

ARTIFICIAL INTELLIGENCE BASED AGRICULTURAL ROBOT USING RASPBERRY PI

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Abstract – The rapid increase in population leads to more need of food which in turn leads more cultivation. But the present traditional procedures of farmers might not be sufficient enough to serve the increasing demand. To fulfill the need they might use harmful pesticides and hamper the soil which makes the soil to lose its fertility leaving like barren land. Taking all the considerations into account, “Artificial Intelligence Based Agricultural Robot Using Raspberry Pi” is proposed with the trending technology of Artificial Intelligence and Deep Learning on the Raspberry Pi board with the use of Python. The purpose of this Robot is to monitor the field for 24 hours so called 24 hours monitoring Robot, like humans. It can sense the temperature around, and can react to situation of removing the weeds and bugs from crops and less usage of pesticides. It gives the notification messages and images to the farmers mobile about the diseased leaves, steams etc and it uses different sprays to kill the pests.

Keywords: Artificial Intelligence, Deep Learning, Raspberry Pi, Arduino, Python.

1. INTRODUCTION

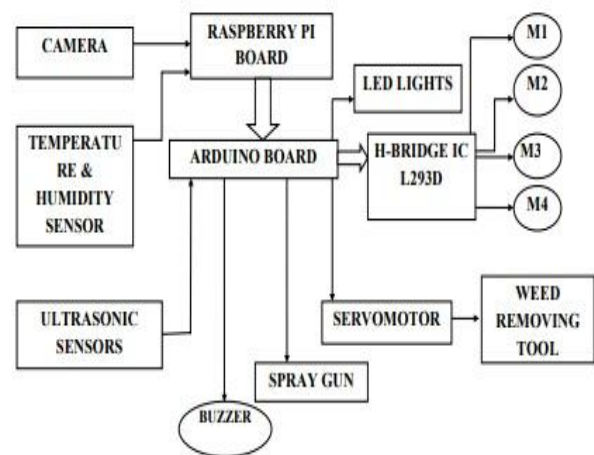
Agriculture is the backbone of India. The history of Agriculture in India dates back to Indus Valley Civilization Era and even before that in some parts of Southern India. Today, India ranks second worldwide in farm output. Agriculture is the science and art of Cultivating plants and livestock. The major problems in Agriculture are removing weeds, spraying harmful pesticides. Spraying of harmful pesticides leads to several health problems to the farmers & the people who are consuming it. There is a great demand for the labor but only few people are interested in the field of agriculture.

2. ADDITIONAL FEATURES

Reducing the need of labor, removing weeds and yields a better productivity with less usage of pesticides.

3. PROPOSED SYSTEM

3.1 BLOCK DIAGRAM



3.2 RASPBERRY PI



The Raspberry Pi is a credit-card sized computer powered by the Broadcom BCM2835 system-on-a-chip (SOC). This SOC includes a 32-bit ARM1176JZFS Processor, clocked at 700MHz, and a video core IV GPU. The Raspberry Pi is powered by a 5V micro USB AC charger. It contains PC or laptop inside the board but are much smaller.

3.3 ARDUINO BOARD



Arduino is an open-source electronics platform based on easy-to-use hardware and software. The Arduino Uno is a microcontroller board based on ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button

3.4 RASPBERRY PI CAMERA

The Raspberry pi Camera is high quality camera which can be useful in the recording videos and capturing images. The raspberry pi by default consist a port for connecting the raspberry camera module.

3.5 TEMPERATURE AND HUMIDITY SENSOR

Humidity is defined as the amount of water present in the surrounding air. This water content in the air is a key factor in the wellness of mankind. For example, we will feel comfortable even if the temperature is 0°C with less humidity i.e. the air is dry.

3.6 SERVO MOTOR

A Servo motor is a rotator actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback.

3.7 GEAR MOTORS

We are using four DC Gear Motors for the movement of the Robot.

3.8 ULTRASONIC SENSORS

Ultrasonic Sensors are used to detect approaching objects and track their positions.

3.9 H-Bridge IC L293D

A H bridge is an electronic circuit that allows a voltage to be applied across a load in any direction. H-bridge circuits are frequently used in robotics and many other applications to allow DC motors to run forward & backward.

3.10 BUZZER

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

3.11 LED LIGHTS

LED is an semiconductor light source it consists of PN junction diode and when voltage is applied to the LED, electrons and holes recombine in the PN junction and release energy in the form of light.

3.12 WEED REMOVING TOOL

Weed removing tool is used to remove weeds mechanically by using servomotor.

4. WORKING

The solar is placed on top of the Robot and is connected to the battery for charging the battery. Thus the maximum 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. The Robot is moving with the help of the gear motors. Some amount of power is driven by the H-Bridge IC to rotate the motors either in clockwise or anti-clockwise direction. The images of the field are captured by the camera and forwarded to the Raspberry pi board which compares the captured images with the original images using Image Processing. The other devices are activated by the Arduino board.

It can sense the temperature and moisture content of the soil in the field and can react to the situation with the help of temperature and humidity sensor. We are using two ultrasonic sensors. One is used to track the distance and direction and the other is used to find if any obstacles are there in front of the Robot and at that time the buzzer is ON.

The weeds in the field are removed with the help of weed removing tool mechanically by using servomotor. If the Robot is identifying any diseased leaves on the crops it can send the alert messages to the farmers mobile. It can spray the pesticides on the diseased leaves by using spray gun. The image processing is continuing without interruption with the help of LED lights.

5. RESULTS

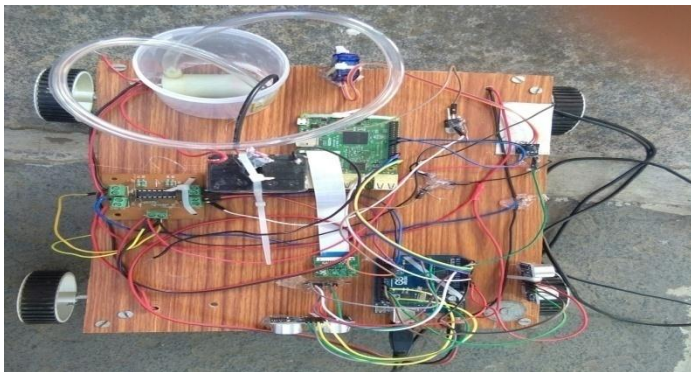


Fig 1: photograph of the project



Fig 2: Robot movement in the field

In the above figure, the Robot is placed in the field which monitors the field for 24hours so called 24 hours monitoring system. The power can be obtained from either the solar panels or the battery. It can detect the obstacles by using ultrasonic sensor. It takes 25 frames/sec with the help of Raspberry Pi Camera. If it can identify any diseased leaves in fields then it will send Alert messages to the farmers mobile.

The above figure shows the range values detected by the ultrasonic sensor by using Arduino Uno software. The ultrasonic sensor is used to detect the approaching targets and track their positions and also displays the range. If the object is far away it displays out of range.

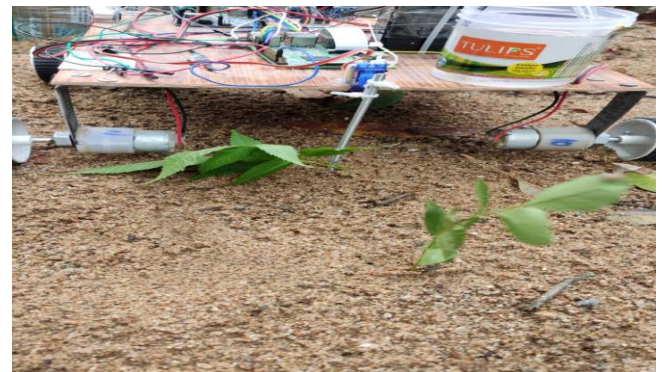


Fig 4: Robot removing the weeds in the field

The above figure shows the removing of weeds from the fields. It removes the weeds mechanically by using servo motor with the help of weed removing tool. This process helps to removing the weeds in initial stages which is helpful for getting the better productivity.

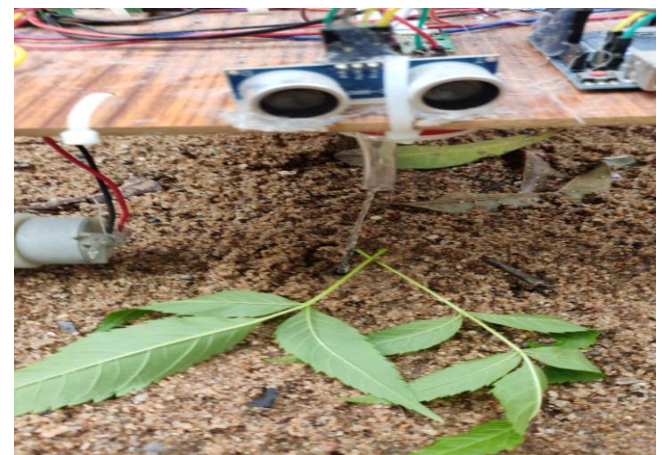


Fig 5: Spraying pesticides

The above figure shows the spraying of pesticides on the diseased leaves. It can identify the diseased leaves in pre-early stage and send alert messages to the farmers mobile. When farmer gets alerted by this message then he can give his command from the mobile. Then, it sprays the pesticides on the diseased leaves from the pesticides tank through the submersible pump.

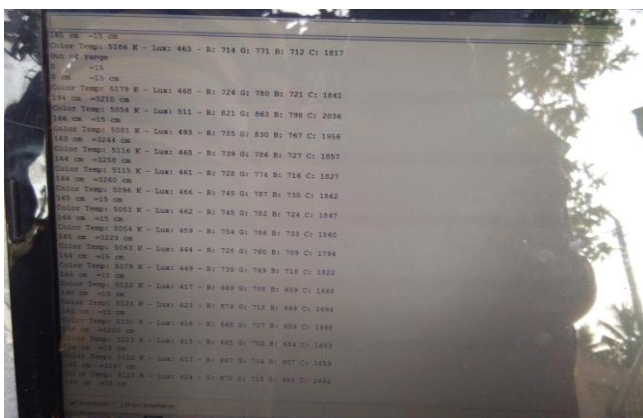


Fig 3: Object detection of Ultrasonic sensor

6. CONCLUSION

In agriculture, the cultivation and the production from the farming field with less need of labor might not be achieved every time. The farmer face difficulty in identifying the weeds and removing them, spraying pesticides on diseased leaves is a difficult task which requires more need of labor. Our project is mainly concentrated on those above problems. To reduce those problems, we designed an Artificial Intelligence based agricultural robot with the basic roots from Deep Learning using python on Raspberry Pi. This robot is used to remove the weeds, capturing the images and sends alert messages to the farmers mobile about the diseased leaves, spraying pesticides on diseased leaves in early stage. So it requires less usage of pesticides. Hence, we can conclude that this project is mainly used to reduce the need of labor and to achieve the greater production as per the demand by day by day increasing growth of population.

7. FUTURE SCOPE

The basic structure of the robot can be modified in different ways which can do planting, seeding, tilling and sowing and further extended to allow selective harvesting.

REFERENCES

- [1] Shivaprasad B S, Ravishankara M N, B N Shoba, "Design and Implementation of Seeding and Fertilizing Agriculture Robot", International Journal of Application or Innovation in Engineering & Management (IJAIEEM), Volume 3, Issue 6, June 2014, ISSN 2319-4847.
- [2] Amruta Sulakhe, M.N. Karanjkar, "Design and Operation of Agriculture Based Pesticide Spraying Robot", International Journal of Science and Research (IJSR), Volume 4, Issue 12, December 2015, ISSN 2319-7064.
- [3] Mr.J.Rajesh, Mr.R.Vinesh, Mr.S. Gowtham, et al, "Autonomous Adjustable Pesticide Spraying Device for Agricultural Application", International Research Journal of Engineering and Technology (IRJET), Volume 6, Issue 3, March 2019.
- [4] V. Dharmaraj and C. Vijayanand "Artificial Intelligence in Agriculture", International Journal of Current Microbiology and Applied Sciences, ISSN:2319-7706, vol. 7, no.12, 2018, pp .2122-2128.