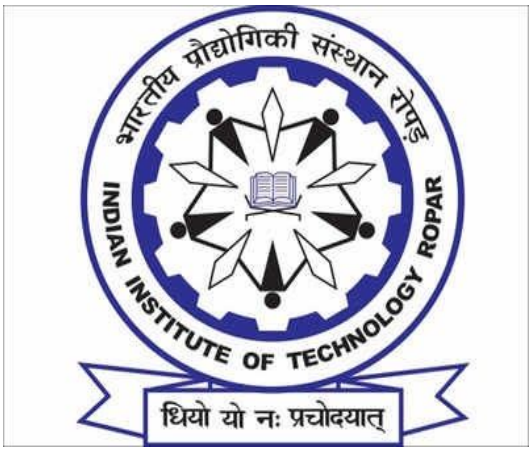

Final Report for the course

Tinkering Lab (GE 107)

Project on

Automatic Water Gardening System

Submitted by

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Title: AUTOMATIC WATER GARDENING SYSTEM

Motivation of our project:

The truth in the statement “Nature is man’s best friend” is clearly evident from the fact that the inclusion of some time with nature in our fast-paced lifestyle prevalent in modern cities has a positive impact beyond measure on our mental health and internal well-being. This is the main reason why more and more people who are realizing the benefits of such a close ambiance with nature are gradually starting to practice gardening on a small scale.

But generally, when people realize the amount of labor, time and energy involved in maintaining a garden such as providing plants with right amounts of water or selection of right plants from the nursery to suit the environment, they feel inconvenience in maintaining it (given their busy schedules) and bereft themselves of the benefits involved.

Our group discussed the matter in great detail and decided to work towards increasing the feasibility of keeping a garden to reach more people. As a part of this project, we have come up with a plan to implement an automated water gardening system for plants that would cater to their water needs and, in the process, reduce human effort and increase convenience by a great margin.

Our aim is to provide adequate amounts of water to the plants for their incessant growth independent of the environmental variations. A good implementation of our project can also provide other side benefits to the environment such as reduced unplanned usage and over-exploitation of water resources leading to its shortages world-wide.

In order to achieve the above-mentioned objective, we are utilizing moisture sensors for continuous monitoring of soil moisture and regulating water flow (through Arduino board, relay module, and water pump) into the plants until a threshold level is reached. We understand that each plant has different water requirements. So, the threshold level for a plant is kept variable in our system and can be set according to the plant's needs by the end-user after gaining knowledge about the plant. This would certainly prevent over-usage of water and such optimal usage of water, in the long run, can save tonnes of this valuable resource which can be put to many other good usages.

Software requirements:

- **Arduino IDE software-** The Arduino Integrated Development Environment is a cross-platform application that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards.

Hardware requirements-

- **Arduino Mega**- It is a microcontroller board. Microcontrollers are used in automatically controlled products and devices.
- **Water Pump Motor-**The pump is powered by an electric motor to derive water from the tank.
- **Soil Moisture Sensor-**To sense the level of moisture present in the soil.
- **LCD Display-**It displays the outputs coming from all the sensors.
- **Relay Module-**It is used for remote device switching. With which we can remotely control devices over a network or the internet.
- **Water Level Indicator-**It is used to indicate the level of water.
- **Track Time Clock-** It is a computer clock that keeps the track of current time.
- **Wires** for connection.

Project description:

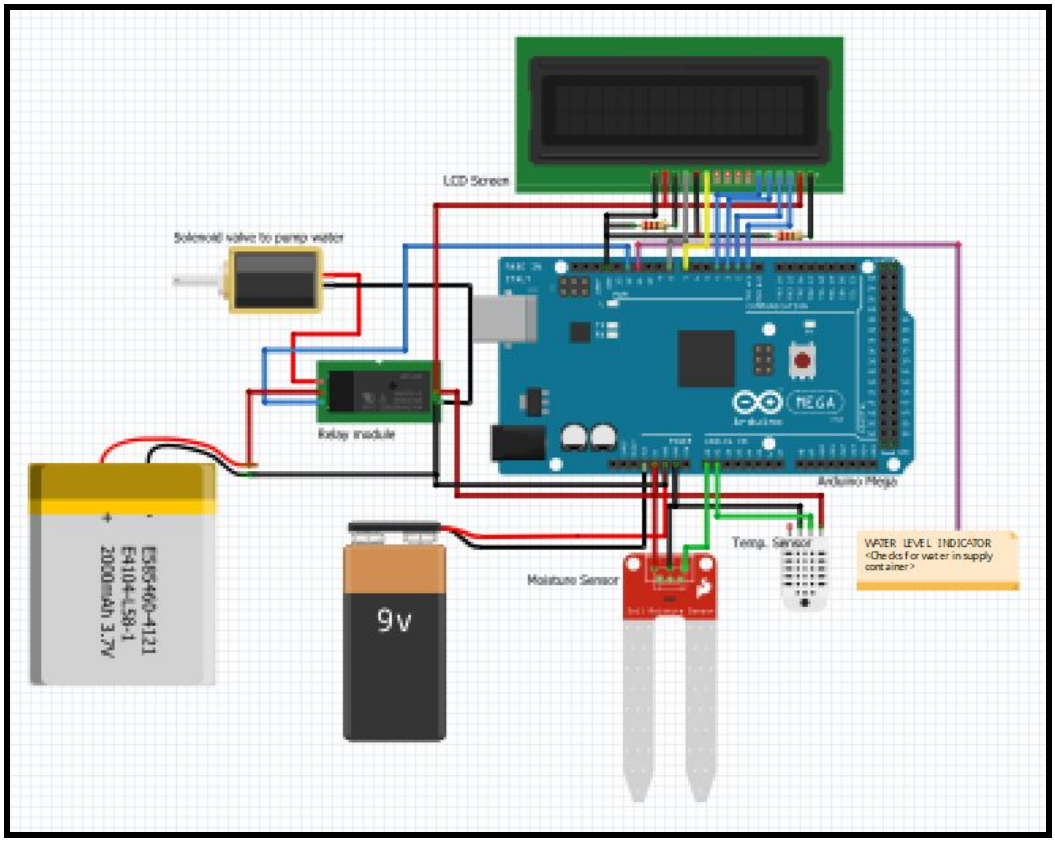
The working of our setup is as follows. First, we give power from 9V supply to Arduino and from a 22,000MAh Lipo battery to the water pump through a relay that is controlled by the Arduino.

The soil moisture sensor detects the percentage of moisture content of the soil and sends it to Arduino. The Arduino then processes the moisture reading and uses our algorithm to see whether the soil is dry or moist enough.

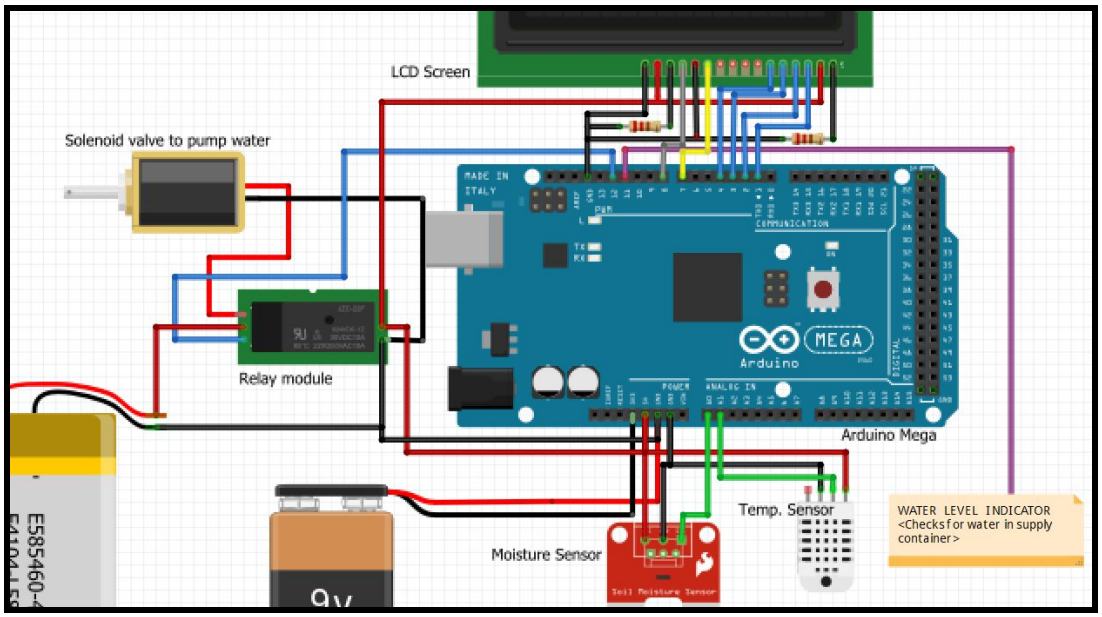
If dry then it sends a high pulse to the relay module and the pump gets power and it starts to water the garden. The moisture sensor sends reading to Arduino every 2 secs so that an overflow is prevented.

Also, from time to time, the reading is also sent to the LCD display so that the user is aware of the moisture and temp reading of the soil and he/she can turn on and off the system according to their own needs and requirements.

The circuit diagram (made in Fritzing) and code (made in Arduino IDE) for our whole model can be found in a Google drive folder (using this link here):- Tinkering Project (AGS)



Circuit Diagram Snippet (Uploaded in drive folder as well)



Clear (Zoomed) Circuit diagram Snippet

Tasks performed by each student:

	TASKS GIVEN	PERFORMED BY
1.	Motivation for our Project	AJEY SINGH BHADAURIA
2. a.	Project Description (Schematics & Diagrams)	ARYANSH KURMI
b.	Arduino Programming	ARYANSH KURMI
c.	Arduino Circuit Simulation	ADITYA S. CHANDRA
3.	Requirements (Hardware & Software)	CHETNA SINGH
4.	Timeline	AMAN PRATAP CHANDRA
5.	Possible Outcomes	ADITYA S. CHANDRA

List of tasks and Timeline for the project:

1. Project Motivation **(Week 1-2)**
2. Ordering Components needed and budget calculation for project **(Week 3-5)**
3. Schematics & Diagrams **(Week 5)**
4. Arduino Programming/Coding **(Week 6)**
5. Simulating the circuit in software**(Week 7)**
6. Prototyping the system **(Week 8-9)**
7. Final Report Making and Submission **(Week 10)**

Possible Outcomes:

The possible outcome for our project can be determined by using a simple test strategy.The test is performed to determine the functioning of hardware and software to its full potential according to the requirement. The following table explains the testing process clearly:-

Test	Soil Moisture Sensor
Test Purpose	To test the sensor values and its functionality.
Test Environment	A glass of water and Arduino IDE
Expected Step	1.Open the serial monitor in the Arduino IDE and see the sensor value for the dry condition. 2.Immersed the soil moisture sensor into a glass of water and looked for the wet condition in the serial monitor in Arduino IDE too.
Expected Result	The soil moisture sensor is lit up in the controller when it is switched on ,and it can show the lower and upper boundaries of the sensor value in dry and wet conditions.

Output would be like the soil moisture sensor captures high values for dry condition which are around 893 with 900 as the upper boundary. And the sensor will capture low values for wet conditions which are around 399 with 400 as the lower boundary.

These all outputs can be seen on the LCD display of the proposed system. As the automated watering system provides the monitoring function where users are able to check the soil moisture based on the reading on the LCD display.

-----THANK YOU-----