EEE 416-Microprocessor and Embedded Systems Laboratory

Jan 2023 Level-4 Term-1 Section - C

Final Project Demonstration

GREEN VIGILIANCE:ADVANCE PLANT COMMUNICATION TO THRIVE and SAFEGUARD DROUGHT STRIKEN PLANTS

SUBMITTED BY – GROUP C.02

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Outline

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1. Summary

Our project basically aims to monitor dry soil condition monitoring in a vast region which is replaced here as a prototype with three moisture sensors. It will engage the users as well as automatic selection for which data they want to see in the “ARDUTOOTH” app via Bluetooth module. Here the challenging part was the multiplexing and demultiplexing. There is an interesting part which plays a wav type sound to alert the user about the dry condition of the soil.

2. Introduction

In today's world of increasing environmental awareness, our project takes a step forward towards sustainable plant care. We have developed a smart soil moisture monitoring system using Arduino technology. This system not only detects dry soil conditions but also engages alert system for users . So, the basic motive is to make sure the plans don't dry out due to lack of observation.

3.1 Design Methods(Components)

- Arduino Uno
- HC05, SD card and module
- Esp8266
- CD4067 analog multiplexer
- 74HC4514 demultiplexer
- Speaker
- Connecting wires
- Breadboards
- Push button (for manual control)
- Tree for prototype

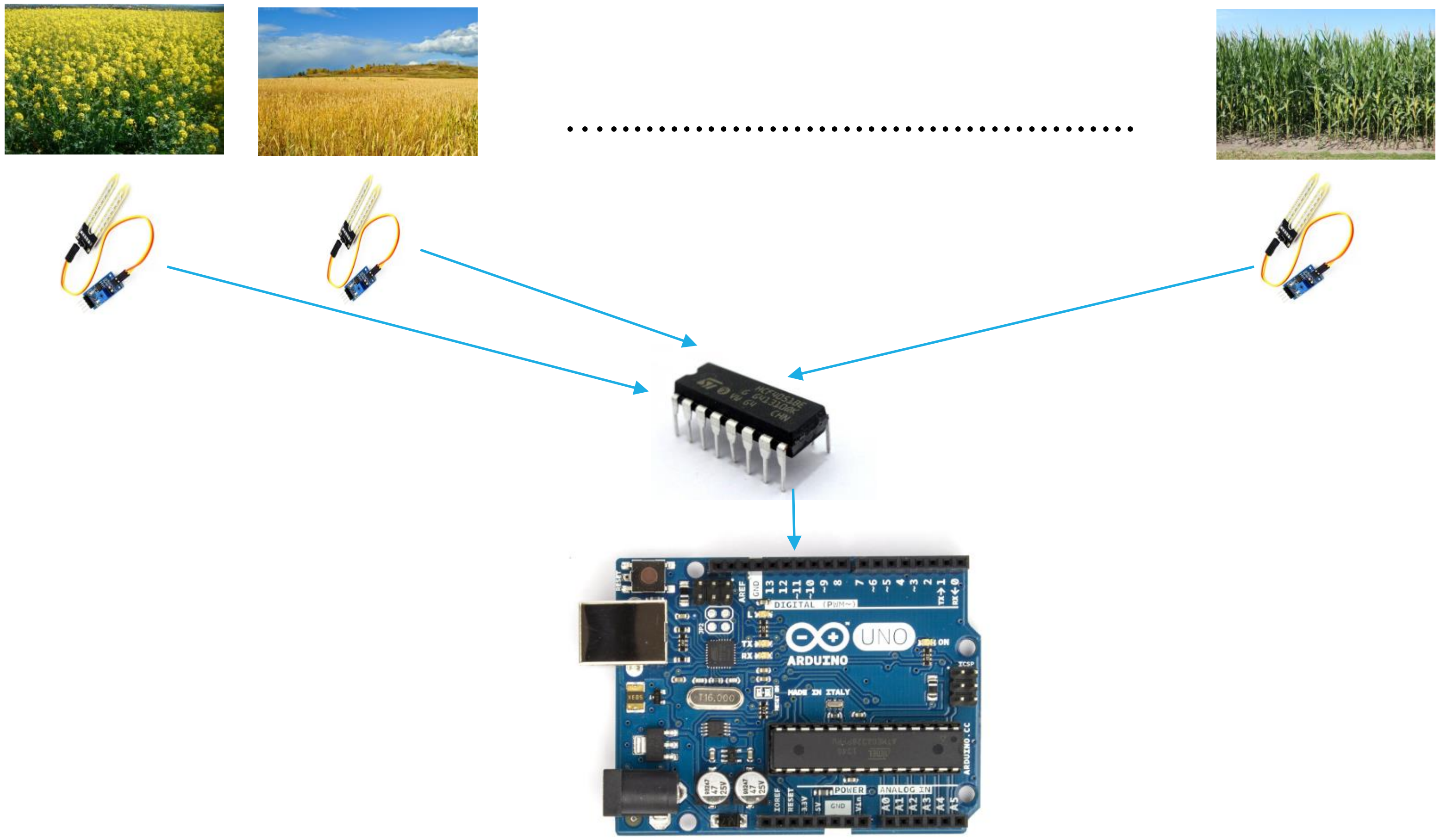
3.1 Design Methods(Flow Chart)_Automatic Option

3.1 Design Methods(Flow Chart)_Manual

Manual → Sensors Reading Data ,send to IOT platform → Mux Signal Control selection using push button → Demux to make sure the desired pin is selected → Dry ? Speaker Sound, Motor On: Motor off → selected data showcasing in app

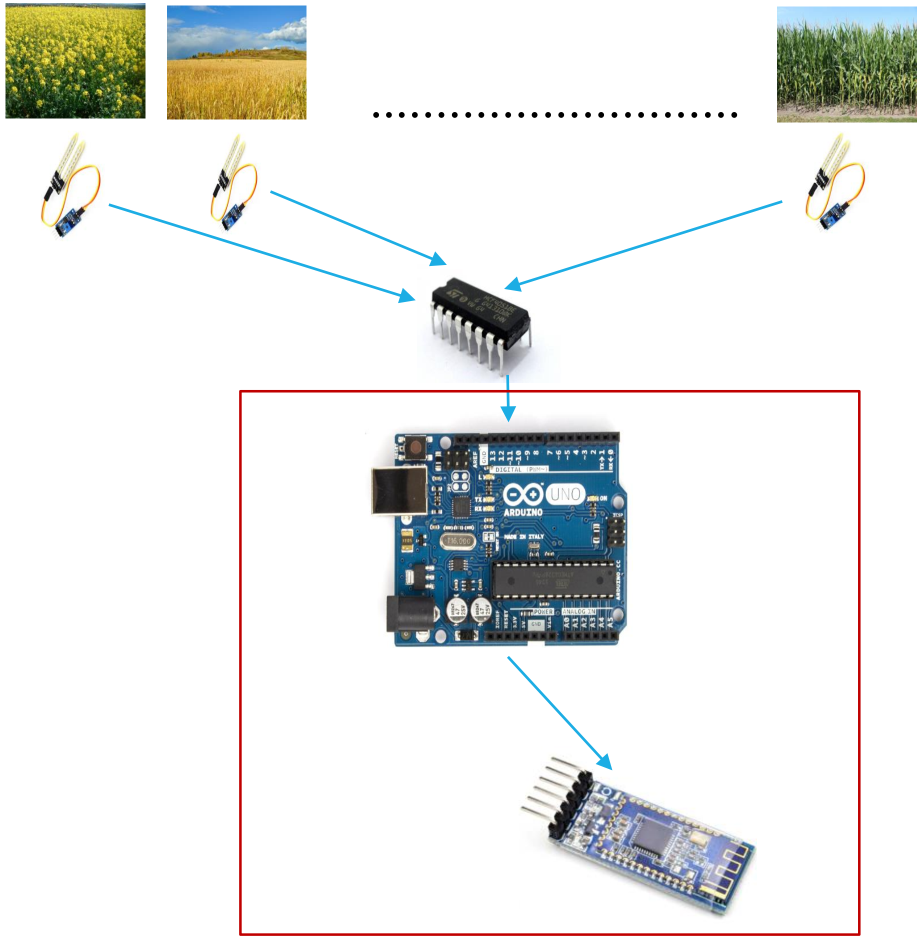
3.1 Design Methods(Methodology)

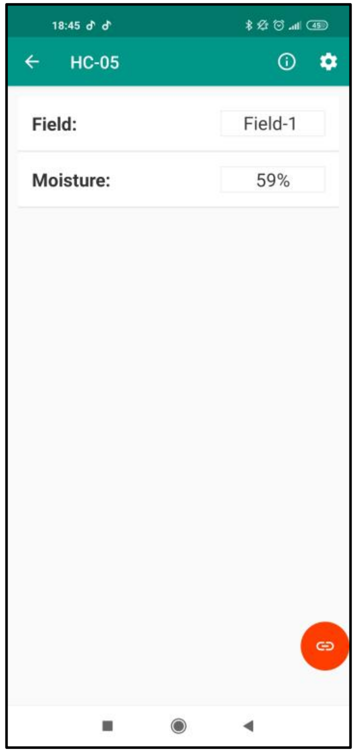
(I) Sensor Input Multiplexing:



3.1 Design Methods(Methodology)

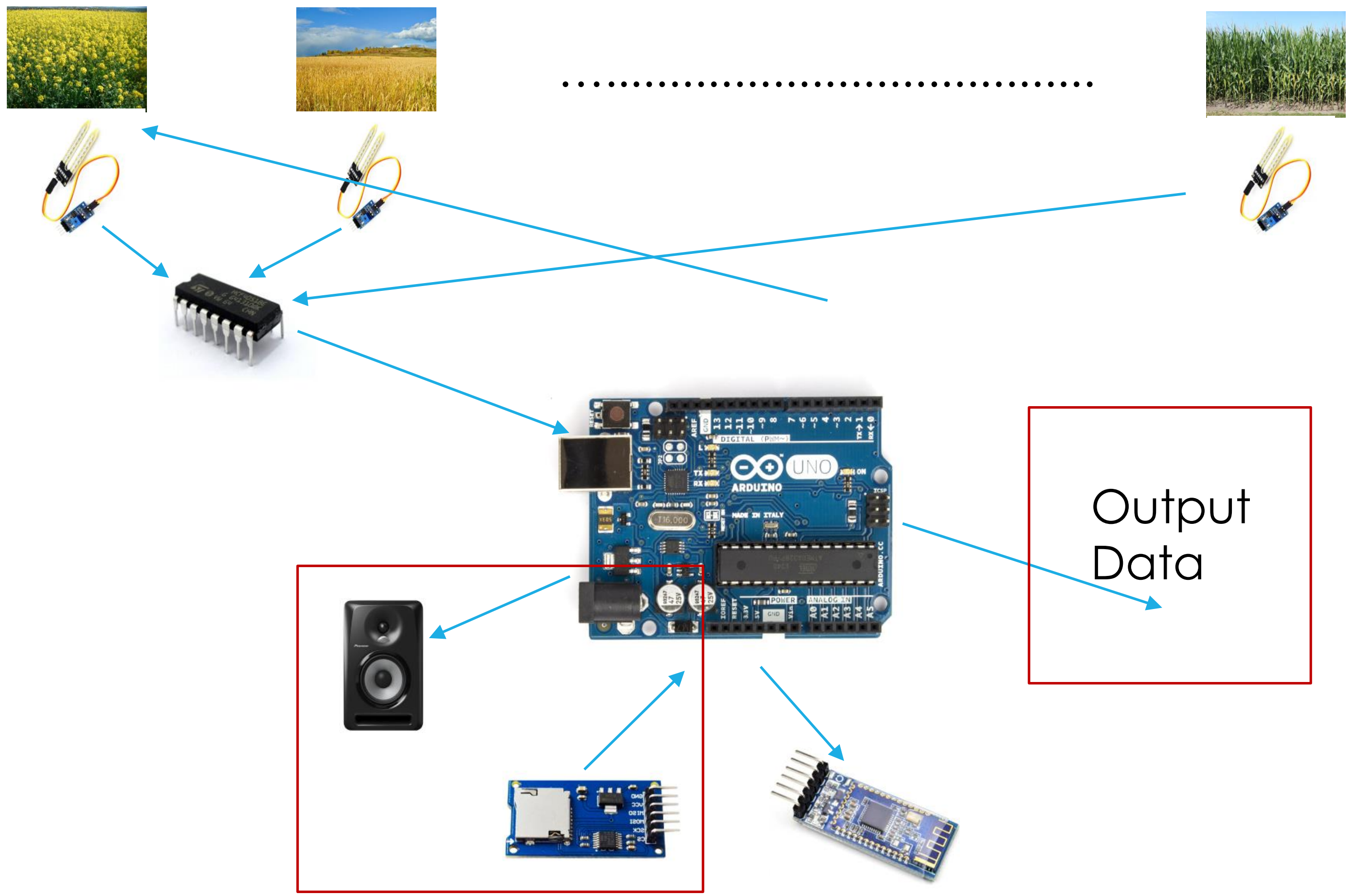
(II) Real Time Data Observation:





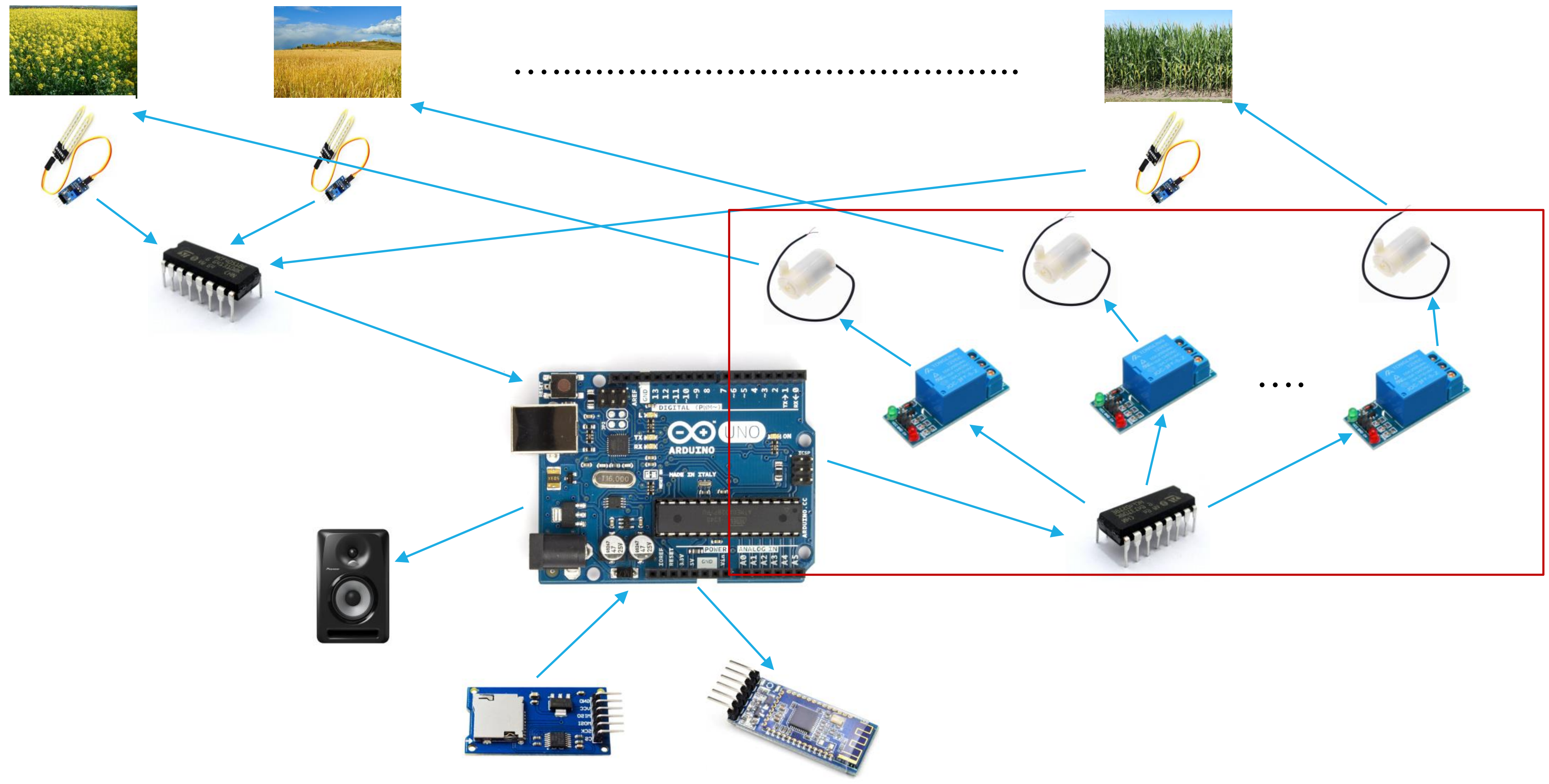
3.1 Design Methods(Methodology)

(III) Input Data Compare & Operation of SD Card Module and Speaker

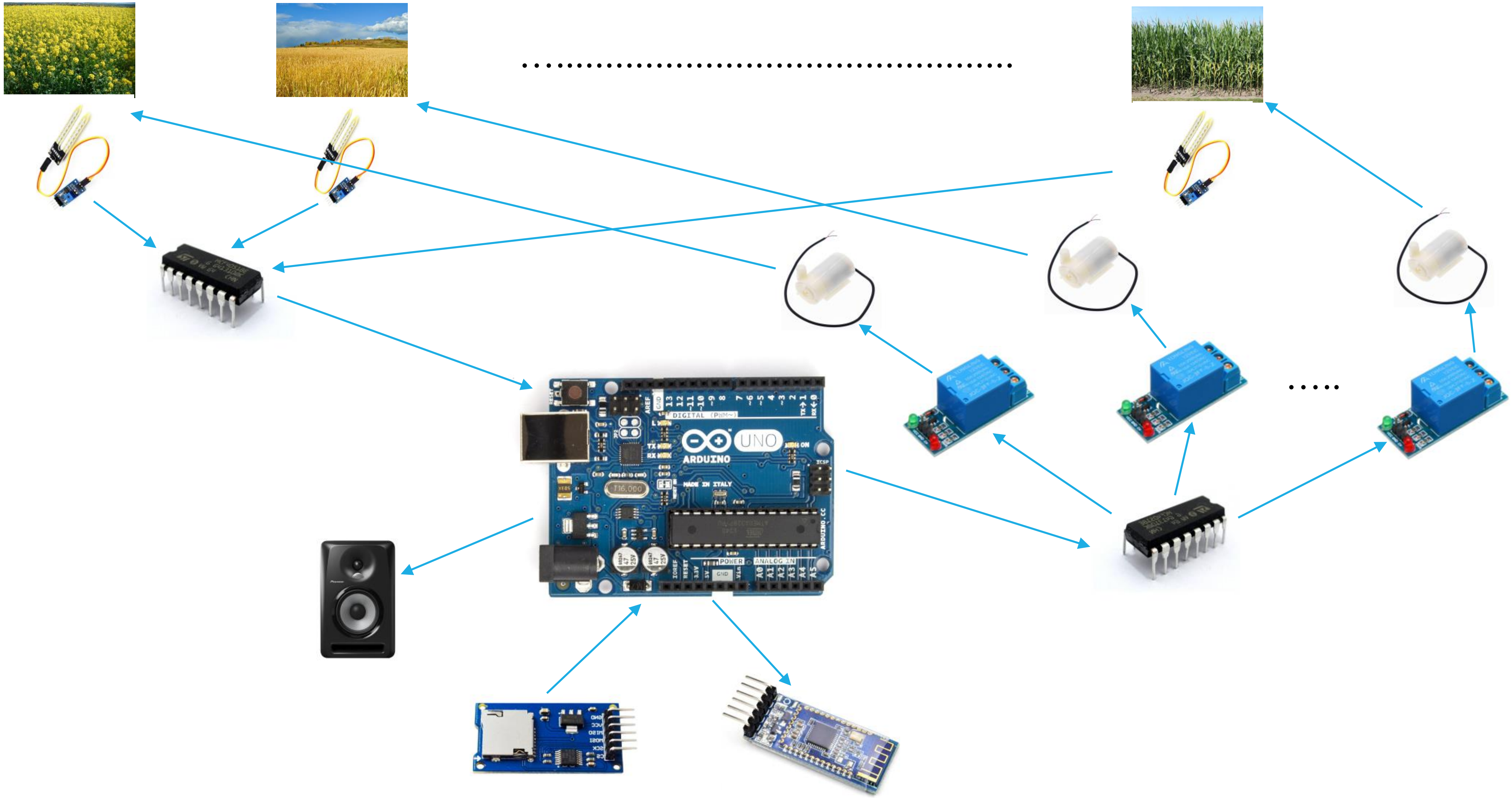


3.1 Design Methods(Methodology)

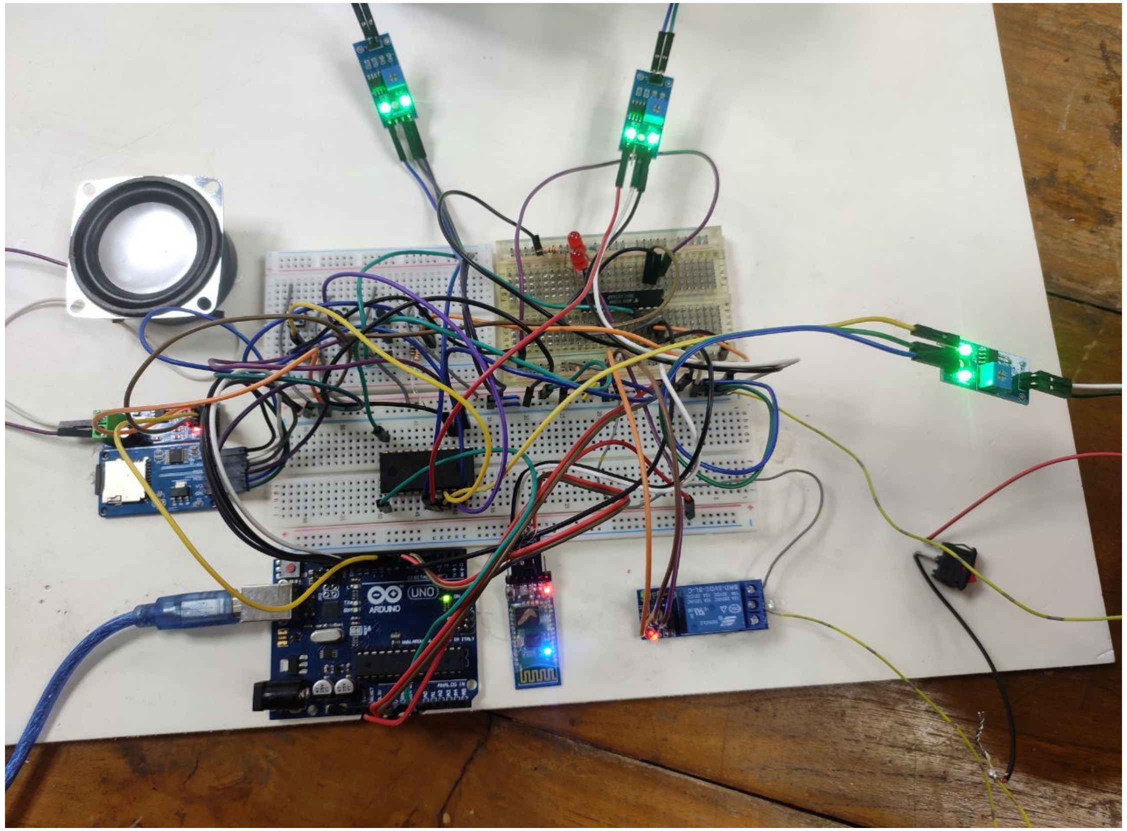
(IV) Operation of DEMUX, Relay and Water Pump

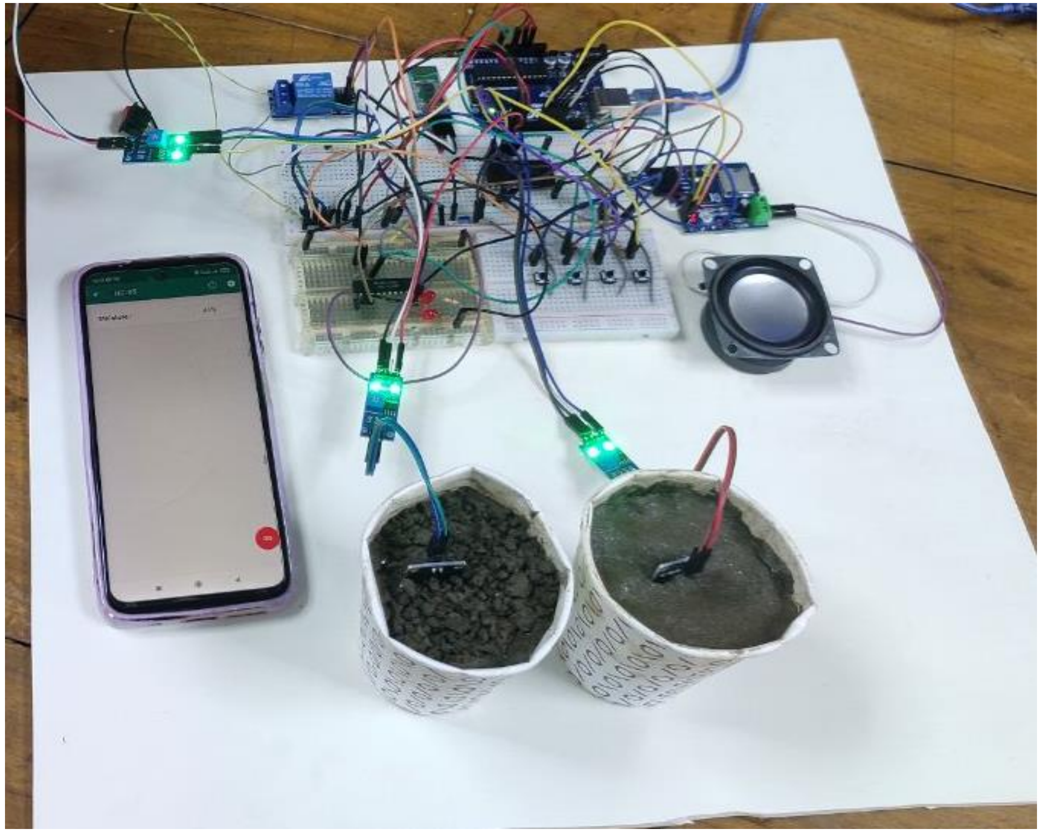


3.2 Design: Circuit Diagram



3.4 Hardware Design





4 Implementation: Demonstration

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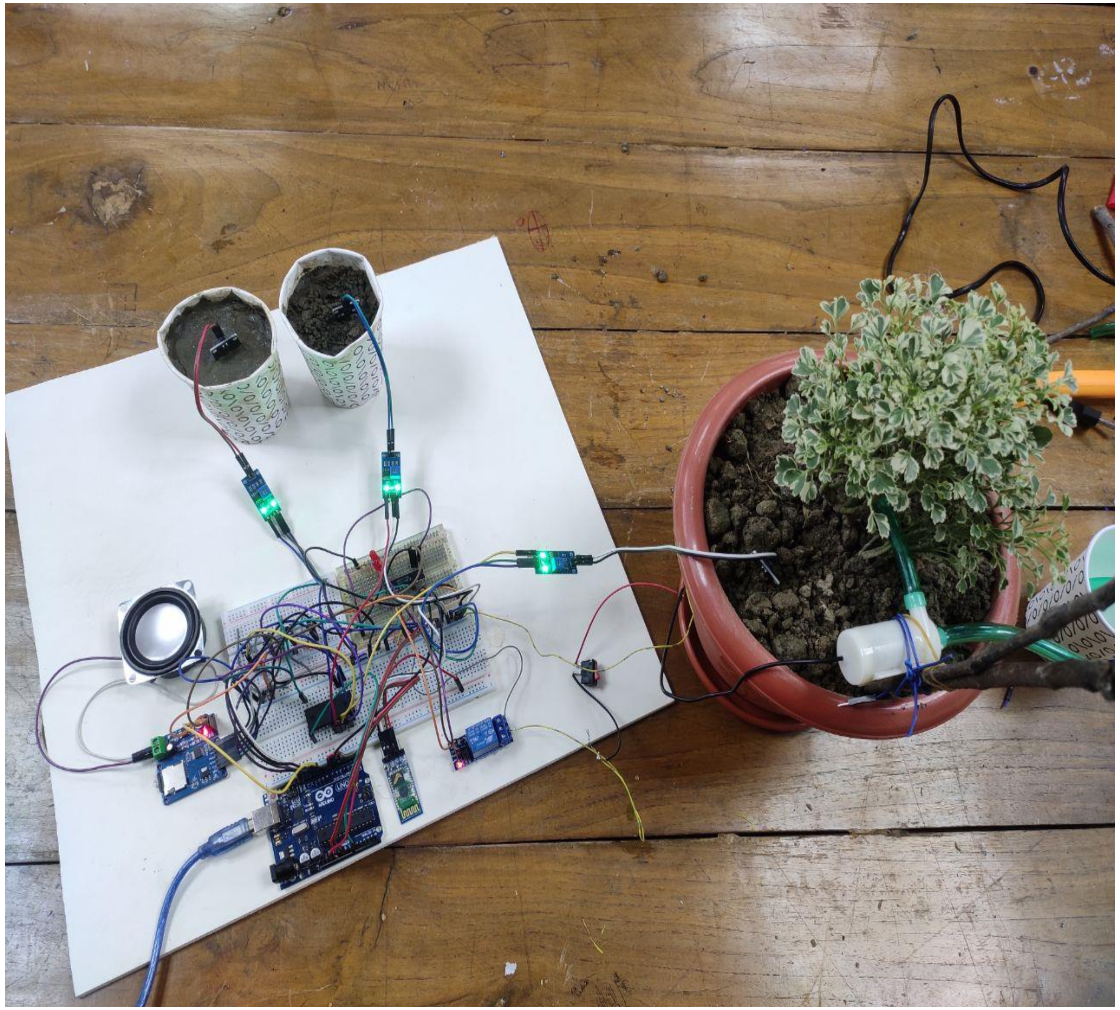
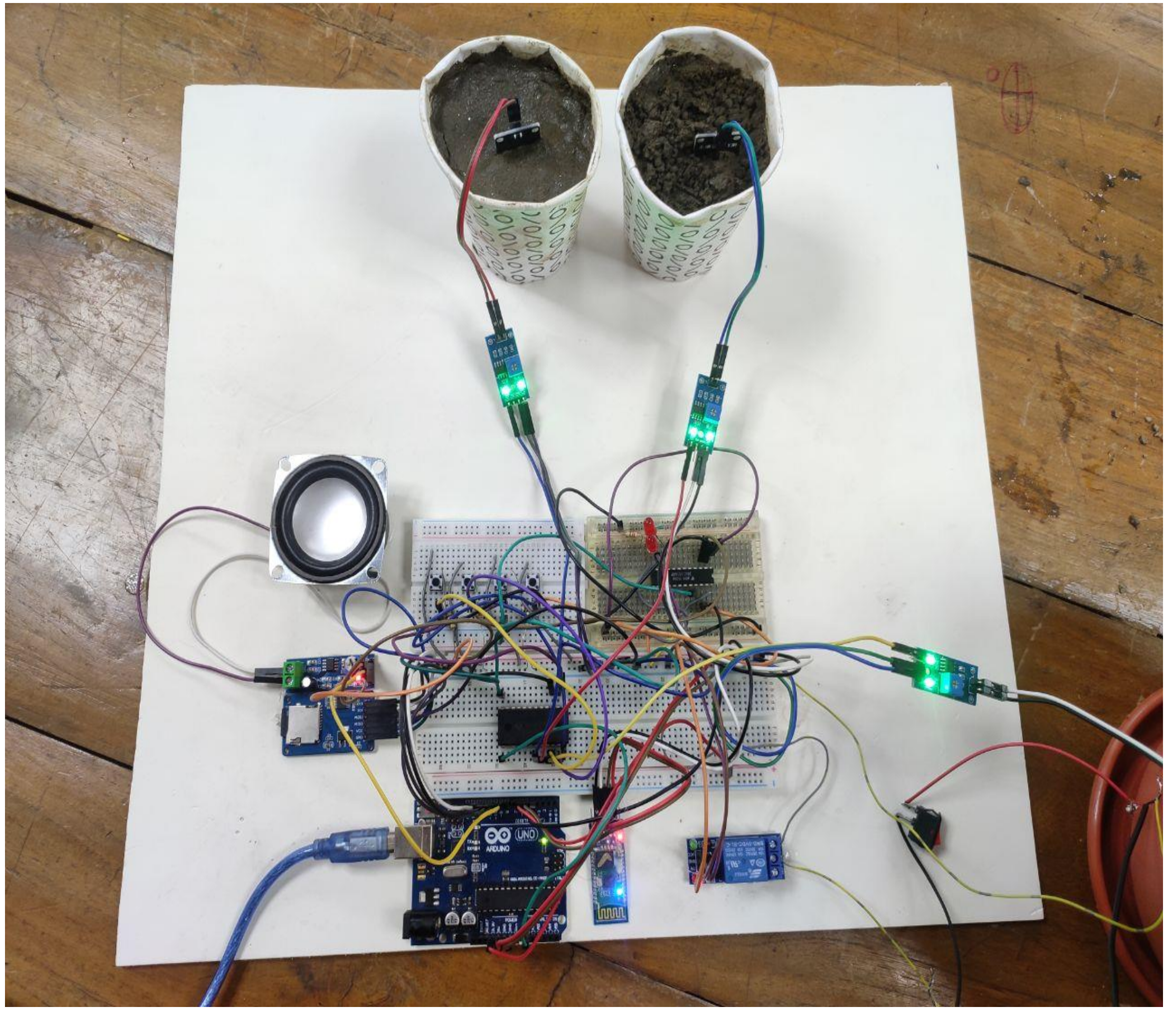
4.1 Implementation: Photo Gallery





4.1 Implementation: Photo Gallary

5. Design Analysis and Evaluation

5.1 Novelty

5.2 Design Considerations (PO(c))

5.3 Limitations of Tools (PO(e))

5.4 Impact Assessment (PO(f))

5.5 Sustainability and Environmental Impact Evaluation (PO(g))

5.6 Ethical Issues (PO(h))

5.1 Novelty

The novelty of this project lies in its ability to seamlessly integrate diverse available systems to create a multifunctional system.

Three major part of this project:

- ❖ Sensor multiplexing & demultiplexing both automatically and manually.
- ❖ Bluetooth module for wireless observation
- ❖ Plant communicator using SD card module and Arduino

Apart from the first one the remaining systems were partially accomplished before. Here novelty is designing the multiplexing part and integrating all the systems.

5.2 Design Considerations (PO(c))

5.2.1 Considerations to public health and safety

- **Minimizing Soil-Borne Disease Risk:** Moisture sensors play a role in preventing excessive watering and waterlogging, thus reducing the chances of soil-borne diseases and creating a healthier plant environment.

◦ 5.2.2 Considerations to environment

- **Precise Water Management:** Moisture sensors provide accurate and real-time information about soil moisture levels, enabling effective water utilization in agriculture. This leads to decreased overall water demand.
- **Preservation of Water Resources:** The efficient water management facilitated by moisture sensors contributes to conserving local water sources. This conservation effort not only prevents soil erosion and nutrient runoff but also safeguards aquatic ecosystems.

5.3 Limitations of Tools (PO(e))

- ❖ **When multiple moisture sensors are multiplexed together, there can be interference or crosstalk between the sensors**
- ❖ **Moisture sensors are sensitive to environmental conditions such as temperature and humidity**
- ❖ **A 3W speaker may have limitations in terms of maximum volume output.**
- ❖ **When pushed to its limits, a speaker of this size and power rating may produce distortion and reduced audio quality.**
- ❖ **Wifi module takes minimum 30 seconds to send data to Thingspeak. Change in any part of the project cannot be detected by Thingspeak. To solve this problem Bluetooth module was used.**

5.4 Impact Assessment (PO(f))

- 5.4.1 Assessment of Societal and Cultural Issues : Our work isn’t against any social point of view and Morality.
- 5.4.2 Assessment of Health and Safety Issues : Our work doesn’t create any hazard waste or any form of danger . We need to ensure the disposal of our component. So we were able to ensure health and safety issues.
- 5.4.3 Assessment of Legal Issues : We have done everything by law. We use everything permitted by govt. of Bangladesh . So we don’t have any legal issues.

5.5 Sustainability Evaluation (PO(g))

- Our component is stable and very much reliable. So we expect it will sustain more than year. We suggest to check our setup every month to ensure optimization service quality.

5.6 Ethical Issues

Our work was solely done by our teammate and we have mention the article from where we took help in the reference section. We have completed our project with moral standard and we abide by all the rules mention by regulation committee.

6. Reflection on Individual and Team work

6.1 Individual Contribution of Each Member

6.2 Mode of Teamwork & Diversity

6.1 Individual Contribution of Each Member

1806167- Hardware Implementation and software Collaboration

1806168 – Hardware Implementation and Software Collaboration

1806172- Hardware Implementation and Software Collaboration

1806174- Component collection and Hardware implementation.

6.2 Mode of Teamwork and Diversity

At first we listed our component list, then 1806174 collected all the component from shop as my home was near to the shop.

Then we schedule our meeting time in the weekend based on team member opinion. We also worked during working day after class in central library.

7. Cost Analysis (PO(k))

Bill of Materials per unit prototype

Components	Price	Components	Price
Jumper wire	140	SD card and module	270
HC05	200	Pump	60
Esp8266	300	Relay, Battery, Breadboard	385
Speaker	150	Sensors	270
MUX-DEMUX	600		

Total of 2375 taka is the per unit prototype cost

8. Future Work

1. **Advanced Sensor Integration:** Incorporating more sensors, such as temperature sensors, humidity sensors, and light sensors, to gather comprehensive data about the environment. This data can be used for precise control and monitoring.

2. **Weather Forecast Integration:** Integrating weather forecast data into your system to make real-time decisions about irrigation. If rain is predicted, the system can automatically reduce or skip watering.

3. **Pump Control:** Adding a pump control mechanism to manage water sources efficiently. This could involve controlling the pump based on water level sensors or scheduling watering times when water availability is high.

4. **Energy Efficiency**: Optimizing power consumption by using low-power components and sleep modes to extend the life of batteries or reduce energy costs.

5. **Community and Sharing:** Creating a platform for users to share their data and experiences.

9. References

- https://agriculture.vic.gov.au/__data/assets/pdf_file/0006/577023/Soil-Moisture-Monitoring-fact-sheet-Dec-2017.pdf
- http://adam-meyer.com/arduino/CD74HC4067
- https://docs.arduino.cc/tutorials/generic/simple-audio-player


THANK
YOU