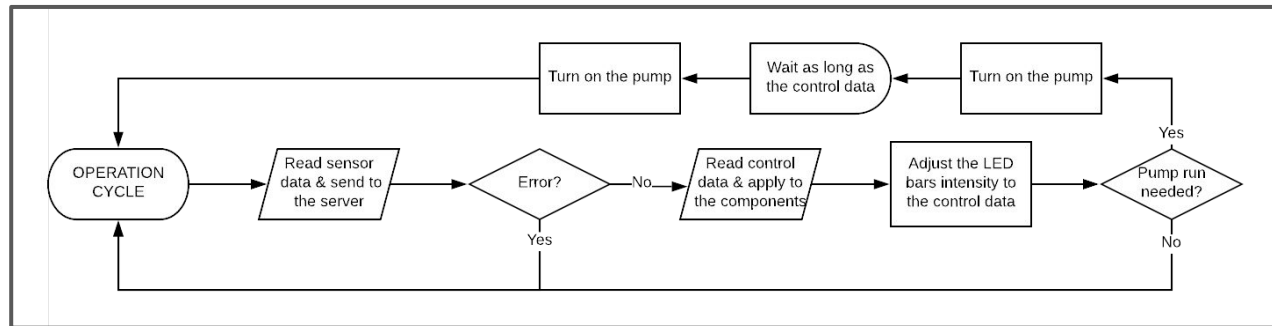
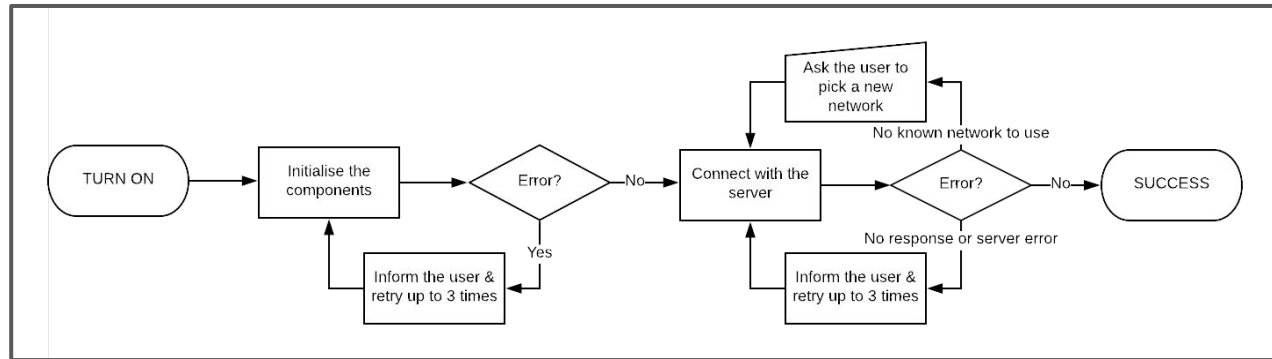
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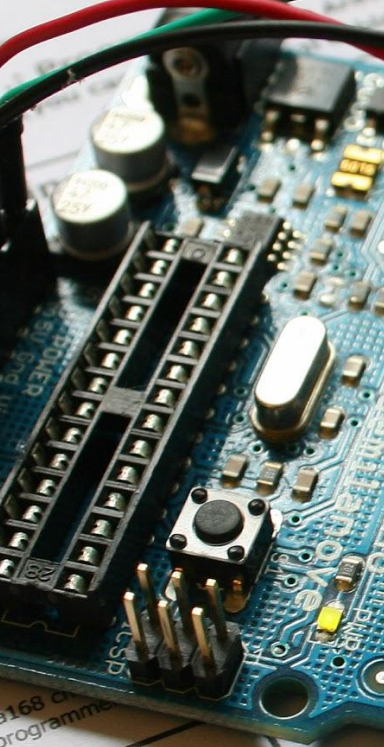
# The Project DEVELOPMENT

# Control Logic

Exchanging sensor data for control calls by server

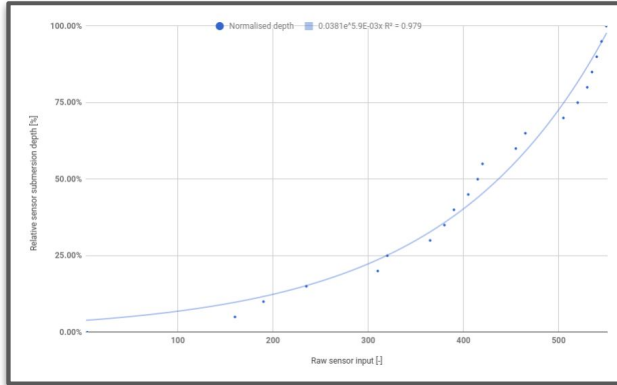


## The Project DEVELOPMENT



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## Unit testing of the components

Step by step, the  
elements have been  
tested independently



## General test of the prototype

Once all the elements  
were combined, general  
test has been done





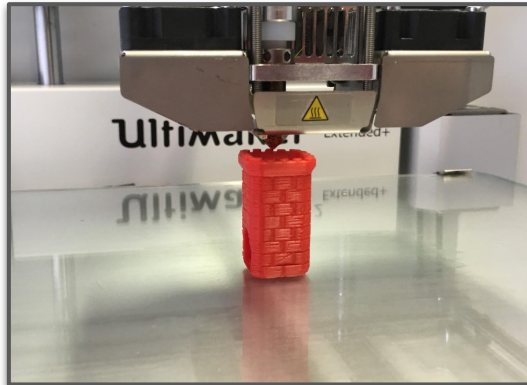
The Future  
**IMPROVEMENTS**

The Future  
IMPROVEMENTS



## Finish the Android App and do an iOS App

Support both systems to be taken seriously in the IoT world.



## Improve the components used

Use 3D printed parts, more precise sensors, faster CPU, specialised LED lights for plants.



The Future  
IMPROVEMENTS



## Implement the true modularity solutions

Create multiple, more advanced prototypes working with each other.



## Improve sustainability

Add water quality control – test samples and conditions. Eliminate toxic chemicals, adjust nutritions.



## Impact the society

Inspire new ideas for the vertical farming technology and change the agriculture's impact on the environment



A group of people are working at a long wooden table. The table is cluttered with various items: a laptop, a notebook, a pen, a glass of iced coffee, a white mug, and a pair of glasses. The scene is lit with warm, natural light, suggesting an indoor setting like a cafe or a meeting room. The focus is on the hands and objects on the table, with the background slightly blurred.

The Final  
**CONCLUSIONS**

## The upsides...

- ✓ Developed a fully working prototype device
- ✓ Managed to cooperate as a team of six people
- ✓ Improved our teamwork skills and competences
- ✓ Gain respect for people from different cultures, countries, mindsets
- ✓ Enjoyed our first Erasmus experience



The Final  
CONCLUSIONS

## And the downsides...

- ✘ Failed to meet some of the deadlines
- ✘ Could not finish part of the software
- ✘ Not all of the ideas fit into the appointed budget
- ✘ Simplified prototype



The Final  
CONCLUSIONS

Video  
(or a humorous accent)



The Final  
CONCLUSIONS

Muito obrigado!

P. PORTO

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