

Multi-Purpose Agriculture Robot with Android Controller

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Abstract: The project aims on the development of the robot which can dig the soil, put the seeds, leveler to close the mud and sprayer to spray water, these whole systems of the robot works with the battery and the solar power. More than 40% of the population in the world chooses agriculture as the primary occupation, in recent years the development of the autonomous vehicles in the agriculture has experienced increased interest.

The vehicle is controlled by Relay switch through IR sensor input. The language input allows a user to interact with the robot which is familiar to most of the people. The advantages of these robots are hands-free and fast data input operations. In the field of agricultural autonomous vehicle, a concept is been developed to investigate if multiple small autonomous machine could be more efficient than traditional large tractors and human forces. Keeping the above ideology in mind, a unit with the following feature is designed.

Keywords: Autonomous vehicle, Robot, gricultural

1. INTRODUCTION

The project aims in designing a Robot that can be operated using Android mobile phone. The controlling of the Robot is done wirelessly through Android smart phone using the Bluetooth feature present in it. Here in the project the Android smart phone is used as a remote control for operating the Robot. Android is a software stack for mobile devices that includes an operating system, middleware and key applications. Android boasts a healthy array of connectivity options, including Wi-Fi, Bluetooth, and wireless data over a cellular connection (for example, GPRS, EDGE (Enhanced Data rates for GSM Evolution), and 3G). Android provides access to a wide range of useful libraries and tools that can be used to build rich applications. In addition, Android includes a full set of tools that have been built from the ground up alongside the platform providing developers with high productivity and deep insight into their applications. Bluetooth is an open standard specification for a radio frequency (RF)-based, short-range connectivity technology that promises to change the face of computing and wireless communication. It is designed to be an inexpensive, wireless networking system for all classes of portable devices, such as laptops, PDAs (personal digital assistants), and mobile phones. It also will enable wireless connections for desktop computers, making connections between monitors, printers, keyboards, and the CPU cable-free. The controlling device of the whole system is a Microcontroller. Bluetooth module, DC motors are interfaced to the Microcontroller. The data received by the Bluetooth module from Android smart phone is fed as input to the controller. The controller acts accordingly on the DC motors of the Robot. The robot in the project can be made to move in all the four directions using the Android phone. The direction of the robot is indicated using LED indicators of the Robot system. In achieving the task the controller is loaded with a program written using Embedded 'C' language.

A Bluetooth-based Architecture for Android Communication with an Articulated Robot An Articulated Robotic Arm which is used in Industry was proposed by Sebastian van Deaden and Andrew Whig ham. It can be controlled by an android device in an industrial fixed setup. It can pick and place, and do some welding works which human can't do. By using the device control we no need to reprogram for every time we use the robot for different works. It can connect various types of other robot too for controlling them. In industrial robotic environments there are many different robots performing a variety of tasks. Each robot is controlled by its own teach pendant or via a networked socket application. However, to monitor the status or make minor changes to the programming of the robot, the user must obtain access to the pendant or terminal. In an effort to eliminate this need, this paper introduces an android platform that communicates with robots over a Bluetooth connection.

One of the uses of this application, a typical manufacturing floor environment was simulated. Two Robotic systems were set up with looping programs. The first simulated a spot welding line by visiting a starting point just above an apparatus containing a model vehicle and then quickly visiting six points around the model. The second simulated a

palletizing line where the robot was programmed to pick and place a cylinder up from a pallet and place it into another pallet and vice versa. Each system was equipped with the typical “stop emergency” and “stop normal” commands that are commonplace in factories. The stop emergency command breaks the robot immediately while the stop normal command allowed the robot to finish its current cycle in the program. The robots were then connected to the Bluetooth server application and the Android application was started. This demonstration showed the case in which a user could switch between robots running different programs quickly and send those robot commands. Both commands executed very well on both simulations.

1.1 BLOCK DIAGRAM

Bluetooth device is interfaced to the control unit on the robot for sensing the signals transmitted by the android application. This data is conveyed to the control unit which moves the robot as desired. An AVR microcontroller is used in this project as control device. Remote operation is achieved by any smart-phone/Tablet etc., with Android OS, upon a GUI (Graphical User Interface) based touch screen operation. Transmitting end uses an android application device remote through which commands are transmitted. At the receiver end, these commands are used for controlling the robot in all directions such as forward, backward and left or right and captures the video and transmits to TV through RF signal. At the receiving end the movement is achieved by two motors that are interfaced to the microcontroller. Serial communication data sent from the android application is received by a Bluetooth receiver interfaced to the microcontroller. The program on the microcontroller refers to the serial data to generate respective output based on the input data to operate the motor through a motor driver IC. The motors are interfaced to the control unit through motor driver IC.

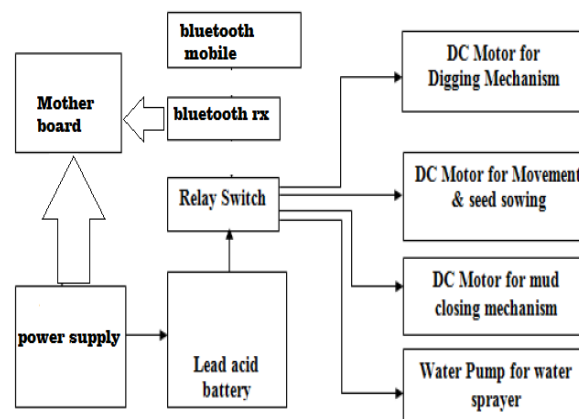


FIG NO.1.1: BLOCK DIAGRAM

2. LITERATURE REVIEW

2.1. “Agricultural Robot for Automatic Ploughing and Seeding” 2015 IEEE International Conference on Technological Innovations in ICT (TIAR 2015) (Amrita Sneha.A, Abirami.E, Ankita.A, Mrs. R. Praveen, Mrs. R. Srimeena).

This paper strives to develop a robot capable of performing operations like automatic ploughing, seed dispensing. It also provides manual control when required and keeps tabs on the humidity with the help of humidity sensors. The main component here is the AVR Atmega microcontroller that supervises the entire process. Initially the robot tills the entire field and proceeds to ploughing, simultaneously dispensing seeds side by side. On the field the robot operates on automated mode, but outside the field is strictly operated in manual mode.

2.2. “Design and Implementation of Seeding Agricultural Robot” (JIRAS) (P.Usha, V. Maheswari, Dr. V. Nandagopal)

In this paper, the robot system is used to develop the process of cultivating agricultural land without the use of man power. The aim of the paper is to reduce the man power, time and increase the productivity rate.

2.3. “Automated Farming Using Microcontroller and Sensors” (IJSRMS) ISSN: 23493371 (Abdullah Tanveer, Abhishek Choudhary, Divya Pal, Rajani Gupta, Farooq Husain)

Farming can be done using new technologies to yield higher growth of the crops. In this project we are going to check temperature, light, humidity and soil moisture. The paper here is all about automatic control features with latest electronics technology using microcontroller and GSM phone line. The project works automatically and hence reduces the manpower.

3. METHODOLOGY

The basic aim of this project is to develop a multipurpose machine, which is used for digging the soil, seed sowing, and leveler to close the mud and water sprayer to spray water with least changes in accessories with minimum cost. This whole system of

the robot works with the battery and the solar power. The base frame is made for the robot with 4 wheels connected and driven the rear wheel is dc motor. One end of the frame, cultivator is fitted which is also driven by dc motor and design is made to dig the soil.

Funnel is made by the sheet metal, to store the seeds

and the seeds flow through the funnel through the drilled hole on the shaft to the digged soil. On the end leveler is fitted to close the seeds to the soil, and water pump sprayer to spray the water. Solar is placed on top of the robot and is connected to the battery for charging the battery. Thus the max efficiency is utilized from the sun by the solar panel and to the battery the whole robot requires the 12v battery to operate the system.

4. ASSUMPTION CALCULATION

DC Motor selection:

1) Specification:

Voltage = 12v

Current 7.5 A

$V = I * R$

$12 = 7.5 * R$

$R = 1.62 \Omega$

The major constraint on motor operation is thermal

$P = I^2 * R$

$= 7.5^2 * 1.6$

$= 90$

Approximate load on motor = 10kg

Force required to move

$F = 10 * 9.81$

$= 98.1 \text{ N}$

2) Torque required for motor

$T = f * r$

Assuming wheel radius 150mm

$T = 98.1 * 0.15$

$T = 14.715 \text{ Nm}$

$P = 2 * \pi * N * T / 60$

$90 = 2 * \pi * N * 14.715 / 60$

$N = 58.40 \text{ rpm}$

3) Specifications:

Rpm = 100rpm

5 Nm torque – DC motor

Voltage - 12v Stress



Fig: Prototype

5. ADVANTAGES, DISADVANTAGES AND APPLICATIONS

Advantages:

- 1- It is one of the latest and sophisticated system.
- 2- It control whole system automatically.
- 3- Lesser maintenance cost.
- 4- It is Affordable.
- 5- The system working is simple and easy to use.

Disadvantages:

- Need DC power supply all time and quickly discharged.
- Need of skilled workers to drive and for maintenance.
- It costs a lot of money to make or buy robots.
- They need maintenance to keep them running.
- The farmers can loose their job.

Applications:

- 1-The system or robot can be mainly use in agricultural field.
- 2-It is used in home gardening.
- 3-Nursery planting.
- 4-Crop seeding.
- 5-Fertilizing and irrigation.

6. CONCLUSION

In this project, we achieved control both wireless communication between the mobile Robot Android GUI Application. The main task of this project make a surveillance robot which can be control by emerging android technology .It gives versatile operation of robot controller which need not modify the hardware This system can further be developed by enhancing the performance and by adding more features. Further development of this system depends on the application we are using an area of work. The system can be added features like gas sensor, thermal image sensing, connecting robotic arms and can be used in pick and place purposes etc... can be done. The development of this system has wide area of applications such as in Military and Law enforcement and Industrial and in Disaster management and so on.

The present commercial devices involve the working of all functions separately. It requires one day or more for loosening the soil and path forming for half acre land whereas the Multipurpose Farm Robot requires approximately 20 hours for completing

The whole process, which involves the three basic functions i.e. forming the path, sowing the seeds and back filling the soil in half-acre land. The robot covers 18 feet in a minute.

In this work a robot, farm robot, has been designed, built and demonstrated to carry out ploughing in an agriculture field. It is expected that robot will assist the farmers in improving the efficiency of operations in their farms.

It is aimed at increasing the productivity and reducing the labour involved, this robot is designed to execute the basic functions required to be carried out in farms.

The robot performs the tasks like digging the ground, sowing the seeds and backfilling the soil automatically in a sequence without human intervention. Thus an effort is made so that the robot becomes an aid to the farmers. The design is accepted and unique compared to the existing robots.

REFERENCES

- [1]. Range-based navigation system for a mobile Robot-Neil MacMillan, River Allen, DimitriMarinakis,
- [2]. Smartphone-based Mobile Robot Navigation -Nolan Hergert, William Keyes, and Chao Wang, spring
- [3]. Development of A Wireless Device Control Based Mobile Robot Navigation System PheySiaKwek, Zhan Wei Siew, Chen How Wong,,BihLiiChua, Kenneth Tze Kin Teo.IEEE 2012
- [4]. A Bluetooth-based Architecture for Android Communication with an Articulated Robot- Sebastian van Delden and Andrew Whigham, IEEE2013