

Self sustained automated cultivation with remote monitoring

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Outline

- Introduction
- Literature review
- Objectives
- Hardware Implementation
- Block Diagram
- Conclusion
- References

Introduction

- The primary aim of this project is to create an **automated watering system**.
- It is designed for **remote monitoring** from the comfort of one's home.
- The project also explores various **energy harvesting** techniques, including **solar** and piezoelectric methods.
- It incorporates **theft detection** through **computer vision** to enhance security.

Literature review

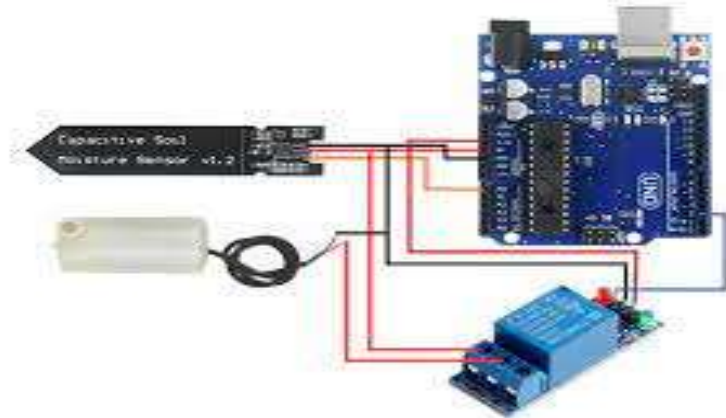
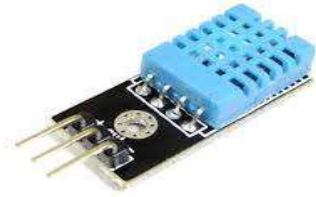
- **Reference 1:** An Automatic Irrigation System is a sophisticated solution that optimizes the watering process, **conserves water**, and enhances the health of plants while providing convenience to users, especially in agriculture and landscaping.
- **Reference 2: Remote monitoring** of a water pump involves using smart technology, and user-friendly interfaces to provide real-time status updates and control options for the pump from anywhere with an **internet connection**.
- **Reference 3:** YOLO(You Only Look Once) Architecture and it's working.

Objectives

- Our system offers remote farm monitoring with **both automated and manual irrigation** capabilities.
- It utilizes **LoRa** WAN technology to transmit data even in remote areas **lacking internet connectivity**.
- **Solar energy harvesting** is employed to ensure sustainable power supply.
- Furthermore, the system includes **trespasser detection** features and can promptly alert the user upon detecting unauthorized individuals on the premises.

Hardware Tools Used

- DHT11
- Soil moisture sensor
- Relay
- Water Pump
- Arduino Uno
- LoRa Module
- Raspberry Pi
- LCD display

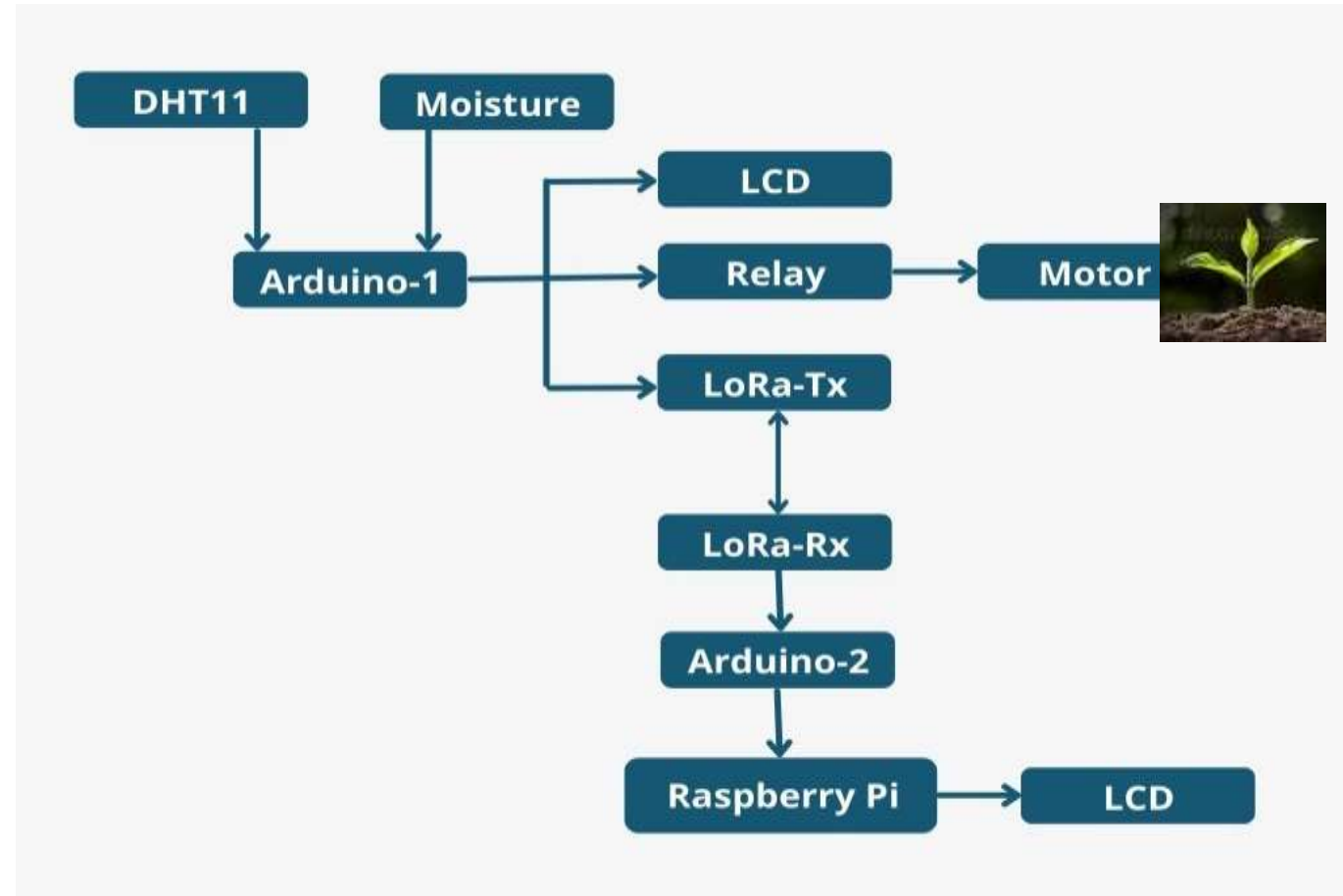


Software Tools Used

- Arduino IDE
- Putty
- VNC Viewer
- Raspberry Pi Imager
- Programming Languages
- Yolo V8
- OpenCV
- Ultralytics

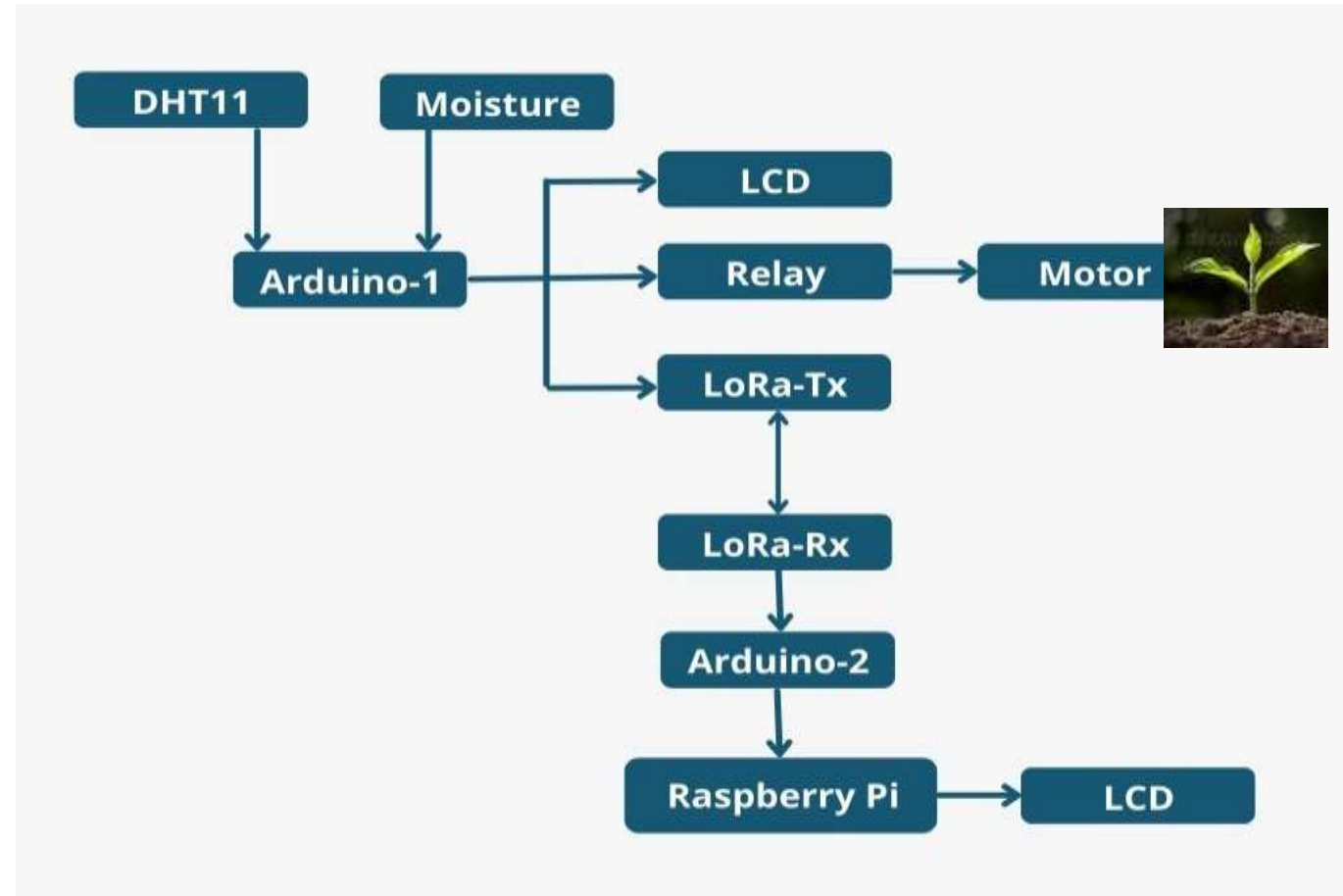
Block Diagram

- Collecting humidity, temperature from DHT11, and soil moisture from soil moisture sensor to Arduino Uno-1.
- Arduino Uno-1 commands relay to turn on pump if moisture percentage is less than 50.
- The data will be sent to receiver using Wireless Communication.

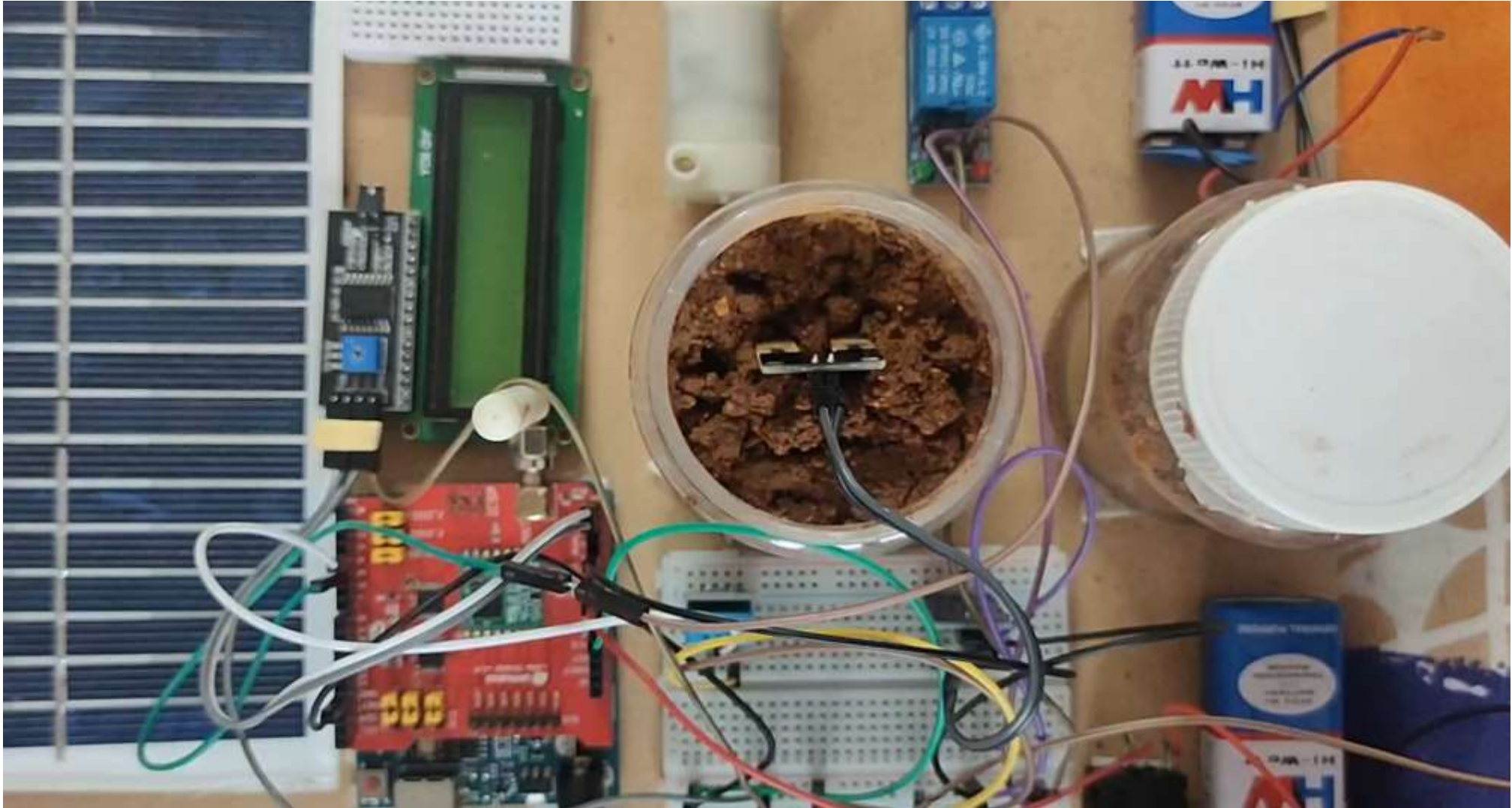


Block Diagram

- The data will be sent to LoRa Rx at **868MHz**.
- The range is a **13kms** if we use gateway.
- Arduino Uno-2 will receive data from LoRa Tx and share with Raspberry Pi using USB serial communication.
- Display the data in LCD which is connected to Raspberry Pi via I2C.



Results



YOLO V8 Model for Object Detection

- The **YOLO**(You Only Look Once) **Version 8** model is a powerful **deep learning model** designed for efficient object detection.
- It's capable of identifying objects in a single pass, making it **highly efficient**.
- To train and evaluate this model, I utilized the **COCO dataset**, which encompasses a rich diversity of object classes, including but not limited to **persons, dogs, cats, cow, sheep**, and many more, totaling **91 categories**.

Future scope of evaluation

- Our objective is to **fine-tune** the model to exclusively detect specific objects: **persons, cats, dogs, cows, sheep, bicycles, and motorcycles**.
- Whenever the model **identifies** any **motion** involving these objects, an **alarm** notification will be sent to the user.

Conclusion

- Irrigation is initiated based on soil moisture levels, with the Arduino **autonomously controlling** the pump's operation.
- The farmer can conveniently monitor the farm **remotely** from their home.
- The system employs **solar energy** harvesting techniques for power efficiency.
- Additionally, it incorporates **computer vision** for detecting trespassers and issuing **alert messages** when unauthorized individuals are detected.

References

- [THILAGAVATHI, S., AISHWARYA RAJENDRAN, and K. PRIYADHARSHINI. "AUTOMATIC PLANT IRRIGATION SYSTEM." \(2016\).](#) [Reference 1]
- [S.Parthiban & V.P.Santhi & M.S.Snehapriya & K.Indumathi & P. Masilamani. "Recent Advances in Enhancing the Productivity of Mango through Hi-tech Practices." \(2020\)](#)[Reference 2]
- [Biswas, B., and Lalit Kumar. "Revolution of Mango production." Fertilizer Marketing News \(2011\): 1-24.](#) [Reference 3]

Questions?