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AUTONOMOUS BOT FOR AGRICULTURE

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Abstract*— Agricultural is one of our most important industries for providing food, feed, and fuel necessary for our survival. Certainly, robots are playing an important role in the field of agriculture for the farming process autonomously. Normally, the farming process includes plowing, seeding, and cultivating. All these processes are not being done by using a single robot. The proposed system focuses on implementing all the farming processes. In India, nearly about 70% of people are dependent upon agriculture. So, the agriculture system in India should be advanced to reduce the efforts of farmers. Various operations are performed in the agriculture field like ploughing, seeding, and pesticide spraying, etc. Very basic and significant seed on precision agriculture concept is the newly emerging technology. The main reason behind the automation of farming processes is saving the time and energy required for performing repetitive farming tasks and increasing the productivity of yield by treating every crop individually using the precision farming concept. Designing such robots is modeled based on a particular approach and certain considerations of the agriculture environment in which it is going to work. These considerations and different approaches are discussed in this system, also the prototype of an autonomous.

Keywords*—Arduino UNO, Ultrasonic sensor, DC Motor, HC-05 Bluetooth Module, L928 Motor Driver, Solar Panel.*

1. INTRODUCTION

The agriculture sector reduces the dependency on manpower by doing the works automatically and also enables the ladies and some disabled persons to do farming. Autonomous on-field guidance is to guide the vehicle following crop rows without over run-on crops. Food is the basic necessity of mankind Smarter world is the result of smarter technology. Agriculture was implemented in the nine of sedentary human civilization and it is the backbone of our Indian Economy. Today scarcity of manpower became the main threat. There has been a tremendous increase in population over the past decade around the globe. This notifies that due to the increase in population there has been a problem of food shortage in developing as well as developed countries. Robots are non-tiring, non-emotional objects which are high in precision and accuracy and are known for repeatability Robots may be staffed in place of workers in farms for future commercial farms. These robots will identify, sprinkle and pick individual pieces of produce from plants, even when their targets are producing rice and wheat in the agriculture fields. Many driverless tractors have been developed in past by the engineers. But these tractors have failed to have an ability to embrace the complexity of the real world. Scientists in past had assumed agriculture farming robots as industrial robots such that, everything was known beforehand where machines would work in predefined ways- such that robots which work on the production line. But now new approaches and trends are to be studied which would not only upgrade the existing agriculture robots but would also help in complete autonomous farming. These smart machines would now be intelligent enough to work in an unmodified or semi-natural environment. Today more and more lands are being developed for the production of a large variety of crops.

2. EXISTING SYSTEM

Nowadays, the Agriculture field they are using many robots for using single purpose. Manpower is required for operating machines and navigation also. It can control through Bluetooth; Operating distance is limited. We extend the operating distance. It requires more components so the cost is also high.

3. BLOCK DIAGRAM

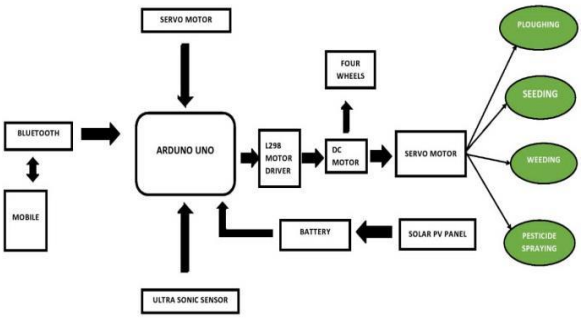

FIGURE 1: BLOCK DIAGRAM OF THE SYSTEM

The project is implemented using Arduino Uno, Ultrasonic sensor, HC-05 Bluetooth module, L928 Motor Driver, Solar panel, Servo motor, DC motor, Battery.

4. SIMULATION MODEL

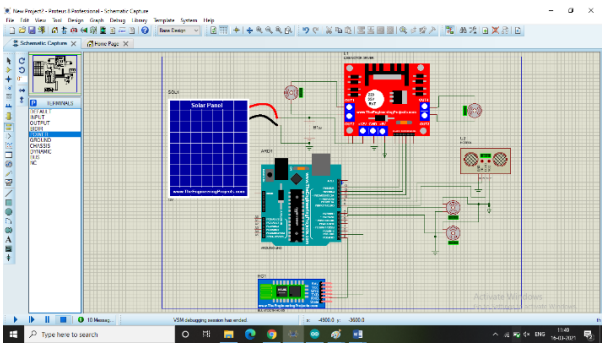

FIGURE 2: SIMULATION MODEL

5. METHODOLOGY

A. ARDUINO UNO

In Our project, we are using the Arduino UNO microcontroller. Arduino is an open-source computer hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical and digital world. **It acts as the brain of the project. It controls all the devices.** Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) or Breadboards (other circuits on them). Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller, simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, in the worst-case scenario you can replace the chip for a few dollars and start over again. ―Uno‖ means for one in Italian and was chosen to mark the release of Arduino Software(IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards and the reference model for the Arduino platform. (IDE = integrated development environment).

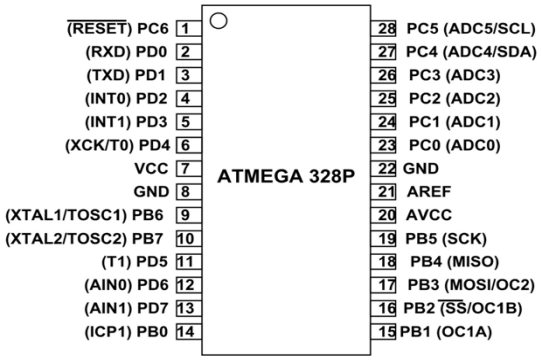

FIGURE 3: PIN DIAGRAM OF ATMEGA 328P

B. ULTRASONIC SENSOR

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound. HC-SR04 is an ultrasonic ranging module that provides a 2 cm to 400 cm non-contact measurement function. The ranging accuracy can reach 3mm and the effectual angle is < 15°. It can be powered by a power supply. **In this project, it is used to identify the obstacles in the field and sends the trigger to a microcontroller.**

FIGURE 4: ULTRASONIC SENSOR

C. HC-05BLUETOOTH MODULE

The **HC-05** is a very cool module that can add two-way (full-duplex) wireless functionality to your projects. You can use this module to communicate between two microcontrollers like Arduino or communicate with any device with Bluetooth functionality like a Phone or Laptop. Many android applications are already available which makes this process a lot easier. The module communicates with the help of USART at a 9600 baud rate hence it is easy to interface with any microcontroller that supports USART. We can also configure the default values of the module by using the command mode. So if you looking for a Wireless module that could transfer data from your computer or mobile phone to a microcontroller or vice versa then this module might be the right choice for you. However, do not expect this module to transfer multimedia like photos or songs; you might have to look into the CSR8645 module for that.

FIGURE 5: HC-05 BLUETOOTH MODULE

D. L928 MOTOR DRIVER

This **L298N Motor Driver Module** is a high-power motor driver module for driving DC and Stepper Motors. This module consists of an L298 motor driver IC and a 78M05 5V regulator. **L298N Module** can control up to 4 DC motors, or 2 DC motors with directional and speed control.

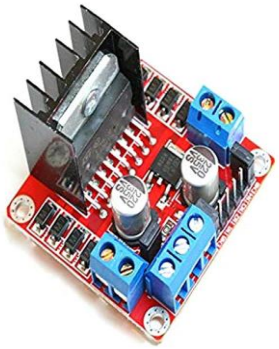

FIGURE 6: L928 MOTOR DRIVER

E. DC MOTOR

A 12V DC motor is any of a class of rotary electrical motors that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in a part of the motor. It controls the wheels of the vehicle.

FIGURE 7: DC MOTOR

F. SERVO MOTOR

A servo motor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity, and acceleration. **It consists of a suitable motor coupled to an ultrasonic sensor for position feedback**

FIGURE 8: SERVO MOTOR

G. SOLAR PANEL

Solar panels are those devices that are used to absorb the sun's rays and convert them into electricity or heat. A solar panel is a collection of photovoltaic cells, which can be used to generate electricity through the photovoltaic effect. A solar panel works by allowing photons, or particles of light, to knock electrons free from atoms, generating a flow of electricity. **We are using a 10W, 12V solar panel for generating power.**

FIGURE 9: SOLAR PANEL

H. BATTERY

A twelve-volt battery has six single cells in series producing a fully charged output voltage of 12.6 volts. A typical 12-volt battery used in an RV or marine craft has a rating of 125 AH, which means it can supply 10 amps of current for 12.5 hours or 20-amps of current for 6.25 hours. A battery is a device consisting of one or more electrochemical cells with external connections for powering electronic devices such as Arduino Uno, Wi-Fi (ESP8266), GPS(NEO6M), DC motors, and Servo motors.

FIGURE 10: BATTERY

6. WORKING

This project combines the following three technologies mainly robotics, embedded systems, and solar power vehicles. In this project, it doesn't need manpower to operate it can operate autonomously once turned on through signal from farmers via Bluetooth. Servo motor is used to lift the ultrasonic sensor. There are two servo motors are used. One servo motor lift is 9 grams. Another will lift 450 grams. One servo motor is the fixed front side of the vehicle. An ultrasonic sensor is used to sense the obstacles. It can rotate up to 90 degrees.it will find interrupts occur.it senses the signal to the servo motor. Another servo motor was fixed on the backside of the vehicle. Backside attachments are seeding, ploughing, and pesticide spraying. This servo motor can rotate up to 180 degrees. It contains three major systems there are one is obstacles detection system, bot navigation system, and attachment system. The obstacle detection system contains an ultrasonic sensor and micro servo motor, but once reached the end of the field the ultrasonic sensor detects and finding the path and sends the digital signal to Arduino Uno. And next bot navigation systems once received the signal from ultrasonic sensor its starts to operate based on pre-code given to Arduino board. An attachment controlling system is used to control all those attachments like ploughing pesticide spraying and seeding attachment.

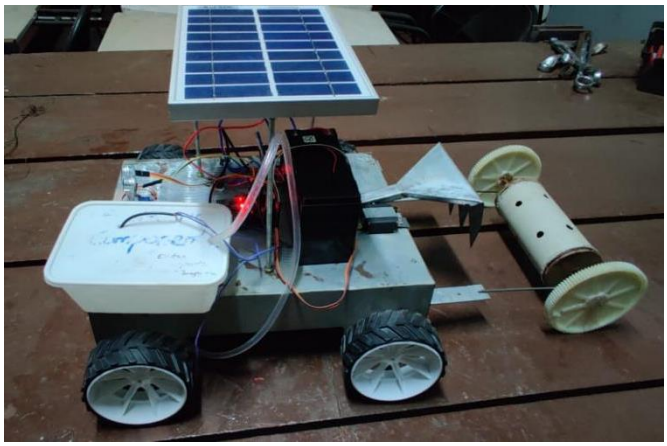

FIGURE 11: HARDWARE OUTPUTS

7. RESULTS

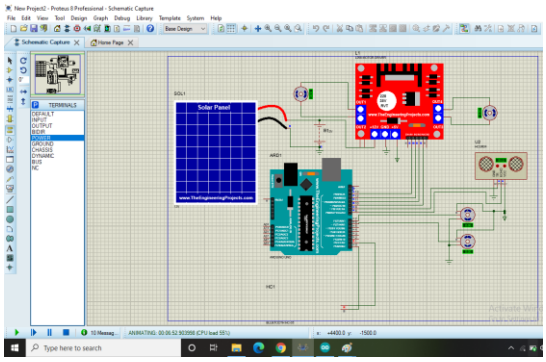

FIGURE 12: SIMULATION RESULT

8. CONCLUSION

The system is having multiple features like plowing, seeding, and pesticide spraying. And this system is overcoming the drawback of an existing system and also, it's easy to use. Hence our system is one of the innovations that help our farmers to grow, maintained, and monitor the crops.

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