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Soil Moisture Sensor

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ABSTRACT:

Soil moisture sensors measure the volumetric water content in soil.Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighing of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content.The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners.

Keywords: Soil, Requirement, Agriculture, Moisture.

1. Introduction

About the project:

Soil moisture plays a crucial role in agriculture, gardening, and environmental monitoring. Monitoring and managing soil moisture levels are essential for ensuring the optimal growth of plants, conserving water resources, and preventing soil erosion. In this project, we present a comprehensive overview of our endeavor to create a Soil Moisture Sensor system using Arduino, a versatile microcontroller platform, to

address these critical needs. The soil moisture detector is a simple device for measure the moisture level in soil and similar materials. The soil moisture sensor is straight on to use. The two large expose pads function as probes for the sensor, together acting as a variable resistant. The more water that is in the soil or any other material means the better the electricity between the pads will be and will result in a lower resistant. To get the soil moisture sensor function we need to connect the VCC and GND pins to your Arduino-based device and you will receive a SIG out which will be conditional on on the amount of water in the soil..

OBJECTIVE:

1. Optimize irrigation practices for water efficiency.
2. Monitor and improve crop health by preventing overwatering or underwatering.
3. Conserve water resources in agriculture and landscaping
4. Reduce energy costs in automated irrigation systems.
5. Aid in environmental monitoring and research.
6. Enhance safety by detecting soil moisture-related risks.
7. Facilitate research and experimentation in soil science.
8. Support water resource management in regions with water scarcity.

II. SYSTEM ANALYSIS

Existingsystem:

In this project, we present a comprehensive overview of our endeavor to create a Soil Moisture Sensor system using Arduino, a versatile microcontroller platform, to address these critical needs. Portable probe instruments can be used by farmers or gardeners.

Disadvantages:

- Soil moisture sensors might not be precise in the clay soils. Clay soils can be the skew readings due to their dense, compact nature, leading in to incorrect data.
- Regular calibration is the necessary property for these sensors to ensure accurate readings. Without it, the data can become unreliable and misleading.

Proposed system:

Soil moisture sensors is used to measure the amount of water in the soil. They can be used to automate the process of monitoring moisture levels in the soil . Soil moisture sensors can help farmers to manage their crops, reduce labour costs and improve crop yield. They can also help fermers reduce the amount of water that is wasted.

Advantage:

- Soil moisture sensors help in boosting plant health by ensuring they receive the sufficient amount of water, preventing both dehydration and waterlogging.
- They play a major role in water conservation, as they provide accurate data on soil moisture and allowing for efficient usage of water.

III. SYSTEM METHODOLOGY

- Arduino Uno
- Jumper wires
- Motor drive
- Soil moisture sensor
- LCD Display 16x2
- 5V Relay Module

Arduino Uno:

Arduino Uno is a micro controller board based on the ATmega328P (datasheet). It has 14 digital input and output pins 6 analog inputs , a 16 MHz quartz crystal, a USB connections, a power jack, an ICSP header and a reset buttons. It contains everything needed to keep up the microcontroller;

simply join it to a computer with a USB cable or battery to get started. Uno" means one in Italian and was select to mark the release of Arduino Software (IDE) 1.0. The Uno board of Arduino Software (IDE) were the comment on versions of Arduino, now evolved to newer release. The Uno board is the first in a serie of USB Arduino boards, and the reference model for the Arduino platform; for an large list of current, past or outdated boards see the Arduino index of board.

Jumper Wires:

A jump wires (also known as jumper, jumper wire, DuPont wire) is an electrical wire, or category of them in a cable, with a coupling or pin at each end (or sometimes without them – simply "tinned"), which is normally used to inter connect the component of a bread board or other proto type or test circuit, privately or with other appliances or components, without soldering. Individual jump wires are fitted by inserting their "end connector" into the slots provided in a bread board, the title connectors of a circuit board, or a pieces of test appliances.

Motor Drive:

The L298 is a integrated monolithic circuit in a 15- lead multiwatt and PowerSO20 packages. It is a high voltage, high current and dual full-bridge driver. it is designed to accept standard TTL logic levels and drive reactive loads such as relays, solenoids, DC and stepping motors. Two authorize inputs are provided to allow or damage the device independently on the input signals. The emitters is a lower transistors of all bridge are join together and the corresponding external terminal all so be used for the connection of an external sensing resistor. An additional supply input is provided so that logic works at a lower voltage

Soil moisture sensor :

The sensor contains a fork-shaped probe with two big exposed conductive pads. It isused to measure or estimate the amount of water in the soil. These stationary sensor are placed at the predetermined location and depths in field.

LED display:

The term LCD stands for liquid crystal display. It is one of the electronic display module which is used in an extensive range of applications like various circuits & devices. such as mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred as multisegment light-emitting diodes

and seven segments. The main benefits of using this module is inexpensive, simply programmable, animations and there is no limitations for displaying custom characters, special and even animations, etc,

IV. CONCLUSION:

Soil moisture sensors is a prized tools for observe and managing soil condition in various applications, including agriculture, horticulture, environmental research, and more. They offer insights into soil moisture levels, enabling informed decisions about irrigation, resource management, and crop health. However, it's essential to recognize their limitations, such as depth restrictions, sensitivity to soil type, and calibration requirements, to ensure accurate and reliable data.

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