INNOBIODIV
TECHNICAL PART

DARYNA ANISIMOVA, DARYNA NIENOVA, ILLYA PARA, MAKSYM RESHETNIAK, SUVENDU BARAI, RINKAL PORIYA

UNIVERSITÄT ZU KÖLN
TECHNISCHE HOCHSCHULE KÖLN
KHARKIV NATIONAL UNIVERSITY OF RADIO ELECTRONICS

CONTENT

INTRODUCTION

The rapid expansion of Internet technologies, such as the Internet of Things (IoT) and programming, presents a valuable opportunity to incorporate their features into tackling various challenges. This is particularly relevant in addressing global climate change and its impact on different species and the environment.

GOALS OF THE PROJECT

Objective n° 1

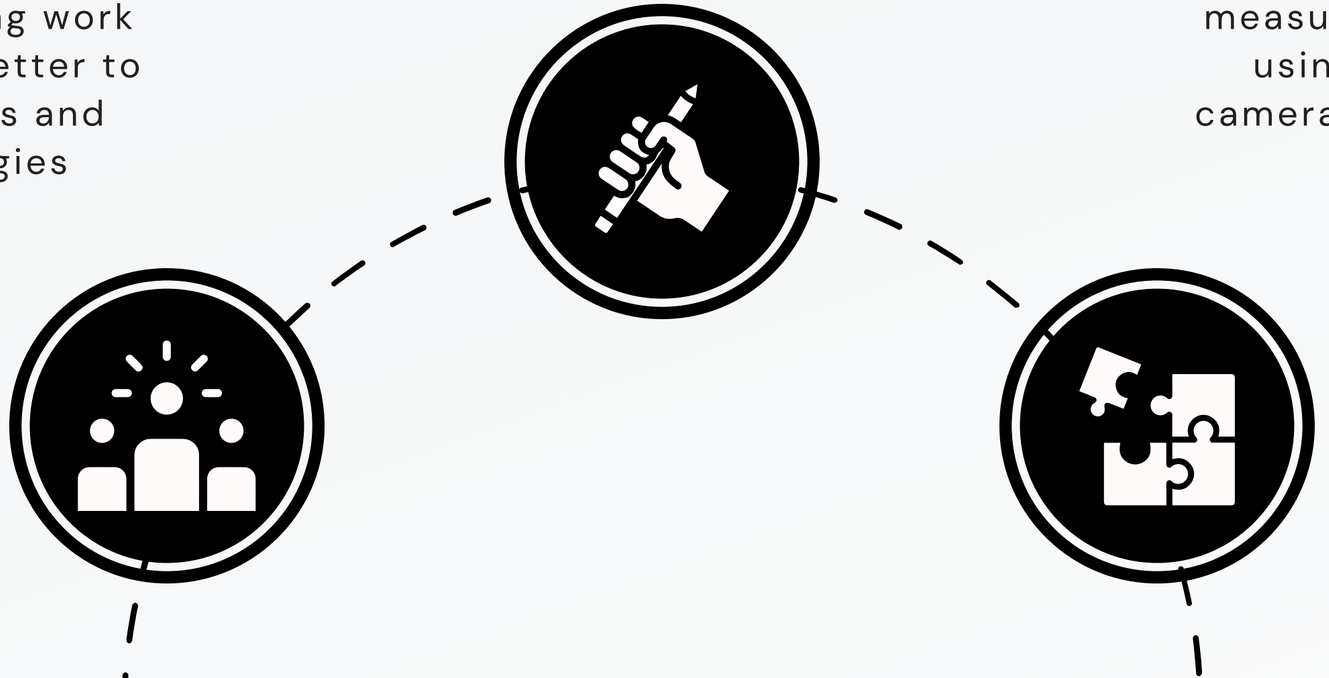
Investigation on climate change and its impact on plants and species. Such investigation is a complex one so to make everything work more accurately is better to use robotic systems and modern technologies

Objective n° 2

Provide biological students with a reliable automated system for improving and supporting biological climate-related research

Objective n° 3

To improve the watering system of plants using FarmBot's possibilities and find new ideas on how to measure the height of plants using FarmBot's built-in camera and photo processing features



TECHNICAL IDEAS

Idea 1

- During discussions of the technical solutions for the experiment, the team of technical students were provided with the idea of improving the previous idea that describes possible solutions for creating a specific automated system of watering plants, utilizing the built-in camera of the FarmBot and programming features implemented in a general code that controls watering process.

Idea 2

- From the very beginning, one of the ideas was to measure the height of the plants using FarmBot's built-in camera to take pictures, analyze them, and have particular conclusions about the height of the plants. To make it read we decided to use Python programming language and photoprocessing.

DYNAMIC WATERING

The idea of dynamic watering can be implemented using several different techniques, including Photo Processing, Calibration of the FarmBot's camera and implementing of new programming techniques into the existing code.

01

CAMERA CALIBRATION

For this idea it was needed to prepare special conditions for the camera, so it will be possible to work with its pictures. This process called - Camera Calibration

02

CODING

For the Dynamic Watering system we need to write a code that would detect soil without showing leaves or other plant's parts.

03

PHOTO PROCESSING

To detect directly only soil (so FarmBot will be able to know, what part of pot to plant) we used photoprocessing features provided by PlantCV and OpenCV Python packages,

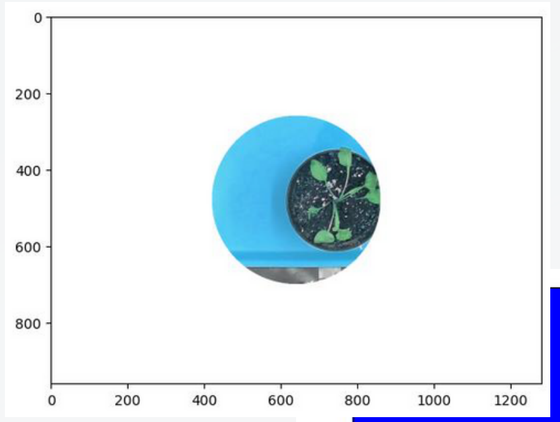
04

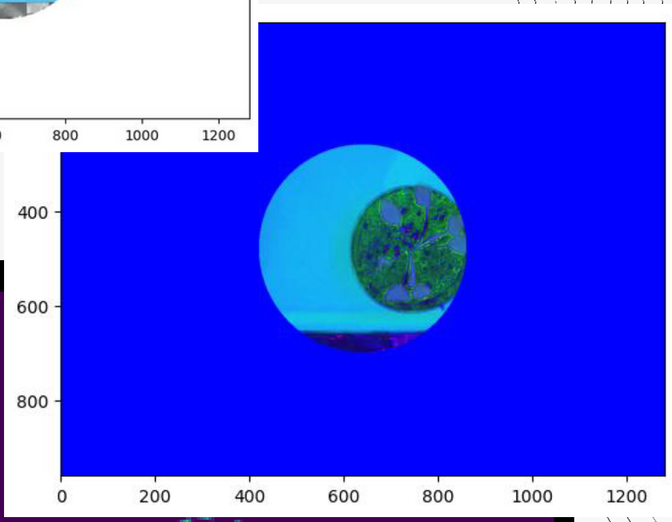
IMPLEMENTATION

After all previous steps were done, techncal students from TH Cologne was able to combine all of them, and check how does it work.

PHOTO ANALYSIS

- Analyse the captured photos using Python programming language and relevant packages such as "Matplotlib," "OpenCV," and "PlantCV."





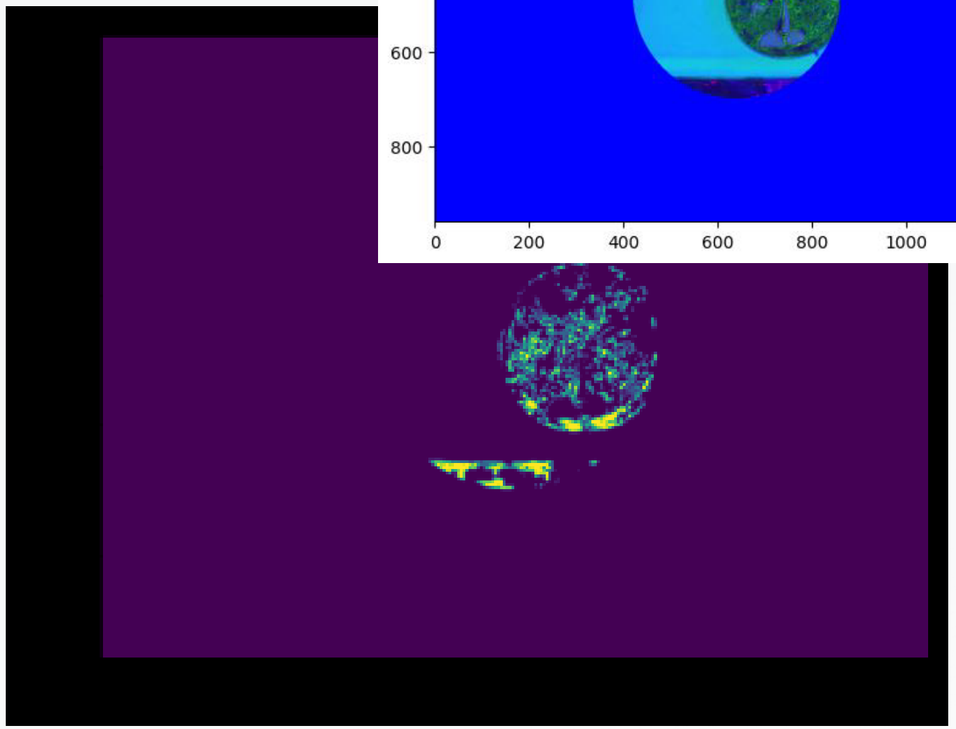
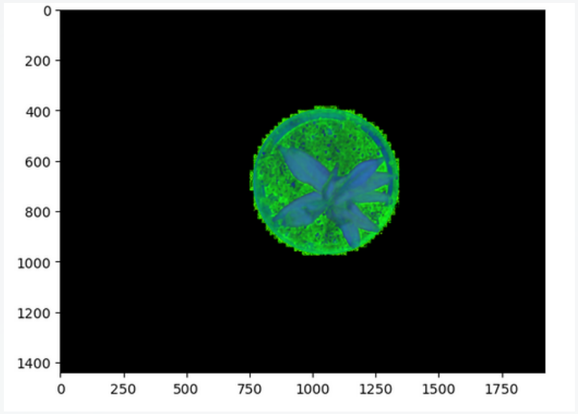
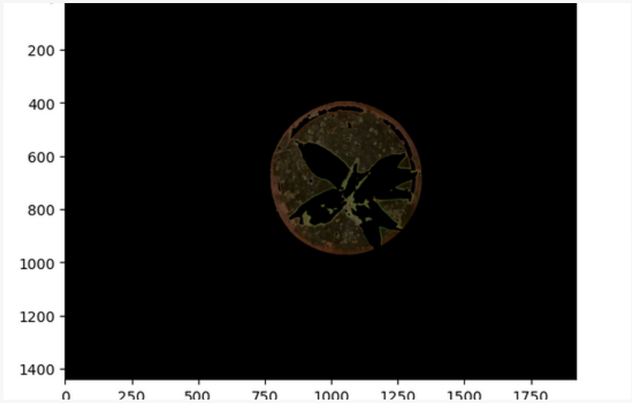
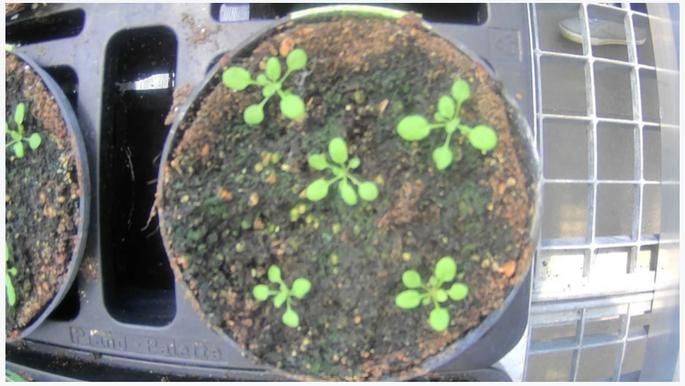


PHOTO CROPPING







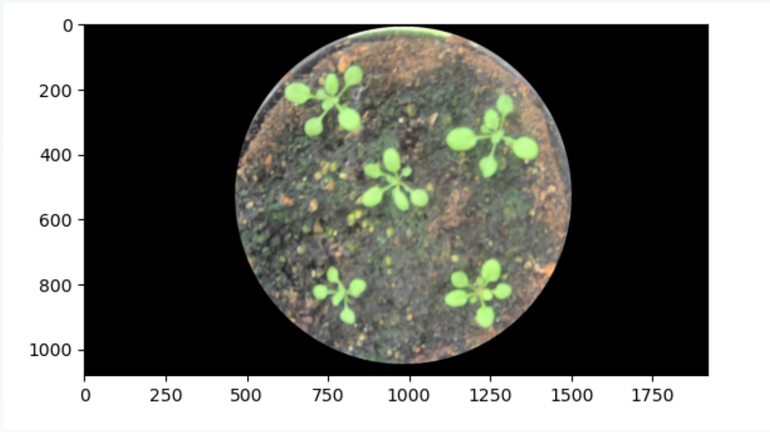


PHOTO PROCESSING

As mentioned before photo processing is needed for some particular results such as detection of the soil and masked picture

RESULTS

In conclusion, the proposed methodology of implementing a dynamic watering system and measuring the height of plants through photo processing is expected to yield several positive outcomes.

1.1. Dynamic Watering System

The implementation of a dynamic watering system based on the proposed methodology is anticipated to offer the following benefits:

Improved watering process

Reduced water wastage

Enhanced accuracy

Optimal plant health

1.2. Plant Height Measurement

The methodology eliminates the need for manual measurement of plant height, making the process more convenient and reducing the potential for human errors.

In summary, the implementation of the proposed methodology for the dynamic watering system and plant height measurement is expected to enhance the accuracy, efficiency, and reliability of these processes. These advancements have the potential to improve agricultural practices, facilitate biological research, and contribute to the development of more sophisticated and automated systems in the field of plant cultivation.

THANK'S FOR YOUR ATTENTION