INTERNATIONAL JOURNAL FOR TRENDS IN ENGINEERING&TECHNOLOGY
VOLUME 28 ISSUE 1 – APRIL 2018 - ISSN: 2349 – 9303

A Smart Agriculture Assisting Robot using Internet of Things

Brittadevi.V [1]
PG Scholar
[1]IFET college of engineering, CSE.
brittaveeran@gmail.com

Hemalatha.P [2]
Senior Assistant Professor
[2]IFET college of engineering, IT.
hemadec4@gmail.com

Abstract— Agriculture is the backbone of our country. Robots are playing an important role in field of agriculture for farming process autonomously. The proposed system aims at making the agriculture smart by using automation and IoT technologies. Agri-robot is a robot designed for agricultural purposes to minimize labour and energy consumption. The highlighting features of this project includes Raspberry Pi based remote controlled robot to perform tasks like Seed Sowing and Automatic Irrigation. The efficient mechanism of the disperse seeds are led to fall into the soil through the seed dispenser and it includes smart irrigation with pump automation and intelligent decision making based on accurate real time field data. The farmers can able to control the robotic actions by switching onto the desired modes through dashboard from the mobile connected to Internet. These operations will be performed by interfacing sensors, motor, smart phone Wi-Fi and actuators with Raspberry Pi. It is designed to minimize the labour wages in addition to increasing the speed and accuracy of the work. Thus the multitasking robot keeping the ideology that multiple small autonomous machines could be more efficient than traditional large tractors and human effort.

Index Terms—Internet of Things, Raspberry Pi, Robot, smart phone.

1 Introduction

The real world the farmers are progressively under pressure to feedstuff more people .This emergent inhabitants has developed fussier about the food they eat. Yonder organic food, there is an global impulsion to variety farming greener through using less water and pesticides. These influences mean farmers prerequisite to produce more, at a higher quality, and in a ecological manner. Consequently arrive the robots set to improve production yield, while reducing resources required and making farming and exciting high-tech profession.

Over the past few years technology and agriculture have come together in an unprecedented way, as advances in the Internet of Things. IoT is a part of a smart farming. The smart farming is an umbrella term that describe the adoption of digital technology allowing farm decisions to be augmented by information that comes from sensors, farm software and outside sources. It also refer to the automation of farm decision, where machines and system such as robots, autonomous vehicles and smart irrigation system, act in accordance to data coming in from the environment.

The internet of things is now a household term and the world where anything can connect to anything via connectivity infrastructure that is significantly cheaper and far more granular than existing mobile networks, and devices can be added to the network at any place and time. Devices and application talk to each other across the network. Data is open and shared widely, with huge amounts of data being combined, analysed and fed into cloud-based software which automates and manages almost every aspect of life. The sensing devices measure changes in their environment and send data to a central computer to be gathered, analysed and turned into information that feeds into decision-support systems. Data from sensors trigger actuators, components of a system that move or control mechanisms. Sensors and actuators together in the IoT can automate processes that may have been previously carried out by humans.

2 Related Work

[1] The Arduino ATMEGA328 at first, the vehicle will sow the seed by moving around the field. After some days, the vehicle covers all over distance of that agricultures field. After finishing the seed sowing process, the vehicle will return back, it provides the water pumping when the soil is seems to be dry. they use a soil sensor to monitor the humidity and temperature of the soil. Side by side it provides the good quality pesticide spraying and fertilizer spraying. The over usage of fertilizers are also leads to the plants death. To prevent the plants from over fertilizers, the time delays are set using the relays. It also provides the special function, which pick out the unwanted grass from the soil. [2] The automated system, depending on the crop considering particular rows & specific columns. The spacing between two seeds in a column has to be entered manually. Proximity sensor is used to measure the rotation of wheels. To detect the obstacle in the path of the vehicle IR LED with TSOP receiver is used and turning position is also depend on this sensor. To check whether seed container is empty or not LDR sensor is used. All the operations are monitored and control by PIC microcontroller using sensors. [3] It plan a smart irrigation system innovation in ease which is usable by agriculturists. A mechanized water system framework was created to advance water use for rural harvests by utilizing raspberry pi. Mechanization enables us to control machines autom-atically. It control the water engine naturally, screen the plant development utilizing webcam and we can likewise observe live spilling of ranch on android mobiles by utilizing wifi. [4] It consist of PIC microcontroller system. The users presses the start button the robot starts moving in the forward direction. When the robot starts moving in the forward motion after few distance it stops and then it

starts drilling with the help of a drilling mechanism. After this process, there's a Solenoid valve arrangement through which the seeds are being dispensed in the soil.This same procedure continues until the user does not switches off the circuit. Drilling process is done with DC motor and seed dropping in land is done with the help of a two port solenoid valve. All these process are displayed on LCD.

3 PROPOSED SYSTEM

There are various machine used for agricultural purposes out of which some are cost effective but required more man power. In multitasking agricultural robot, we are trying to reduce the cost as well as human dependency by making it fully automated. The main processing unit is Raspberry pi 3 and it easy-to-use hardware and software . It is used as an input and output device to get continues readings from sensors and based on these readings generate corresponding control signals to ensure the accurate working of the robot. All the modules like seed sowing, soil moisture sensors, directly communicate with raspberry pi using I/O ports. This paper consist of two fragments and using smart phone to control system. In the present system, every fragment is integration with different sensors and devices and they are interconnected to one central server via wireless communication modules. The server sends and receives information from farmer end using internet connectivity. This system allow the farmer to control multitasking robot appliances sensors and motors from mobile phone through an internet connections.

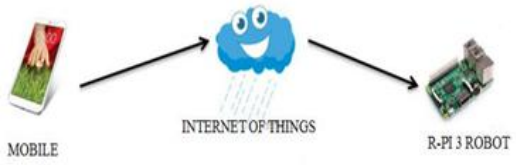

figure 1. system overview

3.1 Architecture of The System

It consist of Raspberry Pi 3, the heart of the project. Small single computer like credit card size. It works on 5V supply. It has inbuild wireless LAN and Bluetooth connectivity.

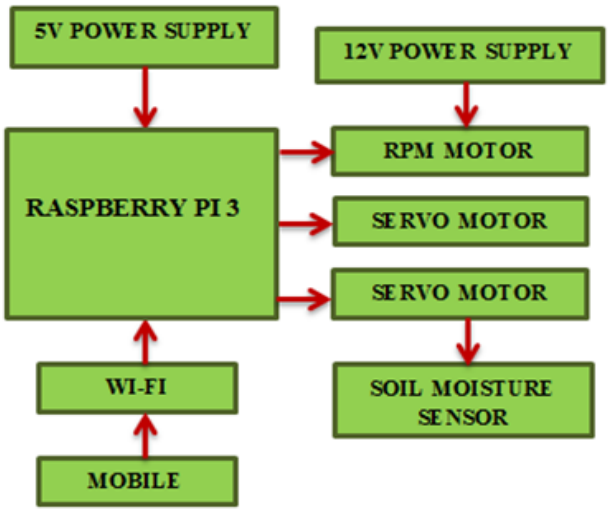

figure 2. system architecture

The multitasking robot is capable of performing multiple operations like seed sowing and smart irrigation. The mechanism of the robot is guided by the signals being sent out from the Raspberry Pi controller. The robot is composed of 6 motors out of which two is a servo motor and the remaining are RPM motors. The one servo mechanism is used for seed dispensing and another servo is used for smart irrigation. A 12V battery supply is feeded for the operation of wheels and other process. Four RPM motors are attached to the wheels on either side such that each side is driven by two motors each. From the mobile wireless connection farmer can operate the robot by switching onto the desired modes through dashboard.

3.2 Seed Dispensing

For the process of seed dispensing, farmers from the mobile wireless connection they can operate the robot by switching the move bot mode and dispenser seed modes through dashboard. These mode signals are send to the raspberry pi 3. That the R-Pi controller wheel motors and devices. The move bot mode are assistance to travel the robot in forward direction. After the dispenser seed mode are doing the seed sowing process. The seed dispensing process is to provide a light and compact robot adapted to be pushed over the ground to be seeded and capable of distributing seeds evenly in uniform quantities. A seed distribution system constructed in an upright main hopper for containing a mass of seeds. Then the seeds which are allowed to pass through a valve to the seed dispenser. From where the seeds are led to fall into the soil through the dispenser whose movement is aided by a servo motor. This nothing but a simple electrical motor, controlled with help of servo mechanism.

The way a servo motor reads the information it's being sent is by using an electrical signal called PWM. It sending ON electrical signals for a certain amount of time, followed by an OFF period, repeated hundreds of time a second. The amount of time the signal is on sets the angle the servo motor will rotate. So for 90 degrees, divided by 18, which is 5, then add 2, and we get 7. So on this servo 7% duty is 90 degrees.

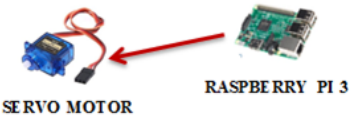

figure 3. interconnection of seed dispensing

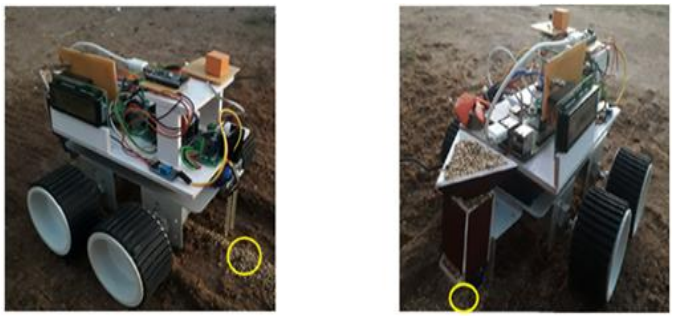

figure 4. experimentation and results for seed dispenser system

3.3 Moisture Sensing and Automation

Soil moisture is basically the content of water present in the soil. This can be measured using a soil moisture sensor which consists of two conducting probes that act as a probe. It can measure the moisture content in the soil based on the change in resistance between the two conducting plates. The resistance between the two conducting plates varies in an inverse manner with the amount of moisture present in the soil.

This paper uses Python scripts run on a raspberry pi microcontroller to send GPIO PWN output to a servo motor to set its angle. GPIO stands for General Purpose Input/Output which mean these pins can either send electrical signals to drive hardware or receive them and read sensor data. We're using them as output, to send signals to a servo motor. That the servo motor act the soil moisture sensor. A typical soil moisture sensor consist of two components. A two legged lead, that goes into soil or anywhere else where water content has to be measured. This has two header pins which connect to an amplifier/ A-D circuit which is in turn connected to the arduino nano. The amplifier has a Vin, Gnd, Analog and Digital data pins. This mean that we can get the values in both analog and digital forms. The soil moisture sensor gives a resistance variation at the output. It sends analog data which can be converted with an integrated analog to digital converted in the arduino nano. The arduino nano are connected to the raspberry pi with USB cables. It sends the current soil moisture sensor data in digital form to arduino nano.

That digital signal is given to the raspberry pi 3 board. Then relay is switched ON/OFF to turn the water motor. If the soil moisture value is high then the water motor will be on, otherwise if the moisture level is low the motor will be off through the relay. Every moisture action indicated by the LCD display.

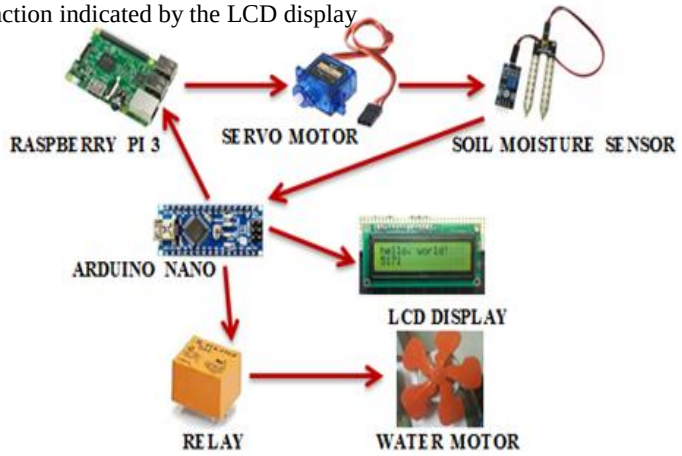

figure 5. Interconnection moisture sensing

figure 6. Experimentation and results for smart irrigation system

Test results shows that the robot can be controlled remotely using wireless transmission of mobile commands to R-Pi. R-Pi forwards the commands to arduino nano and gives signals to the relay in order to run the water motor.

3.4 Mobile Wi-Fi Controlled Robot Using Raspberry Pi

In this paper agriculture robot controlled by Raspberry Pi 3. As hardware, the robot body is build mechanically and electronic components. The robotic control is made wireless that is; it controlled by the WI-FI. The smart phone and Raspberry Pi 3 board is connected through WI-FI. The desired mode are generated from smart phone are sent to the raspberry pi and raspberry pi receives these signals according to a program written in the python programming language. At this point, it is possible to talk about one and only communication channel. From the farmer mobile they would able to see the dashboard to run the robot. Fig.9. Disperse seed mode used for seed sowing operation. Move bot mode using for robot running. Plant servo mode used for soil moisture sensing. The agriculture robot are controlled through the smart phone and raspberry pi 3.

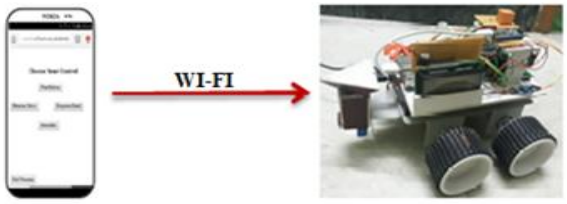

figure 7. Smart phone wi-fi controlled the robot

Figure 8. Dashboard for robot running

4 CONCLUSION

In this paper, we have introduced a systematic vision of IoT technologies for the advancement of agriculture. It increase the agriculture field, make tranquil work to the farmers and save the water and energy conservation. The raspberry pi 3 is an incredible little machine with endless automatic process. This smart irrigation system proves to be a useful system as it automates and regulates the watering without any manual intervention. Another system has been developed for the sowing of seeds in an automatic way. Here with the help of a robot the seeds are been dispensed in the soil in a proper sequence hereby reducing the wastage of seeds.

REFERENCES

[1] Angel Nimisha Lorain F, Ramamalini.P, Udhayanithi.N, Veeralakshmi.R: "Smart Automated Agriculture Monitoring And Controlling System Using Arduino" *IOSR Journal of Electronics and Communication Engineering (IOSR-JECE) e-ISSN: 2278-2834,*(2017).

[2] Prashant G. Salunkhe1, Sahil Y. Shaikh, Mayur S. Dhable, Danis I. Sayyad, Azeem S. Tamboli: "Automatic Seed Plantation Robot" *International Journal of Engineering Science and Computing, volume no:6,Issue:4 April* (2016).

[3] Bhagyashree K.Chate, Prof.J.G.Rana: "Smart Irrigation System Using Raspberry Pi" *International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume: 03 Issue: 05 May*(2016).

[4] Abdulrahman, Mangesh Koli, Umesh Kori, Ahmadakbar: "Seed Sowing Robot" *International Journal of Computer Science Trends and Technology (IJCST) – Volume 5 Issue 2, Mar – Apr* (2017).

[5] Mahendheran, Arun, Manickavasagam, Lawrence Justin and Parthasarathi : "Multifunctional Robotic Vehicle for Agriculture Application" (2017).

[6] Nikesh Gondchawar, Prof. Dr. R. S. Kawitkar : "IoT based Smart Agriculture"(2016).

[7] P.Hemalatha, Development of IOT Enabled Robotic Guide Dog for visually impaired people to enhance the guiding and interacting experience, *JARDCS , Scopus(Elsevier),02-Special Issue,pp 262-272*(2017).

[8] P.Hemalatha ,A Smart Healing Mechanism for Diabetic Neuropathy using IoMT,*IJARSE,Volume No.06, Issue No. 09,pp 77-83*(2017).

[9] P.Hemalatha,Cardiac Monitoring using Internet of Medical Things, *IJARSE, Volume No.06, Issue No. 09,pp 197-204*(2017).

[10] Arindam Giri, Subrata Dutta, Sarmistha Neogy: "Enabling Agricultural Automation to Optimize Utilization of Water, Fertilizer and Insecticides by implementing Internet of Things(IoT) International conference of information technology (2016).

Author Profile:

- *Britta devi.v is pursuing masters degree program in computer science and engineering in IFET college of engineering, villupuram, India..*
  E-mail: brittaveeran@gmail.com
- *Hemalatha.P working as Assistant professor in department of information technology in IFET college of engineering, Vllupuram, india .*
  E-mail: hemadec4@gmail.com