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Research Article

AUTOMATIC PESTICIDE SPRAYER USING VOICE COMMANDS

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ABSTRACT

Agricultural is the backbone of our country. Because of agriculture we get food, feed and fuel necessary for our survival. Certainly, robots are playing an important role in the field of agriculture for farming process autonomously. There are serious of problems faced during the agricultural practice, such as sowing of seeds, pesticide spraying, farming, maintenance of field etc. We just gone over a wide range of technological development and found a solution for the agricultural problems. The proposed system is exclusively designed for pesticide spraying purpose and watering of plants by a single bot. So that it acts as a multifunctional one. This bot is controlled by our voice commands. So it greatly saves the farmers health preventing their direct exposure to the field. Here we used Arduino, Bluetooth model for communication.

INTRODUCTION

The robotics field is gradually increasing its productivity in agriculture field. Some of the major problems in the Indian agricultural are rising of input costs, availability of skilled labors, lack of water resources and crop monitoring. To overcome these problems, the automation technologies were used in agriculture. The automation in the agriculture could help farmers to reduce their efforts. A robotics-based guidance method is presented to guide a robot platform which is designed independently to drive through the crops in a field. Thus, the robot platform is designed in real time to guide the platform on the basis of detection of obstrucles using Ultra-Sonic sensor. The proposed system is basically developed to implement an agricultural production. This type of system is very useful in agriculture field where we need to spray the pesticide to different crops. Arduino UNO is heart of this work and the system and Arduino 1.8.6 software is used to code the algorithm**.** Using Bluetooth HC-05 for Voice command and processing the command with the help of Arduino.

Effects of Manual Spraying

Pesticides are widely used in most sectors of the agricultural production to prevent or reduce losses by pests and thus can improve yield as well as quality of the produce, even in terms of cosmetic appeal, which is often important to consumers. Pesticides can also improve the nutritional value of food and sometimes its safety.

There are also many other kinds of benefits that may be attributed to pesticides, but these benefits often go unnoticed by the general public. Thus, from this point of view, pesticides can be considered as an economic, labor-saving, and efficient tool of pest management with great popularity in most sectors of the agricultural production.

Despite their popularity and extensive use, pesticides serious concerns about health risks arising from the exposure of farmers when mixing and applying pesticides or working in treated fields and from residues on food and in drinking water for the general population have been raised. These activities have caused a number

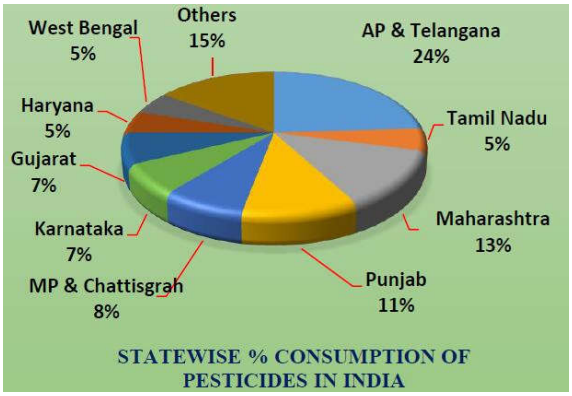

Fig 1 State wise Consumption of Pesticides

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of accidental poisonings, and even the routine use of pesticides can pose major health risks to farmers both in the short and the long run and can degrade the environment. In developing countries, farmers face great risks of exposure due to the use of toxic chemicals that are banned or restricted in other countries, incorrect application techniques, poorly maintained or totally inappropriate spraying equipment, inadequate storage practices, and often the reuse of old pesticide containers for food and water storage . Obviously, exposure to pesticides poses a continuous health hazard, especially in the agricultural working environment. By their very nature most pesticides show a high degree of toxicity because they are designed to kill certain organisms and thus create some risk of harm. Within this context, pesticide use has raised serious concerns not only of potential effects on human health, but also about impacts on wildlife and sensitive ecosystems. Often, pesticide applications prove counterproductive because they kill beneficial species such as natural enemies of pests and increase the chances of development of pest resistance to pesticides. Furthermore, many end users have poor knowledge of the risks associated to the use of pesticides, including the essential role of the correct application and the necessary precautions. Even farmers who are well aware of the harmful effects of pesticides are sometimes unable to translate this awareness into their practices Fig 1, show the state wise consumption of pesticides in India.

Although pesticides have been developed to function with reasonable certainty and minimal risk to human health and the environment, the published results are not always in agreement with this fact. Even though the development of toxicity reference levels for pesticides incorporates uncertainty factors that serve to achieve this regulatory standard, in reality, we may never know whether a pesticide is safe under all circumstances, nor can we predict with certainty its performance in hypothetical situations. Scientific investigation is bound by the tools and the techniques that are available and therefore new developments continually redefine our capabilities. Despite many studies on the fate and toxicity of pesticides, there are research gaps causing uncertainty in the predictions of their long-term health and environmental effects. On the basis of these contradictory results of the literature, discussions among scientists and the public focused on the real, predicted, and perceived risks that pesticides pose to human health (worker exposure during pesticide use and consumer exposure to pesticide residues found in fresh fruit, vegetables and drinking water) and the environment (water and air contamination, toxic effects on non-target organisms) are fully justified.

Construction

A robotics-based guidance method is presented to guide a robot platform which is designed independently to drive through the crops in a field. Thus, the robot platform is designed in real time to guide the platform on the basis of detection of obstrucles using Ultra-Sonic sensor. The proposed system is basically developed to implement in agricultural fields. This type of system is very useful in agriculture field where we need to spray the pesticide to different crops. Arduino UNO is heart of our work and Arduino 1.8.6 software is used to code the algorithm**.** Using Bluetooth HC-05 for Voice command and processing the command with the help of Arduino. Spraying of pesticides is automated by this technique where the direct exposure of humans is avoided.

Block Diagram

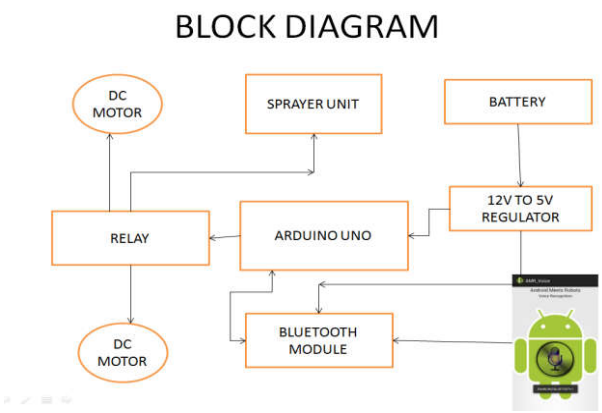

Fig View of our Agribot

Block Diagram Explanation
Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, 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. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter."Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform

Bluetooth Module Hc-05

HC-05 Bluetooth Module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Its communication is via serial communication which makes an easy way to interface with controller or PC. HC-05 Bluetooth module provides switching mode between master and slave mode which means it able to use neither receiving nor transmitting data. Supply voltage is 5V

12v Relay

12V DC relay is used for the control of DC motor and Pump motor. With supply to NC and NO terminals the motor operation can be done. So that when the output from the arduino is made, the operation of relay is done and the control to motor is given with common terminal from the relay. Normally there are two modes of relay operations 1.NC and NO operation 2.Common operation. Common operation is done where a DC motor need to be operated in both forward and reverse directions.

Voltage Regulator

12V to 5V dc regulator circuit can be designed so that it can be used for the operation of Arduino UNO and for other operation applications where we are in need of 5V supply

DC Motor

12V DC Motor is used for the movement application of the prototype. Forward, Backward, Left, Right directions are made with the help of these motors .Here we use 2 motors for our application. These two motors are connected to the relay. From the relay the output is obtained and it helps in driving out the motor

Pump Motor

12V 1.2A 70PSI Pump motor is used for our application based on the pressure the spraying distance of pesticides are made. So that it helps in spraying purpose

Battery

12V/7A battery is used for our application. With the help of voltage regulator circuit the supply of 12V DC is directly given to the motor and from the battery it is given to regulator circuit and from regulator circuit it is given to arduino as 5V DC

Working

When the device is made to ON, Bluetooth is connected to our app. So when we give command through our mobile, it is then converted into text by voice to text conversion. Then those texts are received by bluetooth. Serial communication happens between Bluetooth and arduino at 9600dB baud rate. Then the received data is again transmitted to arduino where we match our input commands with our coded one. When those two strings are matched we control the motors with the help of relay. Actuation of relay happens with the output from the arduino.

Here we define trig pin and echo pin for the start of communication between ultrasonic sensor and arduino for measuring the distance and we include library file for interfacing arduino and Bluetooth. Then Tx and Rx pins of Bluetooth pins are defied and communication is made possible between arduino and Bluetooth module. So when the communication begins the data transmission starts. As a result of this the commands which we give will be taken to the arduino and the functioning starts.

The following table tells the command which we have used and the function that the agribot will perform.Table1.1 explains the commands

Table 1.1 Explains the commands and its functions

Command	Function
Left	Turns left side
Right	Turns right side
Forward	Moves forward
Back	Moves backward
Spray	It stops at the place and starts spraying
Stop	Whole execution stops

These left, right, forward and back motion controls are made with the help of relay. In relay common connection is followed for our purpose as we are controlling a single DC motor in both forward and reverse direction

Advantages

- No direct exposure of farmers onto the field
- This greatly saves the health of farmers
- Pesticide spraying can be monitored and controlled from a distance around 10m
- Huge loads need not to be carried by the farmers

CONCLUSION

This paper has set out a vision of how aspects of crop production and maintenance of crops could be automated in the future. Although existing manned operations can be efficient over large areas there is a potential for reducing the scale of treatments with autonomous machines that may result in even higher efficiencies. The development process may be incremental but the overall concept requires a paradigm shift in the way we think about mechanization for crop production that is based more on plant needs and novel ways of meeting them rather than modifying existing techniques.

The development of new pesticides with novel modes of action and improved safety profiles and the implementation of alternative cropping systems that are less dependent on pesticides could minimize exposure to pesticides and the undesirable effects of exposure on human health. Moreover, the use of appropriate and well-maintained spraying equipment along with taking all the precautions required in all stages of pesticide handling could also reduce exposure to pesticides. The overall optimization of pesticide handling strictly according to the regulations and also considering the public concerns about pesticide residues in food and drinking water could contribute to reduction of the adverse effects of pesticides on human health and environment. All these may sound difficult, but seem to be a promising way for sufficient supply of safe food production within a viable agricultural production system.

Future Works

- Cloud database can be maintained for periodic inspection of field
- Spraying duration can also be controlled with webcam surveillance
- Cost efficient module with efficient plans can be made
- At present we are working with IoT application where we can monitor and control our agribot from anywhere in the world
- Next after this we are planning to change our microcontroller as Raspberry Pi, where we are going to implement artificial intelligence with machine learning

- At this case the agribot will automatically sense the filed in case of pesticide requirement and spray to the field, without human interfere
- So that sustained field maintenance can be achieved

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Achievements

1. Won "Best Agro Project Award" at TAFE Industry Sembiyam, Chennai
2. Won Third prize at Project contest in CIT Coimbatore
3. Presented a Paper and won Second Prize at VIT Chennai

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