

Aalto CS-C2130 Project Proposal 2019-2020

Green Thumb Engineering

Or: How to grow green things at home, IoT Engineer style

1. Introduction

Do you have plants at home? Do you have actual knowledge on how to manage them well? I don't.

As simple as plants are, instructions for keeping them alive and well are typically vague. "Not in direct sunlight." "Not in the dark." "Water regularly". Proper specifications, please!

In Lyon, they realized this in large scale. They set up sensors (branch thickness, temperature, moisture) to monitor their trees at Garibaldi Street, and created an automated watering system based on an underground water reservoir.



Why not apply such engineering practices to managing house plants and leave the green thumb skills to AI? The Internet of Things (IoT) can make things smart, or at least reduce double guessing by providing exact data. Experience can be gathered to an Open Database of House Plant Care, retrievable by household AIs to optimize your plants.

2. Project Goals

The main outcome of the project is a house plant monitoring & management system. This includes a lightweight sensor platform with near real time communications (wifi), a database, a mobile/web user interface for both showing your plants' current status and for providing qualitative feedback on visual observations on the plant's and an AI to provide management suggestions. Optionally, an automated safeguarded watering system can be implemented as an extension.

The system should be scalable to allow any end users to register and start using the system, along with publishing their data. It should be battery based, with longevity and usability in mind.

3. Technologies

The project will utilize lightweight ESP/Arduino technology for developing the IoT subsystem. An initial development demonstrator with breadboard installation is suggested. If necessary, Raspberry Pi based system could also suit for an initial demonstrator. Sensors will include capacitive moisture sensors, temperature and light sensors, and air moisture sensors. Data will be collected to a floral database, with standardized external interfaces using O-MI/O-DF for communications¹. Data will be collected periodically, except when watering, where real time data will be necessary.

The project will produce an Android/Web app for user interface. The app will provide a view the current state of plants and allow qualitative feedback from users. Users need to be able to manage their data, allowing/disallowing the sharing.

An AI will be developed to optimize plant wellbeing, providing suggestions to users based on data, for example to move the plants or suggest a schedule and instructions for watering.

Optionally, the system may be extended to include an automated, safeguarded watering system.

4. Requirements for the students

The students will need

- Ability to program in C/C++
- Create an Android/Web app (preferably Java)
- Set up a database with O-MI node² for external communications
- AI³ (use of open source libraries encouraged!)
- Bit of practical electronics engineering skills
- Someone with a green thumb
- Be able to document in English

5. Legal Issues

IPR: The results are published under a permissive free software license such as BSD or MIT.

6. Client

The project will be executed under the Department of Computer Science, Aalto University. The project is guided by the Product Owner, Research Fellow Antti Nurminen (Aalto CS).

Product Owner

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¹ <https://mycourses.aalto.fi/pluginfile.php/482352/course/section/102169/tutorial-1.pdf>

² <https://github.com/AaltoAsia/O-MI>

³ For example: <https://mycourses.aalto.fi/course/view.php?id=20600>