Multifunction Agri-Bot

Nagesh M S
Assistant Professor
Department of Electronics & Instrumentation Engineering
GSSSIETW, Mysuru

Neetha N
Assistant Professor
Department of Mechanical Engineering
MRIT, Mandya

Abstract – In the present world farmers have been facing problems in the field of agricultural activities such as irrigation, lack of good seeds, ploughing, providing manure to the good crops, the removal of the weeds, the spoiled fruits during harvesting. All these problems could be solved by using one single robot. The robot is provided with the ploughing mechanism to plough the field, it has a wireless connection with the irrigation system of the field where the robot checks the moisture content and simultaneously signals are given to the irrigation system, while sowing seeds the robot checks the quality of the seed by image segmentation process and then sows the seeds, the manure is provided to the crops and the weeds are removed mechanically by the robot, image segmentation is used for harvesting. Farmer can use this robot and at the same time he can involve himself in some other activity like bee keeping, poultry, dairy farming etc; due to which farmer has his income both from the agricultural field and the secondary earning process. This in turn results in the overall development of the economy of a country.

Keywords: Agriculture, Robot, Arduino.

I. INTRODUCTION

Agriculture plays an important role in the human mankind. There are number of problems faced by the farmers in their journey of agricultural activities. The problems may be in the sector of irrigation, lack of good seeds while sowing, lack of knowledge regarding soil testing and its applications, providing manure/fertilizer to the crops, the removal of the weeds, the spoiled fruits during harvesting. All these problems could be solved by using the "HEXA-AGRI ROBOT". This robot undertakes the agricultural activities i.e. from ploughing to harvesting. It is designed to withstand all the weather conditions. The data regarding the entire farm and where exactly the seeds to be sowed are well known to the robot. Firstly, the robot undertakes soil testing and provides the exact information to the farmer about which crop to be harvested in that particular soil. According to the information given by the robot the farmer decides the crop. The robot moves around the field and sows the seeds at a given point. In this process it checks the moisture content of the soil and then provides only the required amount of water to the crops. It also supplies the required manure/fertilizer to the crops. It differentiates between a crop and a weed, the weed is removed mechanically. It separates a good fruit with a bad one thereby carrying out the harvesting process in an efficient way. The robot is solar powered making it more effective in the field of power consumption. This robot would be a farmer friendly robot by increasing his source of income.

II. PROPOSED METHADOLOGY

This is completely an automated robot which has the updated details regarding the present weather conditions, season etc. It has its shelter in the farm. Firstly when the crop growing season arrives the robot moves into the farm at the given place and performs the soil testing. After the testing is done the data received from the test is processed and the details regarding the type of crop, a fertilizer to be used is sent to the farmer via SMS using GSM module. Further the farmer decides the crop and the same is replied back to the robot using SMS. The robot enters the farm and at the selected point it removes the soil, sows the seeds. At the selected time intervals it checks the moisture content of the soil and gives a signal to the irrigation system of the farm. At what time, how much water to be fed is already known to the robot and updates regarding the same is sent to the farmer. The manure is supplied to the crops periodically. The weeds are identified by it and are removed mechanically. At the time of harvesting, using image segmentation process the total number of fruits in a farm is known by the robot, the information regarding the same is sent to the farmer. Finally the harvesting process takes place. All the above processes is performed by the robot automatically, no human intervention is required.

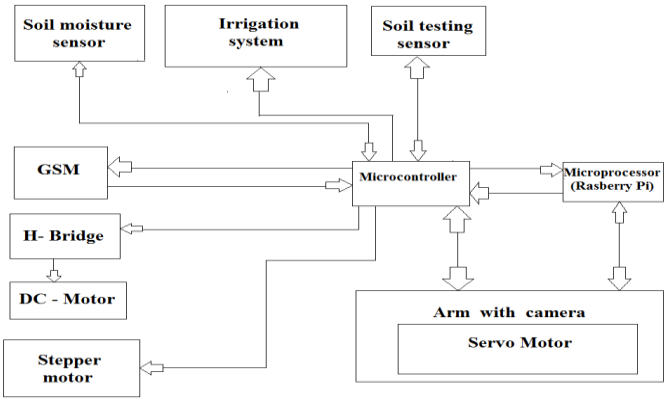

Fig 2.1: Block diagram of "HEXA AGRI ROBOT

III. HARDWARE AND SOFTWARE

HARDWARE USED:

1. *ARDUINO MEGA 2560:*

The Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It is used to control the operations taking place in the Robot.

2. *RASPBERRY PI 2 MODEL B*

The Raspberry Pi 2 Model B is the second generation Raspberry Pi. It has a 900MHz quad-core ARM Cortex-A7 CPU,1GB RAM,4 USB ports,40 GPIO pins, full HDMI port, Ethernet port, Combined 3.5mm audio jack and composite video, camera interface (CSI),Display interface (DSI),Micro SD card slot, video core IV 3D graphics core. It is extensively used for the image segmentation process.

3. *HS-645MG Servo*

A Servo is a small device that incorporates a two wire DC motor, a gear train, a potentiometer, an integrated circuit, and an output shaft. Of the three wires that stick out from the motor casing, one is for power, one is for ground, and one is a control input line. A good example of this is the HS-625MG servo and the HS-645MG servo. It is used for the movement of the arm.

4. *Stepper motor*

Ideal motor for CNC machines. Standard Nema23 frame size10.2Kgcm bipolar mode torque. It is used for the rotation of the wheels towards left and right.

5. *GSM*

This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Applications like SMS Control, data transfer, remote control and logging can be developed easily. The MODEM needs AT commands, for interacting with processor or controller, which are communicated through serial communication.

6. *8051 MICROCONTROLLER*

The Intel MCS-51 (commonly termed **8051**) is an internally Harvard architecture, complex instruction set computer (CISC) instruction set, single chip **microcontroller** (µC) series developed by Intel in 1980 for use in embedded systems.

7. DC MOTOR

300RPM 12V DC geared motors for robotics applications. It gives a massive torque of 30Kgcm. The motor comes with metal gearbox and off-centered shaft. It is used for the movement of the robot in the forward and backward direction.

SOFTWARE USED:

1. KEIL SOFTWARE

Keil development tools for the 8051 Microcontroller Architecture support every level of software developer from the professional applications engineer to the student just learning about embedded software development.

2. ARDUINO IDE 1.6.7

For programming the microcontrollers, the Arduino project provides an integrated development environment (IDE) based on a programming language named Processing, which also supports the languages, C and C++.The open source Arduino IDE makes it easy to write code and upload it to the board.

3. PYTHON PROGRAMMING PLATFORM

It is a widely used high-level, general-purpose, interpreted, dynamic programming language. Its design philosophy emphasizes code readability, and its syntax allows programmers to express concepts in fewer lines of code than possible in languages such as C++ or Java.

IV. RESULTS AND CONCLUTIONS

The HEXA AGRI ROBOT is an agricultural robot which replaces a farmer and is provided with the advanced technology which includes GSM module to provide the updates of each and every activity performed by it. The robot can operate in any weather condition by ploughing, sowing seeds, irrigation process, providing manure to the crops, removing of weeds and the process of harvesting. It is an ECO-FRIENDLY robot since it uses solar energy for the power. India being an agricultural dependent country this robot will help our country grow in economic sector.

REFERENCES

[1] The 8051 Microcontroller and Embedded Systems Using Assembly and C, Second Edition by Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay.
[2] https://www.arduino.cc/en/Main/arduinoBoardMega
[3] http://www.geeetech.com/wiki/index.php/Arduino Mega _ 2560
[4] https://www.google.co.in/?gfe_rd=cr&ei=AmqpWNzbN4bM8geLn4HIBg#q=raspberry+pi+model+b+2+specifications
[5] https://www.raspberrypi.org/products/raspberry-pi-2-model-b/
[6] http://robokits.co.in/motors/high-torque-dc-geared-motor-300rpm
[7] https://www.servocity.com/hs-645mg-servo
[8] http://robokits.co.in/motors/nema23-stepper-motor-10kgcm-torque
[9] http://robokits.co.in/motor-drives/dual-dc-motor-driver-20a
[10] http://www.slideshare.net/vigyanashram/soil-testing-13810346
[11] http://www.slideshare.net/vigyanashram/soil-testing-13810346
[12] http://www.instructables.com/id/Soil-Moisture-Sensor/
[13] https://en.wikipedia.org/wiki/GSM
[14] Lahouaoui Lalaoui, Tayeb. Mohamadi, Abdelhak Djaalab. http://www.sciencedirect.com/science/article/pii/S1877042815036897