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SMART AGRO FARM GUARD AND IRRIGATION CONTROL

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Abstract: Nowadays, farming is the biggest challenge so, this idea is proposed. It uses sensors and Arduino technology to water plants efficiently. a sensor is inserted in the soil to check moisture levels and another in a water tank to pump water to the plants. This system replaces manual watering with an automatic one. With the soil sensor, it knows when the soil is dry and controls the water pump accordingly. It's like having a smart brain for watering plants! Also, this system can help keep animals away from crops. If animals come near, it sets off an alarm and sends a message to the farmer's phone. This helps farmers protect their crops from damage.

I. INTRODUCTION

Agriculture is all about growing crops and raising animals. It provides food, fabrics, wood, and other essentials. Different places have different methods and products. Many people depend on farming for their livelihoods. But, traditional techniques aren't always efficient, leading to low crop yields. Wild Animal damage is a big problem too. To tackle these issues, we can use advanced sensors and controls. For example, we can scare animals away from fields using ultrasonic sensors, speakers, and lasers. Also, most of the world's water is used in agriculture, and with a growing population, the demand for food is increasing. So, it's important to use smart technologies like automated irrigation systems to save water and reduce labor. These systems turn on and off based on soil moisture, cutting down on water waste and costs.

II. METHODOLOGY

2.1 Block diagram

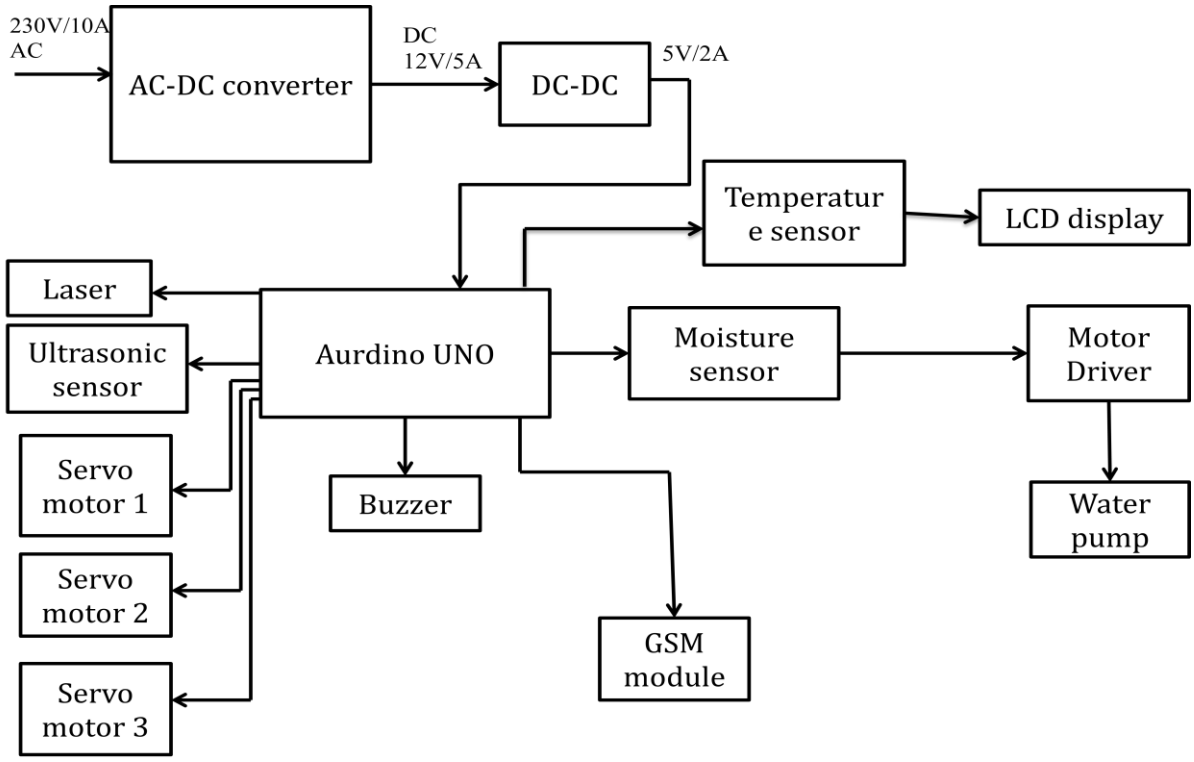

fig. 2.1 block diagram

The ultrasonic sensor detects the intrusion of wild animals into the farm, immediately sending a signal to the arduino, which activates the components in the system. The buzzer produces a sound, and the tiger statue starts moving with the help of a servo motor. An alert message is then sent to the farmer's mobile using the GSM module. The system can also be used for irrigation purposes. The moisture sensor detects the water content in the farm. If the water is insufficient, it automatically turns on the water pump and turns it off when the desired level is reached. The Temperature sensor measures the humidity level of environment displaying the percentage of humidity and temperature on the LCD display.

The main hardware components are:

Arduino uno

Ultrasonc sensor

Servo motor

GSM module

Laser

Buzzer

Moisture sensor

A. ARDUINO UNO

Arduino is the microcontroller board based on the ATmega328P. The operating voltage is 5V. It contains total 14 digital input-output pins. The oscillator frequency is 1 MHz. All the necessary components to help the microcontroller function are included. Just connect it to a computer using a USB cable. It consists of 6 analog input pins.

In this project aurdino is used to receive the signal from ultrasonic sensor and moisture sensor and to perform the certain predefined task. The diagram of Arduino is as shown in fig 2.1

Features

- Operating voltage is 5v
- DC per input pin is 40mA.
- Clock speed 16MHz.
- DC for 3.3v pin is 50mA.
- SPAM 2 KB
- EEPROM 1KB

fig2.1:Aurdino. UNO

B. ULTRASONIC SENSOR

An ultrasonic sensor is a tool that measures how far away an object is by using sound waves that humans can't hear. It sends out these sound waves and then listens for them to bounce back from the object. The sensor has two parts: a transmitter that sends out the sound waves, and a receiver that picks them up after they've bounced off the object. In this project ultrasonic sensor in used to sense the wild animals in the agricultural land. Diagram of the ultrasonic sensor is shown in fig. 2.2

Specifications

- Power Supply: DC 5V
- Working Current: 15mA
- Working Frequency: 30Hz to 500kHz
- Ranging Distance : 2cm – 400cm/4m
- Resolution : 0.3 cm
- Measuring Angle: 15 degree
- Trigger Input Pulse width: 10uS

fig 2.2: Ultrasonic sensor

C. SERVO MOTOR

A servomotor is a remarkable electromechanical device that operates based on signals it receives. Unlike simpler motors, it's part of a closed-loop system, meaning it continuously receives feedback about its position to precisely control its movement and final position. This feedback ensures accuracy in its operations. The control signal it receives can be either analog or digital, representing the desired position for its output shaft. Servomotors are renowned for their high performance, often chosen over stepper motors when precision and reliability are crucial. In practical applications, servomotors are utilized in various fields, including robotics, automation, and mechanical systems requiring precise motion control. In this project, servomotor is used to animate parts of a tiger statue and to control the movement of an ultrasonic sensor mounted on it, showcasing the versatility and effectiveness of this electromechanical component. The Diagram of the servo motor is shown in fig 2.3

fig 2.3 Servo motor

D. GSM MODULE

GSM module is a device that allows electronic devices to communicate using the same networks that cell phones use. It's like a little phone inside your device. When you send it a message or make a call, it uses a SIM card to connect to a cell tower and then sends or receives the information just like a regular phone. This allows devices to send alerts, messages, or even make calls remotely, making them useful for things like remote monitoring, security systems, or controlling devices from afar. A diagram of the GSM module is shown in fig 2.4

fig. 2.4:gsm module

E. LASER

A laser (which stands for Light Amplification by Stimulated Emission of Radiation) is a device that produces a concentrated beam of light. It works by stimulating atoms or molecules to release photons in a specific direction and at the same frequency. The diagram of Laser is shown in the figure 2.5.

fig 2.5 Laser

F. BUZZER

A buzzer is a simple electronic device that produces sound when an electrical current passes through it. It typically consists of a coil of wire wrapped around a magnetic core, a vibrating diaphragm, and a housing.

In this project the buzzer is used to scare the wild animals by producing the sound.

The diagram of buzzer is shown in fig 2.6

Specifications

- Color is black
- The frequency range is 3,300Hz
- Operating Temperature ranges from – 20° C to +60°C
- Operating voltage ranges from 3V to 24V DC

The sound pressure level is 85dBA or 10cm.

fig 2.6:Buzzer

- The supply current is below 15mA

7. MOISTURE SENSOR

A moisture sensor operates by measuring the conductivity of the material it is inserted into, typically soil. It consists of two metal probes that are inserted into the soil, and when the soil is dry, it has low electrical conductivity due to less water present to conduct electricity. In this project moisture sensor is used to detect the water level in the farming land. The diagram of moisture sensor is shown in fig 2.7

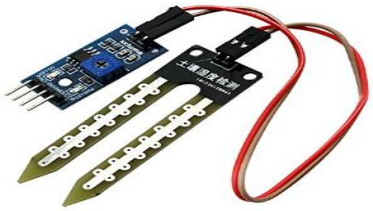

fig. 2.7 Moisture sensor

APPLICATION

- Smart agro farm guard and irrigation control systems can be used in public parks and gardens to maintain healthy plant growth while conserving water.
- Smart agro farm guard and irrigation control systems can be used in agriculture to optimize water usage, increase crop yields, and reduce labor costs.
- This system is implemented in agricultural land to reduce the wild animal intrusion.

G. CONCLUSION

In this proposed module an effort has been made to detecting the presence of animals or human beings such that the farmers could be saved from bearing the expense of the damaged crops. This initiative if executed systematically might prove to be helpful in improving the feeble financial conditions of the farmers.

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