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IOT Based Solar Tracker Robot with Smart Irrigation System

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I. Introduction

Existing Solutions
Existing irrigation solutions:-

- Surface Irrigation Systems
- Flood Irrigation
- Border Irrigation
- Sprinkler Irrigation Systems

All of which are non efficient and water loss in each case very high in a country with such high population water loss is not affordable. So this robot uses drip irrigation technology for minimal water loss.

Existing solar energy systems are either one axis or fixed at a particular angle and cannot be used when the automobile is running this is overcome by this robot which continuously checks for the maximum possible sunlight during the daytime.

Proposed solution

- We have made a robotic car which is driven by solar energy.
- In order to gather the solar energy a 3D solar tracking zenith angle detector with dual-axis rotation has been made whose function is to rotate automatically in 3D space according to the position of the sun , measuring the zenith angle to consume the maximum amount of energy possible.
- The robot has a moisture sensor to measure the amount of dryness of soil by moving around the field. Based on the output of the sensor, a moisture content map of the land to be irrigated is made (similar to what is done in a heat map but instead of heat it is moisture content).
- We also measure the water quality and whether its fit for irrigation

Proposed solution

- That's how just by backtracking we can also find those areas in field facing problem on account of dryness.

We have also tried to make our vehicle smart by connecting our vehicle to the google firebase which is an online database where the data collected like the zenith angle and soil moisture content value is stored for further analysis.

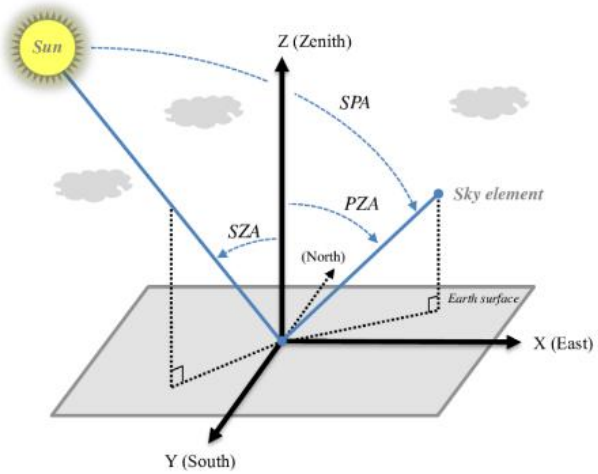
To make the vehicle interactive , we have designed an app using MIT app inventor through which we can control the vehicle's movement and also get the instantaneous readings of the various sensors used. For all such internet connectivity we have used NodeMcu based on the esp-8266

Components Used:-

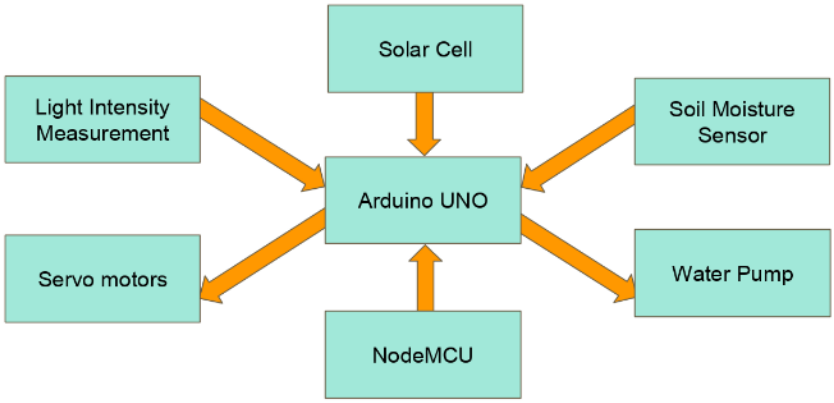
- **Arduino UNO**
- **NodeMCU**
- **Solar Cell**
- **LUX Sensor:TSL2561**
- **Light Dependant Resistor(LDR)**

- **Soil Moisture Meter**
- **Servo**
- **Water pump**

Zenith angle detector



Block Diagram



Description of Block Diagram

- The LUX and Light Dependant Resistors(LDRs) sense the intensity of light and send data to the Arduino.
- The Arduino reads the data and accordingly adjusts the facing of the Solar Cell by rotating the two Servo motors. This ensures that the Solar Cell is able to trap maximum of the available energy, using which the robot car is driven.
- The soil moisture sensor senses the moisture content of the soil, and sends this data to the Arduino.
- The Arduino reads this data. Based on all such data , a moisture map which is presented through a graph on the web.
- Based on such map , the farmer can decide which specific areas require water supply thus saving water wastage on already moist soil.
- The NodeMCU communicates with the mobile application designed for this purpose via the Wifi SoC ,sending the sensor values. The mobile application gives instruction to start or stop working.

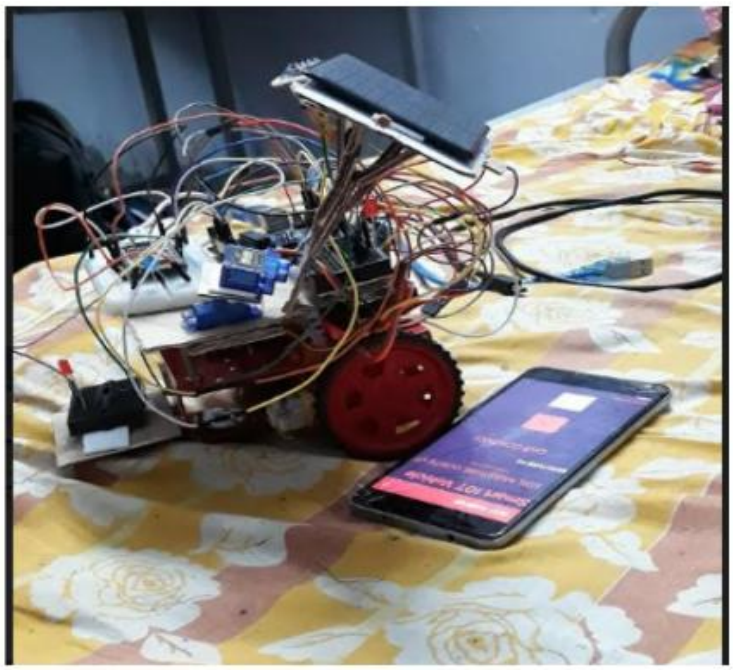
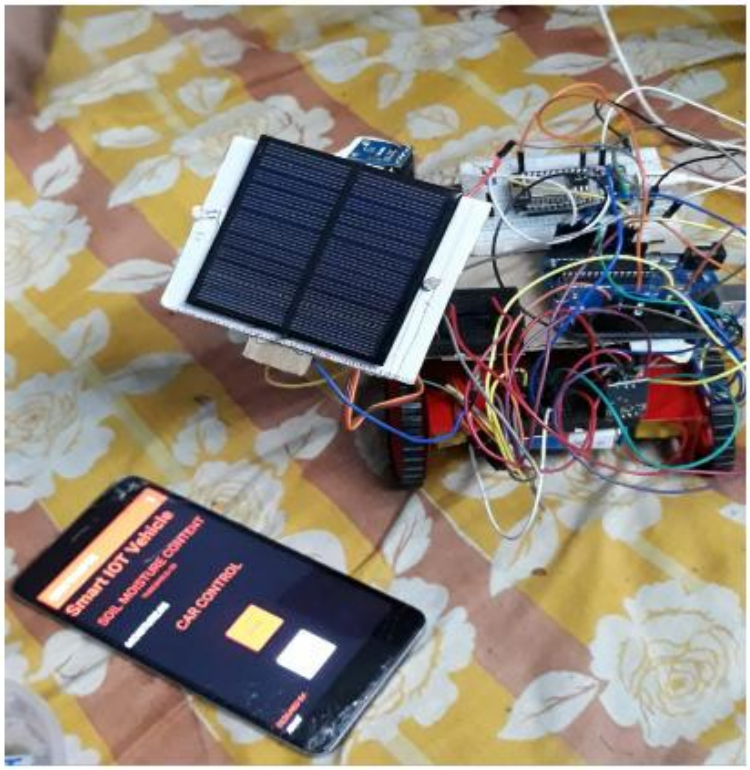
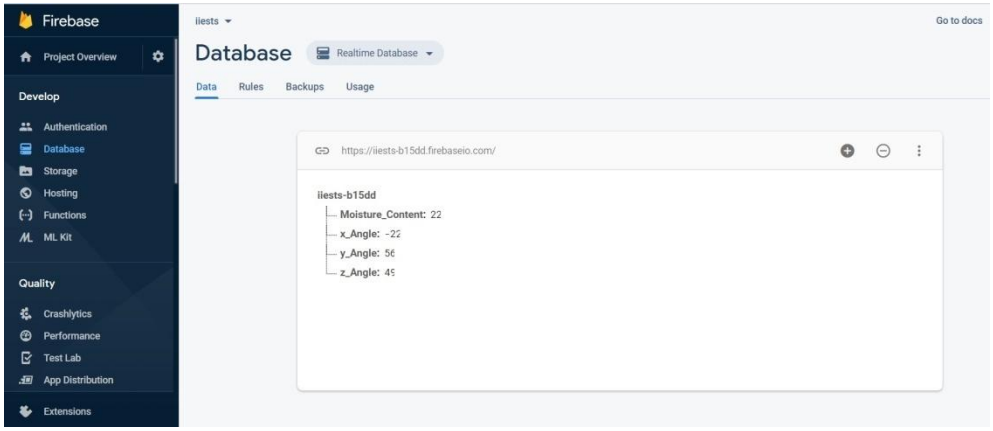


IMAGE OF THE BOT





Firebase Data for our cloud storage

Innovation or Uniqueness of the solution

This is a multi-purpose bot which can perform the task of irrigation and solar tracker at the same time. It would provide the farmer with the arears in the field where there is water shortage and even the necessary conditions like the sunlight radiation.

Mositure content map of the land area is made enabling the farmer to water only those areas which are to watered.

This can be run for the entire day still the solar energy will be trapped and used for its motion.

A low cost IoT based system which can perform all the task on its own, the farmer needs to show the field only once as it is programmed with backtracking and memory map.

Impact or Usefulness of the solution

It is estimated that around 40 per cent of piped water in India is lost to leakage.

Only 7% of total energy production is from solar power.

Drip irrigation advantages:-

- consumes less water and serves more land.
- no need of labor for watering.
- easy to give fertilizers to crops.
- easy to control weeds.
- reduces wastage of fertilizers.

This robot will provide a useful solution to all of these problems pertaining in India. Farmers work will be minimised and the solar energy will be utilised for the purpose of energy generation which will give maximum value as the sun will be tracked for the entire day.

II. Summary

Our robot attempts to minimize waster wastage during irrigation and by enabling IOT technologies the lives of farmer becomes much easier who without having to check the moisture contents manually can get the readings and other sensor values on the the app that we have designed . Not only our robot will simplify the farmers life but with data stored in data base, further processing maybe done by scientists and professionals who can analyse the moisture retaining capability of soil , solar intensity received by the land concerned. Thus we try to provide a cheap and eco-friendly solution to which can help the agricultural sector.

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