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Auto-Aid Agro Seeding Bot Equip with Machine Learning

Nikhil Belwate

Software Consultant, Dept. of Mobility, Quinnox Consultancy Services, India

ABSTRACT: Agriculture is one of the major sector in world economy. Skill labor in this sector is reducing day by day which generate few problem. By implementing automatic agriculture seeding robot we can solve those problems and provide quality outcome. This robot is simple machine which does some farming related actives without human intelligence. It used artificial intelligence and machine learning to do its intended. Using markers and appropriate commands we can use this robot in farming field. The electric power is only fuel that uses in it which make it environment friendly. It is integrated system of various software and hardware modules.

KEYWORDS: Python, Raspberry Pi3, IR Sensor, GSM SIM900, Assembly language code

I. INTRODUCTION

The entire Indian economy, any fluctuation in agriculture income will directly affect the Indian economy. It also requires huge man power, use of machinery and adopting automation is not so simple like industry. More ever it requires more land, man and animal power etc.

In a country like India, which has ever increased demand of food due to rising population, advances in the agriculture sector are required to meet the needs for achieving this there is need of automation in the agriculture field. This is where computer science and technology comes into the picture. The robotic solution for seeding and other farming activities increase production rapidly without wastage of grains.

Our project is based on this concept. We are going to develop wireless communication between computer and agricultural vehicles. These vehicles are fully operated by computer which can perform all agricultural tasks. So farmer can easily do their work without any physical efforts.In this project we are going to use sensor system, modulation techniques, Radio frequency, etc.

The purpose of this project is to provide efficient technique which is useful to develop the Indian economy.

II. LITERATURE SURVEY

1. Agricultural Robot (IJAREEIE – March 2016)
   Author L. Manivannan and M.S. Priyadarshini describe robot which perform planting, irrigation, monitoring and harvesting in farming field. The robot is automated and having complex architecture. That model of robot uses AVR controller and conventional processing. PC is used to control that robot.

2. Autonomous farming robot with plant health indication(IJATES-2015)
   Author K.V.Fale and P.Bhure designed an autonomous intelligent farming robot which indicates plant health by observing the colour of their leaves and the height of the plant. It also notes environmental conditions such as temperature, moisture, and humidity. The health of the plant is displayed on the LCD. The robot has also watering mechanism, it will water the plants according to their needs by observing soil moisture and humidity. The main feature of the robot is the ability to sense the health of the plants using image processing. A webcam will take the photo inside the field and analyses the growth according to the height, colour of the leaves, etc. Vision based row guidance method is used to guide the robot platform driven along crops planted in the row.

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3. Machine Learning: Applications in Indian Agriculture (IJARCCE- April 2016)
   Author Karandeep Kaur, AssistantProfessor of Guru Nanak University created research paper to explore applications in agriculture sector using machine learning. That paper explain details of machine learning types and there usability. The various examples of agriculture tools using machine learning like crop selection, crop disease perdition, farming pattern and price calculation. Adaptation of technology and its need related to agriculture field is very well describe in that paper.

4. The National ArtificialIntelligenceResearch AND DevelopmentReport (National Science and Technology Council - October 2016)
   National S & T Council describe use cases of AI in this report. Artificial intelligence (AI) is a transformation technology that holds promise for tremendous societal and economic benefit. AI has the potential to revolutionize how we live, work, learn, discover, and communicate. The AI R&D Strategic Plan looks beyond near-term AI capabilities toward longer-term transformation impacts of AI on society and the world.

III. PROPOSED SYSTEM

The modified tractor and automatically operated through computer system. This is fully equipped machine which does following task in farming field.

1. Cultivating process
2. Spreading of fertilizers
3. Seeds sowing

IV. WORKING PROCESS

Principle working of this project is based on the image processing method that we have used primarily for the distance measurement between the end point of the field and starting point of the field grid, which is done in real time so that our robot will have the exact idea of it where about and to take the decision for seeding as per predetermined distance between two consecutive seeding location.
We have used the 30 Frame per Second supporting camera which gives is the required frames for the analysis for the image processing for better results this is the reason we did not opt for the standard PI camera which doesn't give the minimum required image quality for the image processing which makes harder for the decision making for the algorithm.
Distance finding using triangular method for focal length this is the methodology that we have used for the distance measurement and for this method to be successful and to make noise free from the environment we have used the big size of 15"5 Inch square which is of bright Red which is placed at the end of the each field which gives the reference to the camera.
AS when the system is imitated the bot take the image of the Red flag and calculate the distance between its present position and end point where the marker has been placed, from the calculated distance it will deduct the distance that will be required for the 180 degree turn so that it can switch the grid for the next process of the seeding. Then it will determine how many of the seeds to be plotted in the straight line that will be calculated as it will deduct the distance required to take the turn and then it will divided the resultant distance with the predefined distance between the two seeds that way it will come to know the number of the seed that it can plough.
AS it fist determine the distance at which is at initial position it will start to move toward the its first seed sowing , this moment is done by sending the command to the Arduino using serial communication between Raspberry Pi and Arduino the command for the moments are as per follow

a> F → Move Forward
b> B → Move Backward
c> R→ Take Right Turn
d> L→ Take Left Turn

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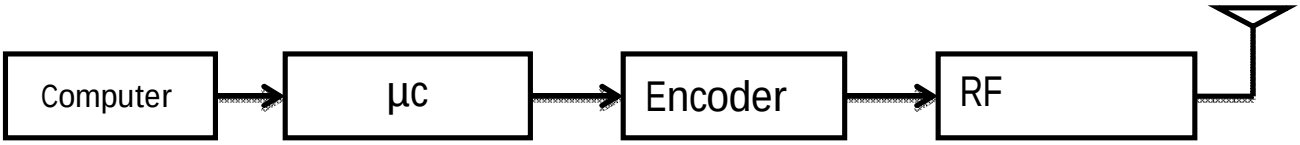
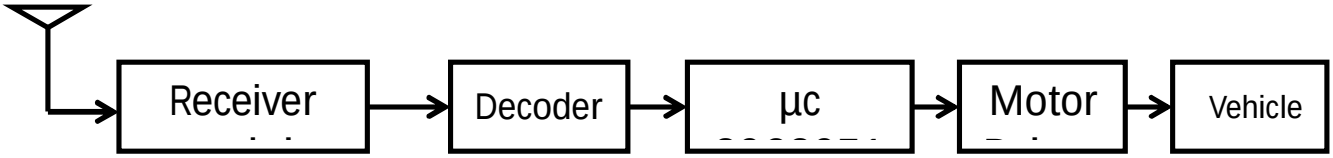
e> D→Drop Seed
f> S→ Stop all the motors
g> P→ stop only seeding motor
h> A→ Sound Buzzer

Since the motors are of the high torque they will require the high current to make moment this is the reason we have choose the high current motor driver the L298, as per the received command Arduino will generate the signals and this signals will be first send to the motor driver and this motor will send the auxiliary power to the motor as per the polarity signals that has been send by the Arduino which are followed by the Raspberry Pi decision making algorithm. Same goes for the seeding motor.
AS for the more smart process we have taken the advantage of the GSM technology, in which we are determining the when bot will require the refill for the seeds for that we have implemented the mechanism using the IR sensor, we have implemented the IR sensor inside the hopper so that as soon as the Seed comes down the level of IR sensor IR sensor will send the signal to the Arduino and then Arduino will send the SMS using SIM 900 to predetermined number as the seed are low in the hopper. So that human can refill the hopper for the further processing.
There are two sections, transmission section and receiver section. In transmission section user give commands such as type of work and parameter of field for example length and width of field. This data is input to microcontroller which gives the appropriate code to encode for transmission. Encoder transmits the code with specific address which we can set to RF transmitter module. Using ASK (Amplitude Shift Keying) modulation technique this data is send to receiver section.



In transmitter section, first by using the front end we give the input to the microcontroller which gives appropriate code to encoder for transmission. Encoder transmit the code with specific address which we can sent to the RF transmitter module.



In receiver section, by RF module we receive the signal which is given to decoder. It converts the serial data to parallel, then that code is given to microcontroller which gives the data to motor driver to drive the vehicle.

In tractor circuitry there is one sensor the purpose of sender is to detect the object that come in front of tractor while working. If any object obstacle detect by sensor then tractor will stop working and alarm will ring and acknowledgement of detection of obstacle is send to computer.

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V. BLOCK DIAGRAM

The complete robot system is developed in modules. Arduino is open source hardware which act as microcontroller and integration component in the system. The functions of robot are inter dependent on all these components synchronization. Block diagram of farming tool and robot is shown in Fig. 1.1.

The diagram define overall structure of robot system. There are three motor divers which operate 5 different DC motors, 4 motors for vehiclemovement and 1 for operating rotating wheel tool. Raspberry Pi communicates with Arduino to exchange sensors input. GSM module and IR sensor module also connected to Arduino.

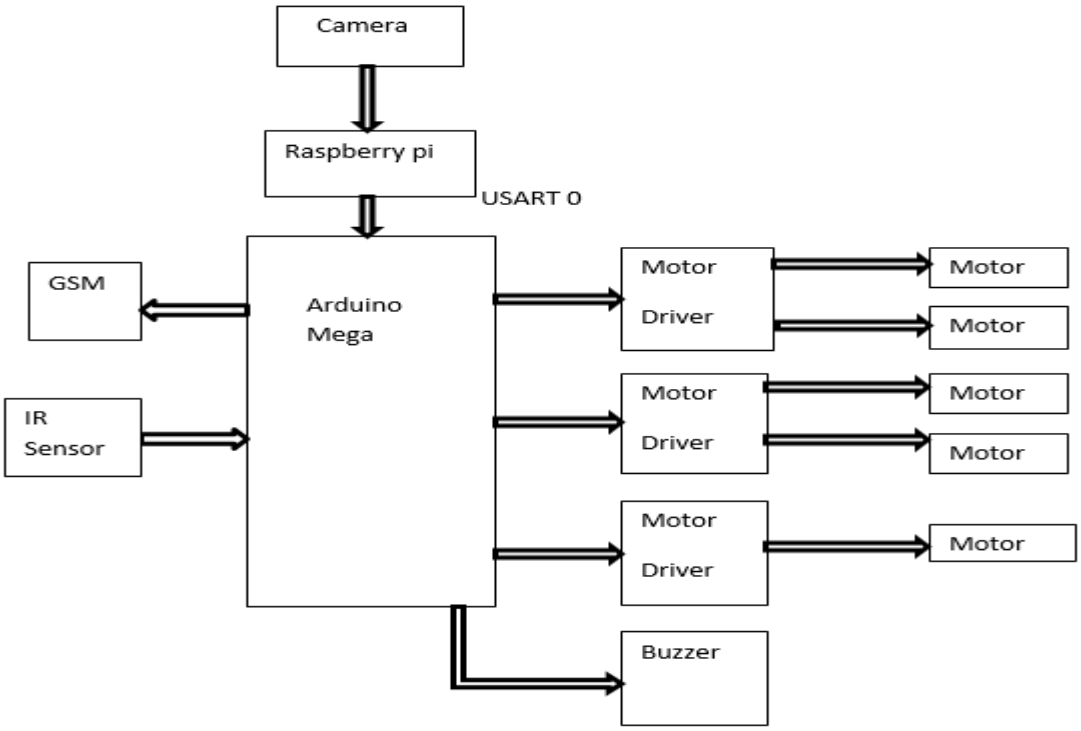

Fig. 1.1 Block diagram of robot

VI. IMPLEMENTATION

To demonstrate all function of robot there is small prototype shown in Fig. 1.2. This is basic structure of farming tool robot and it include all component shown in block dig (Fig 1.1).

In the Fig. 1.2 black color strips which are joined with wheels are called moving belt and it is use to move robot system. The main purpose of those belt is to avoid slippage and unbalancing. On the left down side of the plastic box case is Arduino. It act as a microcontroller and takes the command from Raspberry Pi also it controls motors.Right side of plastic case there is Raspberry Pi which is programmed to do image processing. The motor drivers and GSM SIM900 circuit board are just above the Arduino. At back side of robot there is vassal to hold seeds and just below that a rotating wheel which take out seeds from vassal.Power supply circuit is also available in plastic case. Protective sheets applied on bottom side of robot.

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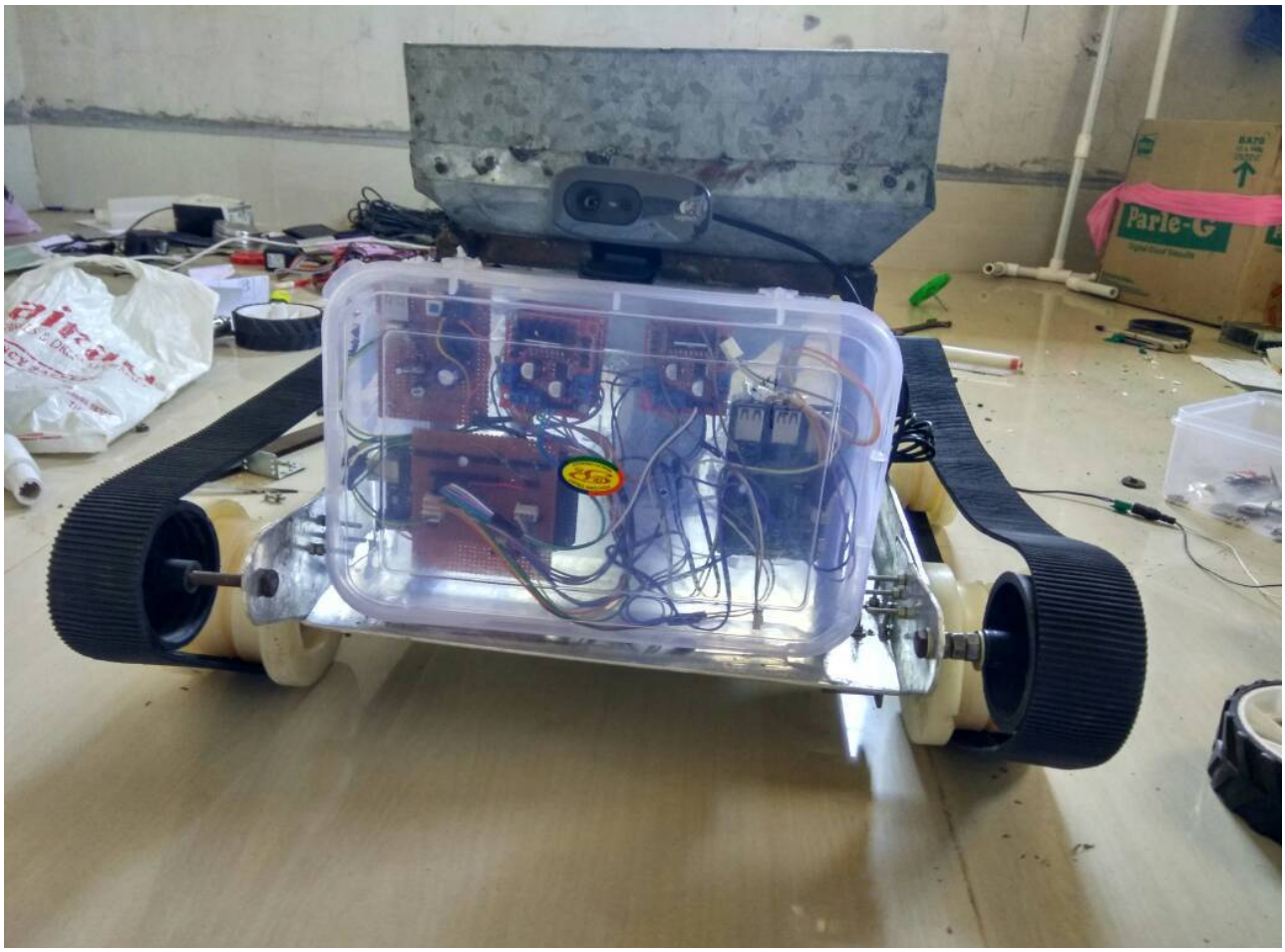

Fig. 1.2 Real image of robot

VII. CONCLUSION AND FUTURE WORK

This system provide wide range of technology intervention in agriculture. The successor of the system is depend on error free operation of intended function. The quality and reliability of the project depends on the result of phases in the system development. The project quality includes user friendliness, maintainability, efficiency etc.

Advantages –

1 High performance

2 The sensor system included in tractor helps to detect the obstacle in path without presence of farmer at the actual site.

3 The use of automation in tractor handling through computer saves tremendous human efforts and animal power

4 Use of webcam reduce chances of error

5 With use of GPS and area learning this robot can operate from remote places

6 Effective utilization of artificial intelligence

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BIOGRAPHY

Nikhil Sharad Belwate is a consultant and Research Assistant in the working in mobility department of Quinnox consultancy services. He received Master of Management Studies(MMS) and B.E. (Information technology) from University of Mumbai, India. His research interests are Computer programming, IoT, and artificial intelligence etc.