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ADVANCED TECHNOLOGIES FOR ANIMAL MONITORING AND WATER RESOURCE MANAGEMENT

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Project No : 69 & 22
Domain : Smart Agriculture
Domain Lead : CVSN sir & Harsha BK sir
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Introduction

- The smart rover is an advanced agricultural tool designed to automate farm management tasks, including monitoring soil moisture levels and protecting crops from animals. The rover will roam around the farm, check the moisture of the plants, and release the required amount of water. Additionally, it will detect animals at night and take measures to protect the crops.

Problem Statement

- More scarcity of water and lot of damage of crops by animals

- Literature Survey
- We manually visited Andhra Pradesh farms and spoken with farmers. They told that more water wastage and animals are going to destroying the more crops.

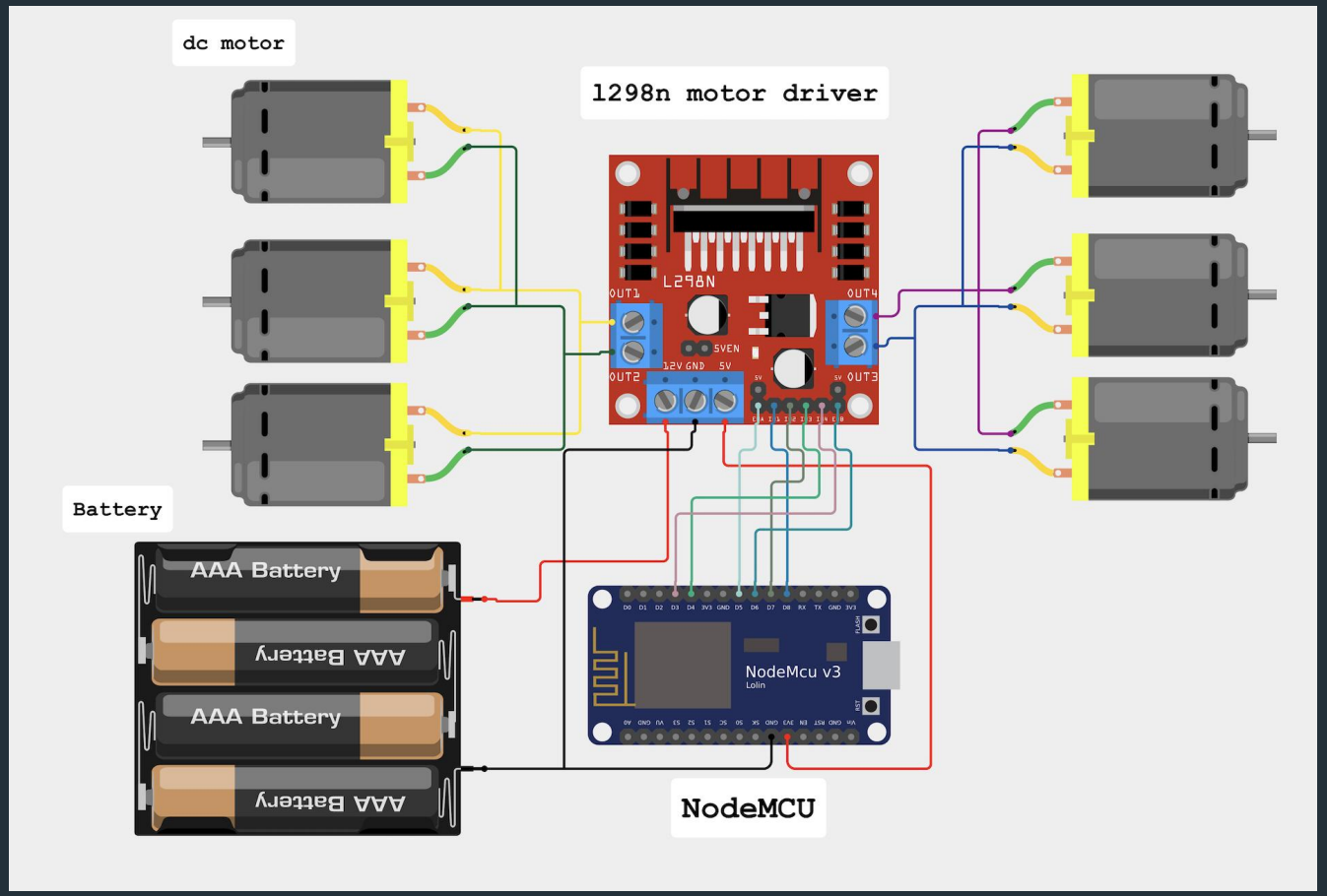
Project Requirements

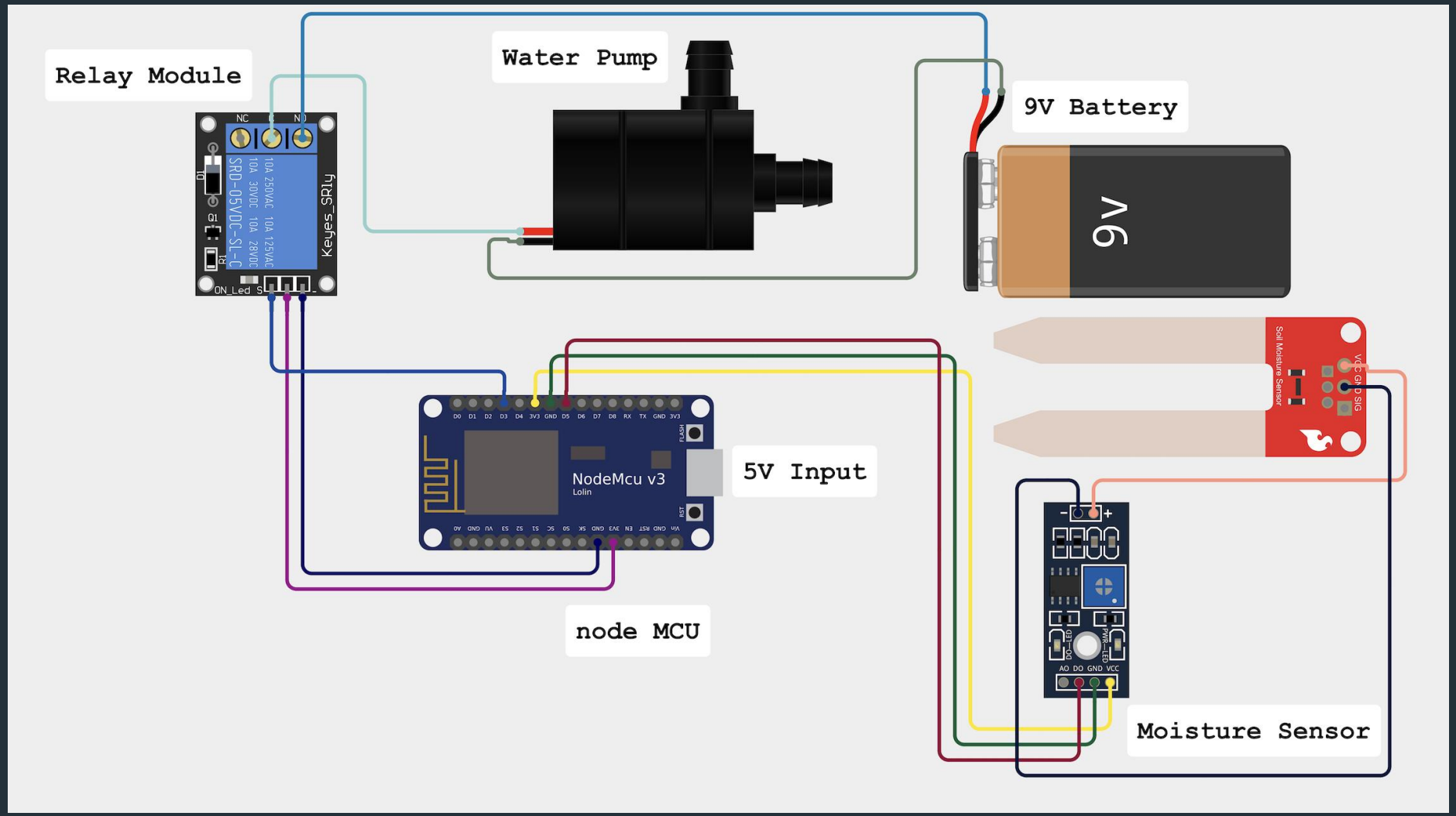
MATERIALS:

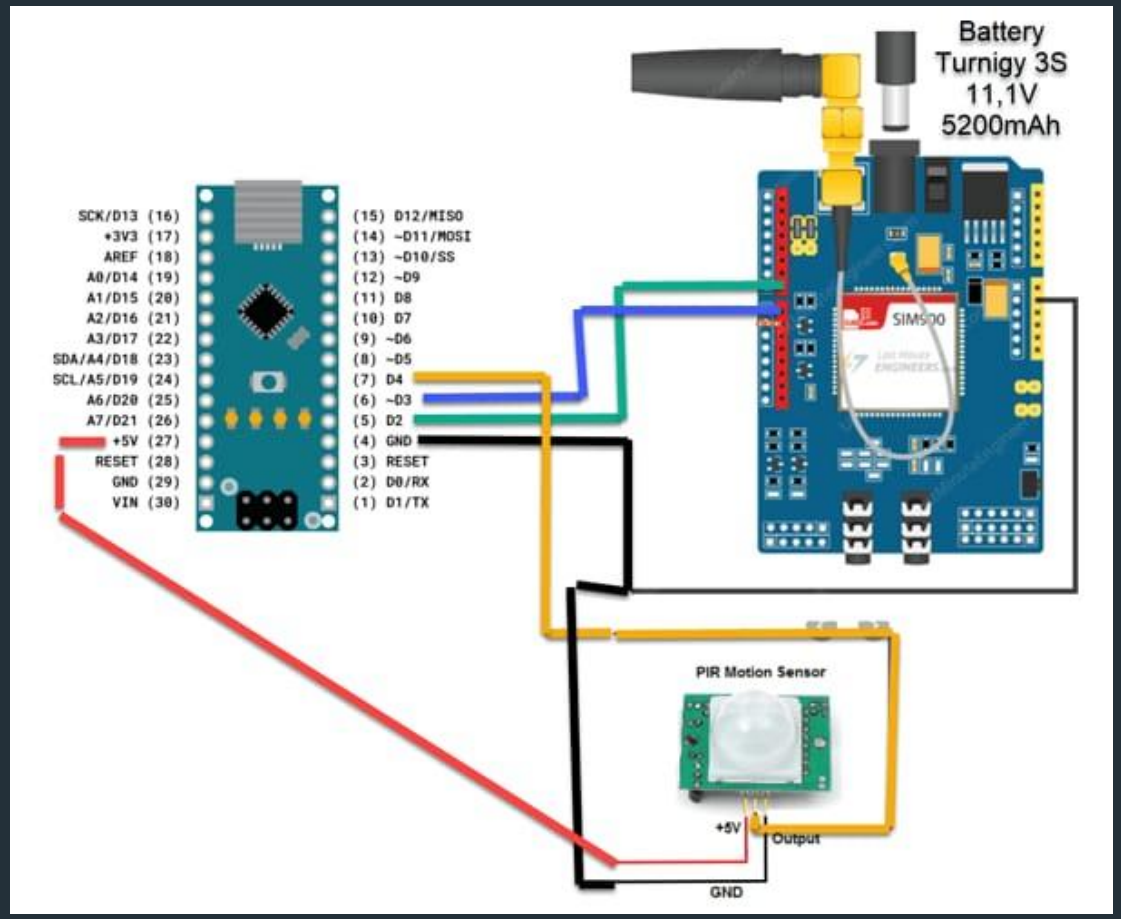
- 1.Moisture SENSOR
- 2.IOT MODULES(EX.ARDUINO,RASPBERRY PI)
- 3.ELECTRIC MOTOR
- 4.SOLAR PANEL
- 5.WHEELS
- 6.PIR AND ULTRA SONIC SENSOR
- 7.BATTERIES
- 8.NODE MCU
- 9. Notification system components(eg. SPEKERS,BUZZER)
- 10.LASER LIGHT
- 11.TRANSMETER
- 2.HEAD LIGHTS
- 13.FRAME

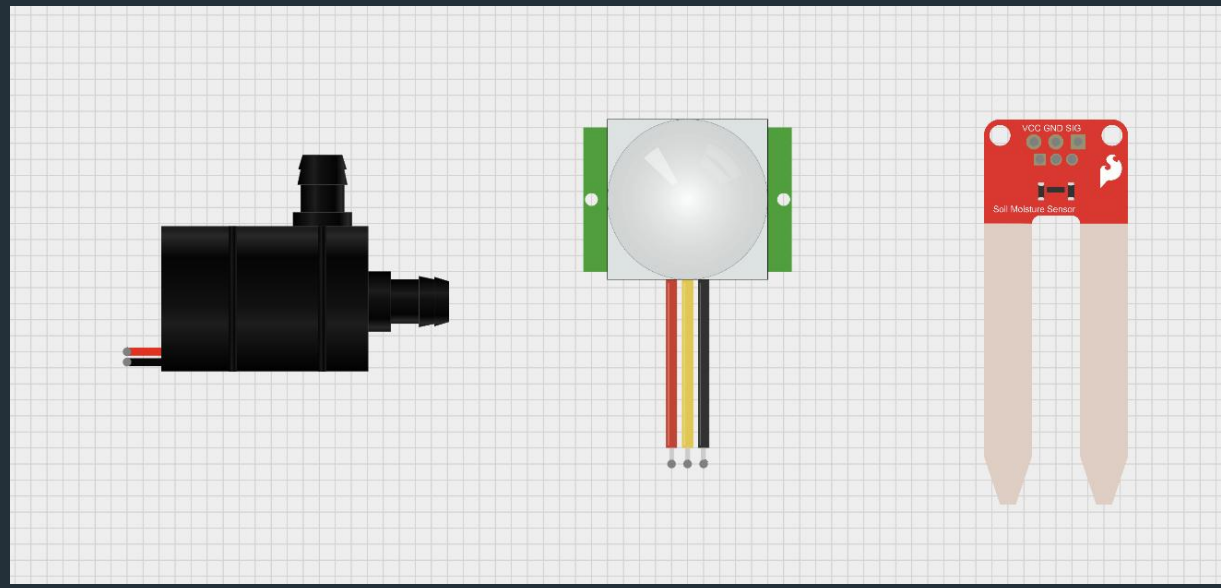
We are building a six–wheel smart rover that moves around the farm, equipped with a moisture sensor and a PIR sensor. The moisture sensor checks the soil moisture levels and predicts the amount of water each plant needs. The rover then delivers the precise amount of water to each plant, reducing water wastage and addressing water scarcity issues. The PIR sensor, which rotates on the rover, detects animals at night. Upon detecting an animal, it sends a notification to the farmer and automatically activates a buzzer. The sound of the buzzer scares the animals away from the farm. This system eliminates the need for farmers to stay at the farm at night to protect their crops, thereby reducing crop damage caused by animals.

Project Design




Relay Module
Water Pump
9V Battery
9v
NC
NO
SRD-05VDC-SL-C
Keyes_SRly
ON_Led S
NodeMcu v3
Lolin
5V Input
node MCU
Soil Moisture Sensor
VCC GND SIG
AO DO GND VCC
Moisture Sensor


Battery
Turnigy 3S
11,1V
5200mAh
SCK/D13 (16)
+3V3 (17)
AREF (18)
A0/D14 (19)
A1/D15 (20)
A2/D16 (21)
A3/D17 (22)
SDA/A4/D18 (23)
SCL/A5/D19 (24)
A6/D20 (25)
A7/D21 (26)
+5V (27)
RESET (28)
GND (29)
VIN (30)
(15) D12/MISO
(14) ~D11/MOSI
(13) ~D10/SS
(12) ~D9
(11) D8
(10) D7
(9) ~D6
(8) ~D5
(7) D4
(6) ~D3
(5) D2
(4) GND
(3) RESET
(2) D0/RX
(1) D1/TX
SIM800
PIR Motion Sensor
+5V
Output
GND


VCC GND SIG
Soil Moisture Sensor

Implementation

- We are building a six-wheel smart rover designed to autonomously manage farm irrigation and protect crops from animals. The rover is equipped with a moisture sensor and a PIR sensor, each serving a specific purpose.

- Moisture Sensor Implementation:

- Installation: The moisture sensor is integrated into the rover's body.
- Operation: As the rover moves around the farm, the moisture sensor periodically checks the soil moisture levels.
- Water Prediction and Delivery: Based on the sensor readings, the rover calculates the precise amount of water each plant needs. It then activates the water delivery system to pour the required amount of water to each plant, minimizing water wastage and addressing water scarcity issues.
- PIR Sensor Implementation:

- Installation: The PIR sensor is mounted on the rover with a rotating mechanism to cover a wider detection area.
- Operation: During the night, the PIR sensor actively monitors the farm for any animal movement.
- Detection and Alert: When the sensor detects an animal, it sends a notification to the farmer via a communication module.
- Buzzer Activation: Simultaneously, the rover activates a buzzer to scare away the detected animals. The loud noise ensures the animals run away from the farm.
- System Integration:

- Control Unit: A microcontroller processes data from both sensors and controls the water delivery system and buzzer.
- Communication Module: This module ensures that notifications are sent to the farmer in real-time whenever an animal is detected.
- Power Supply: The rover is powered by a robust battery pack to ensure continuous operation throughout the night and during its irrigation task

Results and Achievements

Reduced Water Usage:

The smart rover monitors soil moisture levels to optimize irrigation schedules, ensuring crops receive the right amount of water at the right time, leading to more efficient irrigation and reduced water usage.

Enhanced Wildlife Monitoring:

Using PIR sensors, the rover detects animals in agricultural fields. This allows farmers to monitor wildlife activit assess its impact on crops, and reduce crop damage through timely interventions.

Lessons Learned

Machine Learning:

We gained experience in implementing machine learning algorithms to analyze sensor data and optimize irrigat schedules.

Hardware–Software Integration:

We learned how to seamlessly connect sensors and actuators with control software, ensuring smooth communication and operation.

Teamwork:

The project underscored the importance of effective collaboration, clear communication, and task delegation.

IoT:

We saw the benefits of IoT in agriculture, using connected sensors and devices to manage farm activities remotely.

Future Enhancements

- Potential future enhancements or features
- Comming years Farmers are decreasing so by this food shortage will be there to reduce that by samrt Agriculturing process a family can maintain their own form
- Areas for improvement
- Adding LLM

.Imroving applcations on Smart Agriculturing

.Implementng Artifical intilligence in Smart Agriculturing

Contributions

Team 69

- Built a Rover body
- Rover code (Half part)
- Connections for Moisture sensor
- Machine learning code and PIR (Half part)

Team 22

- Rover connections
- Rover code (Reamining part)
- Connections for PIR Sensor
- Machine learning code and PIR (Reamining part)

Conclusion

Preservation of Ecosystem Health: Water conservation practices promoted by the bot contribute to the preservation of ecosystem health by maintaining natural water cycles and supporting biodiversity in aquatic and terrestrial habitats Optimized Water Management : By conserving water and ensuring efficient irrigation, the bot helps maintain optimal soil moisture levels for crop growth, resulting in improved agricultural productivity and crop yields Lower Crop Losses: Timely detection and intervention in response to animal intrusion help minimize crop losses and damage, thereby reducing economic losses for farmers and enhancing agricultural profitability

References

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https://www.w3schools.com/python/python_ml_linear_regression.asp

Questions and Discussion

We are developing a robotic hand for smart agriculture to assist with tasks like planting and harvesting, enhancing automation and efficiency. Additionally, we plan to integrate Large Language Models (LLMs) to analyze agricultural data, optimize resource usage, and provide real–time insights and decision support to farmers. These advancements aim to further improve water efficiency and crop protection in our smart agriculture system.

Thank you