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Robotics In Agriculture

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ABSTRACT

Computer-based sensors and actuators such as worldwide positioning systems, appliance vision, and laser-based sensors have increasingly been incorporated into mobile robots with the aim of configuring independent systems capable of shifting operator activities in agricultural tasks. However, the incorporation of many electronic systems into a robot impairs its trustworthiness and increases its cost. Hardware minimization, as well as software minimization and ease of combination, is essential to obtain feasible robotic systems. A step forward in the application of mechanical equipment in agriculture is the use of fleets of robots, in which a number of expert robots collaborate to accomplish one or several rural tasks.

INTRODUCTION

Many research groups are developing expert independent applications for agriculture that will be operative in the coming years, but many others are also aiming to operate a group of vehicles under unified control. This is the developing concept of fleets of robots, which represents a step forward in agriculture. The linked hypothetical fundamentals fleets of robots have been investigated recently, but the first applications for agriculture are presently under development.For this purpose, the concept of reducing redundant devices coordinating different, various systems by using a central, external computer is outstanding. [1]

To achieve a bendable, trustworthy, and maintainable fleet of independent mobile robots for agricultural tasks, the system planning involving sensors, actuators, and the computers performing the algorithms for both the automobile navigation system and the operation of the implement must be robust, simple, and modular. One of the most important job in a control design is the selection of the number and type of sensors, actuators, and computers. These components represent the basis for the design of the architecture and are very difficult to decrease in number because the processes of perceiving and actuating cannot be avoided; however, these sensors and actuators are typically handled by autonomous controllers, specially, profitable off-the-shelf (COTS) sensors such as LIDARs and vision systems. However, computers are adequately stretchy to share resources and improve the heftiness of the system. [1]

1.1 Need

Robotics and mechanization can play a significant rolein society meeting 2050 agricultural production needs. For six decades robots have played a basic role in increasing the efficiency and falling the cost of industrialized production and products. In the past

twenty years, a alike trend has started to take place in agriculture, with GPS- and vision-based self-guided tractors and harvesters already being available commercially. More recently, farmers have started to testing with self-ruling systems that automate or improve operations such as pruning, withdrawing, and harvesting, as well as mowing, spraying, and weed removal. In the fruit tree industry,for example, workers riding robotic platforms have shown to be twice as efficient as workers using ladders. Advances in sensors and control systems allow for optimal resource and incorporated pest and disease management. This is just the commencement of what will be a revolution in the way that food is grown, tended, and harvested.

1.2 Concept

Agricultural Robots is a automaton deployed for agricultural purposes. The main area of application of robots in agriculture is at the harvesting stage. Fruit picking robots, driver less tractor / sprayer, and sheep shearing robots are planned to change individual labor. In most cases, a lot of factors have to be measured (e.g., the size and color of the fruit to be picked) before the beginning of a task. Robots can be used for other horticultural tasks such as pruning, weeding, spraying and monitoring. Robots can also be used in livestock applications such as automatic milking ,washing and castrating. Robots like these have many profit for the agricultural industry, including a high sameness of fresh produce and lower manufacture cost.

1.3 Application

Robotics in agriculture has wide range application such has:

- High precision.
- Reduced load on farmers.
- Quick implementation.
- Cost saving in long run.
- New trendy robotic technologies will expand the realization of rural vehicle in future. [2]
- Can be used as an embedded system in tractors.
- Power supply can be harnessed through solar energy. [1]
- Can be made water proof.
- Automated technique in under developed and developing countries.

Design and Implementation

A. Arduino UNO:-

The Arduino Uno R3 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 the whole thing needed to hold up the microcontroller; basically connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.The Uno differs from all foregoing boards in that it does not use the FTDI USB-to-serial driver chip.

B. Microtroller 89C51:-

The AT89C51 is a low-power, high performance CMOS 8-bit microcomputer with 4K bytes of Flash programmable and erasable read only memory (PEROM). The tool is man-made using Phillips's high-density nonvolatile memory technology and is well-suited with the industry standardMCS-51 instruction set and pin out. The on chip Flash allows the program recall to be reprogrammed in-system or by a straight nonvolatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip,the Philips AT89C51 is a powerfull micro
computer which provides a highly-flexible and cost-effective solution to many fixed control applications.

C. Transreceiver CC2500:-

MO-CC2500 is a FSK /MSK Transceiver module. It provide wide-ranging hardware support for packet handling ,data buffering ,burst transmissions , clear channel assessment, link excellence indication and wake on radio . It 's data stream can be implicit by the modulator and decoded by the demodulator .It has a high presentation and easily to plan your product. It can be used in 2400-2483.5MHz ISM/SRD band systems, Consumer Electronics,Wireless game controllers, Wireless audio wireless vKB/Mouse and others wireless systems.The Module's frequency ,Output power Sensitivity could be programming and have a Digital RSSI function could be used.

D. Motor Driver L293D:-

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either track. L293D is a 16-pin IC which can control a set of two DC motors parallel in any path. It means that you can control two DC motor with a single L293D IC. Dual H-bridge Motor Driver integrated circuit (IC).C# is a language for professional programming. C# (pronounced C sharp) is a programming language designed for structure a wide range of venture applications that run on the .NET The l293d can drive little and quiet large motors as well, check the Voltage Specification at the end of this page for more info.You can Buy L293D IC in any electronic shop very easily and it costs around 70 Rupees (INR) or around 1 $ Dollar (approx Cost) or even lesser cost.You can find the necessary pin diagram, effective, a circuit diagram, Logic description and Project as you read through.

E. DC Motor:-

In any electric motor, process is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force comparative to the

current in the conductor, and to the potency of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal design of a DC motor is designed to harness the magnetic contact among a current-carrying conductor and an exterior magnetic field to generate rotational motion.

F. PIR Sensor HC-SR501:-

HC-SR501 is based on infrared technology,automatic control unit, using Germany imported LHI778 probe design, high sensitivity, highreliability, ultra-low-voltage operating mode, broadly used in various auto-sensing electrical equipment, especially fo rbattery-powered mechanical controlled.

Specification:

- Voltage: 5V – 20V.
- Power Consumption: 65mA.
- TTL output: 3.3V, 0V.
- Lock time: 0.2 sec.
- Trigger methods: L – disable repeat trigger, Hence enable repeat trigger.
- Sensing range: less than 120 degree, within 7 meters.
- Temperature: – 15 ~ +70.
- Dimension: 32*24 mm, distance between screw 28mm, M2, Lens dimension in diameter: 23mm.

Fig.1 Agriculture Robot

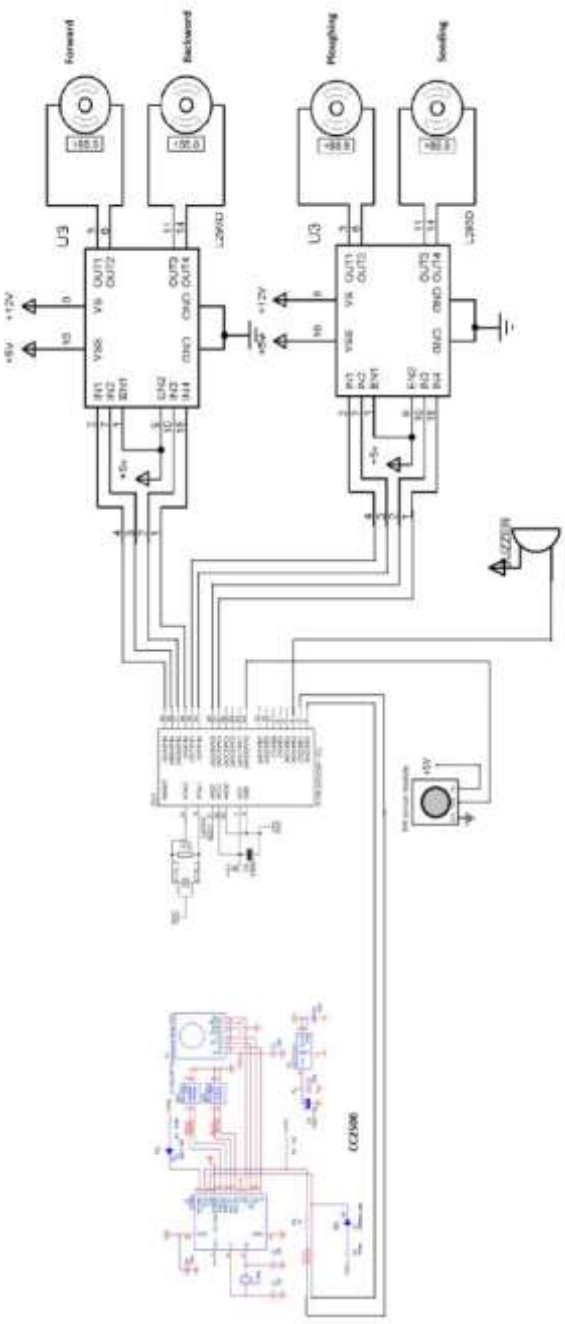

Fig.2 Circuit Diagram of Robot Side

G. Piezo buzzer:-

It is an electronic device commonly used to produce sound. Light weight, simple manufacture and low price make it usable in various applications like car/truck reversing indicator, computers, call bells etc. Piezo buzzer

is based on the inverse principle of piezo electricity discovered in 1880 by Jacques and

Pierre Curie. It is the phenomena of generating.

electricity when automatic pressure is applied to certain materials and the vice versa is also true. Such materials are called piezo electric materials. Piezo electric materials are either naturally presented or manmade. Piezo ceramic is class of manmade material,

which poses piezo electric effect and is widely used to make disc, the heart of piezo buzzer. When subjected to an alternating electric field they stretch or compress, in unity with the rate of the signal thereby producing sound.

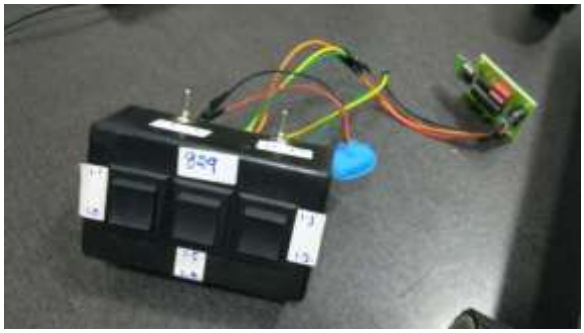

Fig.3 Remote controller

PROPOSED SYSTEM

The robot that is designed is currently a prototype that is capable of performing functions like path tracing and retracing, ploughing, seeding and night patrolling.

REQUIREMENTS

The requirements of the robot are:-

1. Arduino UNO
2. Transreceiver CC2500
3. Motor Driver L293D
4. Motors(4)
5. Power Supply
6. Remote Control
7. Microcontroller
8. PIR Sensor
9. Piezo Buzzer

RESULT AND ANALYSIS

The robot successfully traces and retraces the path that it is trained to do with the help of the remote control. The ploughing and seedind motors do a successful job of ploughing the soil and dropping seeds uniformly.

CONCLUSION

This article implements the basic application of robotics in agriculture.The paper provides the techinal details of making use of an arduino robot for cheap mechanization in agriculture.

FUTURE SCOPE

GPS and mechanical based technique can be combined together to develope the new technology for agriculture. [2]

Solar panels can be mounted on tractors, So it can work on solar energy in Fields.

Harvest manufacture can be done better and cheaper with a group of small machinery than with a small number of huge ones. [2]

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