A project report on

Smart Agribot For Chilli Pest Detection

Submitted in partial fulfilment for the award of the degree of

Master of technology in Integrated software engineering

Submitted by

Sai Preethi Salady – 19MIS7048

S.Niharika - 19MIS7089

M.Sahithi– 19MIS7011

B.Deepthi– 19MIS7098

G.Lal Krishna- 21BCE7390

B.Sahithya – 21BCE8913

Under the guidance of

DR. Rajesh Duvvuru

Amaravati

School of scope

November 2022

ABSTRACT

Increasing population requires the food production to be increased which requires better cultivation in the form of proper utilization of seeds and fertilizers with minimum labor work. The main objective of autonomous agribot is efficient utilization of resources and to reduce labor work. It can perform various tasks like detection of disease, checking the disease type , and spraying of fertilizers. It can spray the pesticides using spraying mechanisms. All above operations are performed by using raspberry pi controller which is master and others are lilypad which are slaves performs specific operation. By using image processing and robotic arm the agribot will detect pests and insecticides on leaves and sprays the required pesticides for the requires all this harvesting work can be done by using Raspberry pi. More than 60 percent of the population in the India, agriculture as the primary sector occupation. In recent years, due increase in labor shortage interest has grown for the development of the autonomous vehicles like robots in the agriculture. An robot called agribot have been designed for agricultural purposes Spraying pesticides especially important for the workers in the area of potentially harmful for the safety and health of the workers. This is especially important for the workers in the area of potentially harmful for the safety and health of the workers. The Proposed system aims at designing multipurpose autonomous agricultural robotic vehicle which can be controlled through IoT for seeding and spraying of pesticides. These robots are used to reduce human intervention, ensuring high yield and efficient utilization of resources

INDEX

INTRODUCTION

The main motive for developing Smart agribot for Chilli pest detection is that the decreasing labour force, a phenomenon common in the developed world. The reasons are the need for improved food quality. . In the current generation most of the countries do not have sufficient skilled man power in agricultural sector and it affects the growth of developing countries. So it’s necessary to automate the sector to overcome this problem. In India there are 70% people dependent on agriculture. Robotics is the branch of technology that deals with the design, construction, operation, and application of robots, as well as computer systems for their control, sensory feedback, and information processing. The design of a rover will often incorporate agricultural efforts, though it may not look much like a human being or function in a human like manner. These types of intelligent systems having robust and feasible model with a number of integrated functionalities is the demand of future in every field of technology, for the betterment of the society.

Agriculture was the key development in the rise of human civilization. A remarkable change in agricultural practices has occurred over the past century in response to new technologies, and the development of world agricultural markets. This also has led to technological improvements in agricultural technique. Farmers suffer large financial losses because of usage of incorrect irrigation mechanisms, insect pests and attack of plant diseases, usage of uncalculated number of pesticides and insecticides, and wrong prediction of weather. They may face some issues while spraying pesticides so they must take numerous precautions when spraying pesticides, including wearing proper clothing, gloves, and masks, among others.

On the earth 42% of population is dependent on an occupation of agriculture, they must do a lot of work and more load on them. Spraying pesticides is one of these jobs that is risky and challenging because the chemicals used in these pesticide liquids are dangerous. It may cause breathing difficulties as well as other physical issues.

2.BACKGROUND

The idea of robotic agriculture (agricultural environments maintained by sensible machines) isn't a replacement one. Many engineers have developed driverless tractors within the past however they need not been prosperous as they didn't have the power to embrace the complexness of the important world. Most of them assumed associate industrial form of farming wherever everything was identified beforehand and also the machines may work entirely in predefined ways that – very similar to a assembly line. The approach is currently to develop smarter machines that are intelligent enough to figure in associate unqualified or semi natural surroundings. These machines don't have to be compelled to be intelligent within the method we have a tendency to see individuals as intelligent however should exhibit wise behaviour in recognised contexts. In this way they should have enough intelligence embedded within them to behave sensibly for long periods of time, unattended, in a semi-natural environment, whilst carrying out a useful task. One way of understanding the complexness has been to spot what individuals waste bound things and decompose the actions into machine management. This is known as behavioural artificial intelligence and a draft technique for applying this approach to agriculture is given.

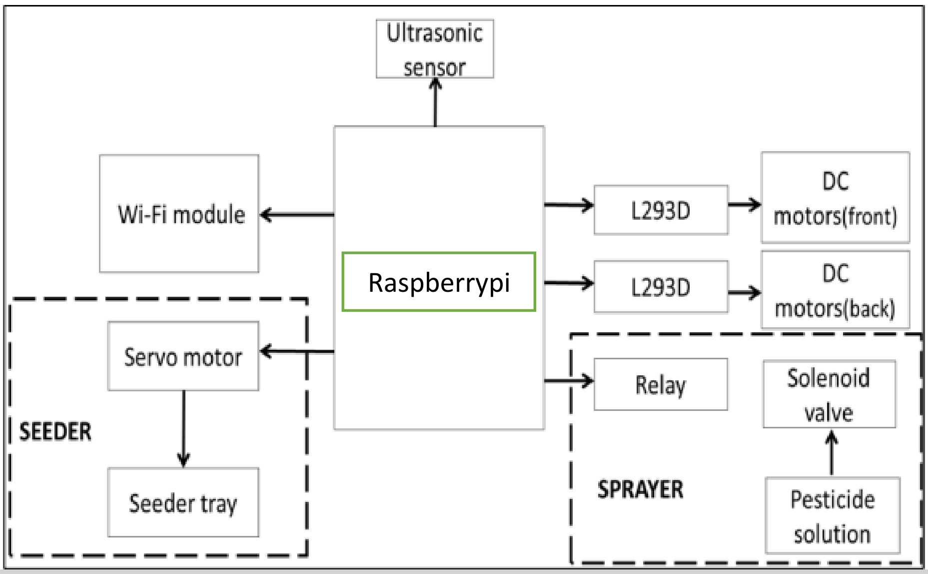
3.PROBLEM DEFINITION

It has induced plant diseases a huge post-effect scenario as it is possible. The quality and quantity of agricultural products decreases significantly. Early detection of pests is a major problem for planting. First phase includes the crop being carefully and periodically monitored. The affected plants are then identified, and photographs are obtained for the affected crop component using scanners or cameras. Then these objects are pre-processed, transformed and grouped. Then these images are sent to the processor as input and images are compared by the processor. If the picture is contaminated, an automatic sprayer of pesticides is used to spray.

4.OBJECTIVES

Current autonomous ground and aerial robots can gather operational data as well as affect the operations on a broader basis than manual practices. Such robotic technologies have a strong potential to further reduce the use of labor and increase the precision and efficiency of production inputs. It takes inputs from infected leaves and sprays the required pesticides for the plant. Smart farming reduces the ecological footprint of farming. Minimized or site-specific application of inputs, such as fertilizers and pesticides, in precision agriculture systems will mitigate leaching problems as well as the emission of greenhouse gases

5.BLOCK DIAGRAM OF THE PROJECT



Block Diagram operation

1) Sensor

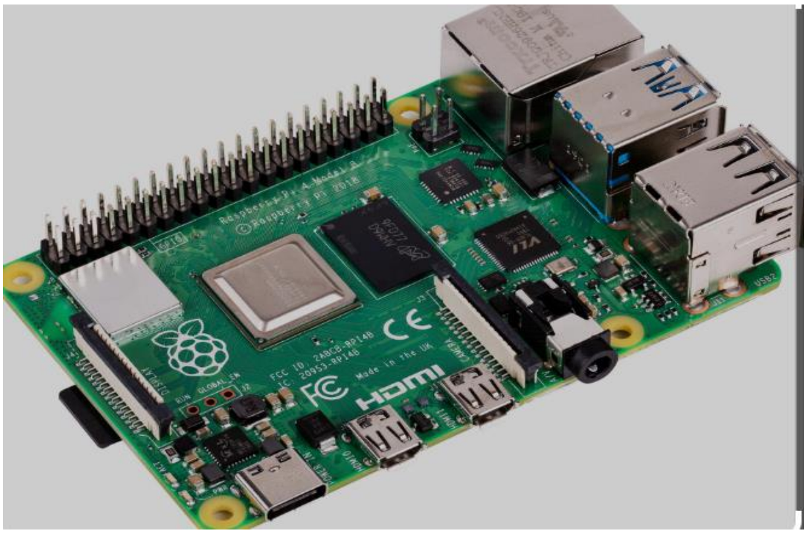
Sensors are basically use to convert physical quantity in electrical form there are different sensor are evadible for various physical quantity. In our project we monitor 2 parameters, first is Temperature, and second is smoke. For this we used two different sensors

2)Servo Motor

Servo Motor A Servo motor is a rotary actuator otherwise called linear actuator that allows for precise control of angular or linear position, speed .It consists of suitable to couple with a sensor module for feedback position. Servo motor is often used to in a closed loop control system. Modern day servo motors are designed and supplied around a dedicated controller module from the different manufacturer. Controllers may also be developed around microcontrollers in order to reduce the cost for large volume applications

3)Raspberry pi: -

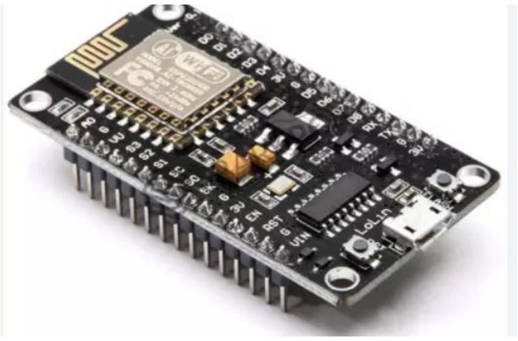
This is the most important segment of the project, i.e., the Arduino. The Arduino is responsible for detection and polling of the peripheral’s status. It is responsible for making decisions for the connected devices. It is responsible for prioritizing all the tasks. We have used the Arduino Uno. It is a High Performance, Low Power AVR 8-Bit Arduino. It also has In-System Programming by On-chip Boot Program. It has 23 Programmable I/O Lines.



It is the major part of the system which controls all the operation of the circuit such as LCD interfacing, Wi-Fi module interaction. It also decides the messages to be displayed on the LCD along with the time duration for which they should be displayed on the LCD.

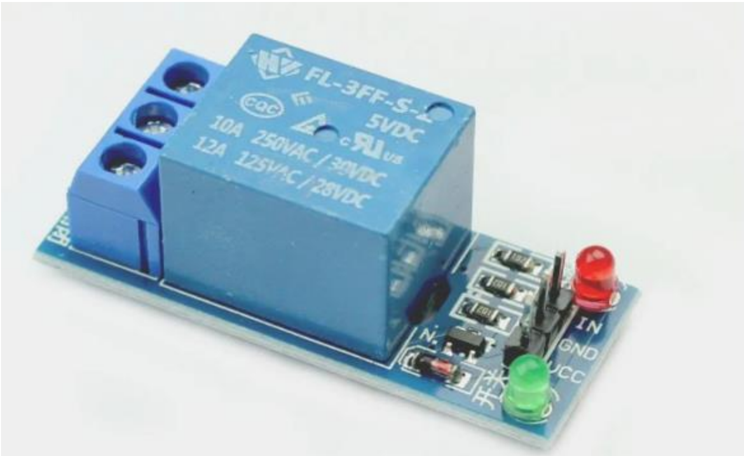
4) ESP8266:

ESP 01 The ESP8266 –ESP 01 is a low-cost SoC Wi-Fi module with support full TCP/IP stack and microcontroller capability produced by expressive Systems. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. The low cost and the way that there were not very many outside segments on the module which proposed that it could in the long run be extremely cheap in volume, pulled in numerous programmers to investigate the module chip and the produce product using it.



5) Relay:

These sensors are attached to Arduino and share the real-time data with it. The relay is used to ON power pump from an external power source. The relay is turned ON and plants are watered as per requirement only, when the soil moisture sensor detects low moisture in soil.



6) Ploughing Function:

The primary purpose of ploughing is to turn over the upper layer of the soil, bringing bottom fresh nutrients to the surface, while burying weeds and the remains of previous crops and allowing them to break down. In the prototype model shown above, a DC Motor coupled with the screw rod is used for ploughing the farm. As the screw rod rotates, the nut welded to the cultivator slides between the screws of the rod. Then the cultivator is lowered down and the soil is dug up to 1.2 inches. The direction of the cultivator can be controlled by the web browser through IoT in the smart phone.

6.METHODOLOGY

It has induced plant diseases a huge post-effect scenario as it is possible. The quality and quantity of agricultural products decreases significantly. Early detection of pests is a major problem for planting. First phase includes the crop being carefully and periodically monitored. The affected plants are then identified and photographs are obtained for the affected crop component using scanners or cameras. Then these objects are pre-processed, transformed and grouped. Then these images are sent to the processor as input and images are compared by the processor. If the picture is contaminated, an automatic sprayer of pesticides is used to spray.

- Identify flaunty and non flaunty leaves
- Next is to identify that which pesticide suits in the crop
- Sprinkling of pesticides

  Proposed system requires IR sensors, Image processing, robotic arm and controller as main blocks for the design. Selection of Controller will be done on the basis of number required memory size, number of analog and digital input/output pins. Hence for system design controllers like ATMEL 8051, PIC and Arduino will be considered. Depending upon number of peripheral used and memory size required for system design, system will be design using Arduino microcontroller as main control unit due to following design issues.

  In ATMEL 8051 there is no provision of inbuilt ADC and if system demands ADC interface for any problem, there is a need to interface ADC externally. Due to which extra cost will increase. In case of ARM processor, there is a provision for on chip ADC interface. As system demands limited number of resources, there will be the possibility of wasting number of unused resources.. It is possible to connect lily pads which are at mega328 controller to the pi. Cost is also an important aspect to consider for design. Hence due to above mentioned points system will have to be implemented by using Raspberrypi controller

6.1. Hardware architecture:

The base frame of agribot consists of 4 wheels connected to four arms and both rear and front wheel is driven by DC motor. The seeds are sowed through drilled hole attached to the shaft. A solenoid valve equipped pump sprayer is used to spray the pesticide. Wi-Fi technology through smart phone is used to control the entire operation of robot for ploughing, seeding and pesticide spraying. The Heart of the proposed system is Microcontroller. Wi-Fi module, DC motors, relays are interfaced to the Microcontroller to provide various operations like Ploughing, seeding and pesticide spraying. The entire mechanism of the system is controlled by Bluetooth module from Android smart phone. The wireless communication of Wi-Fi technology enables the robot to move in four directions as front, back, right and left. Various commands can be used to move robot into forward, reverse, stop, left, and right. The microcontroller in the proposed model enables various functions in the field according to the commands received from smart phone.

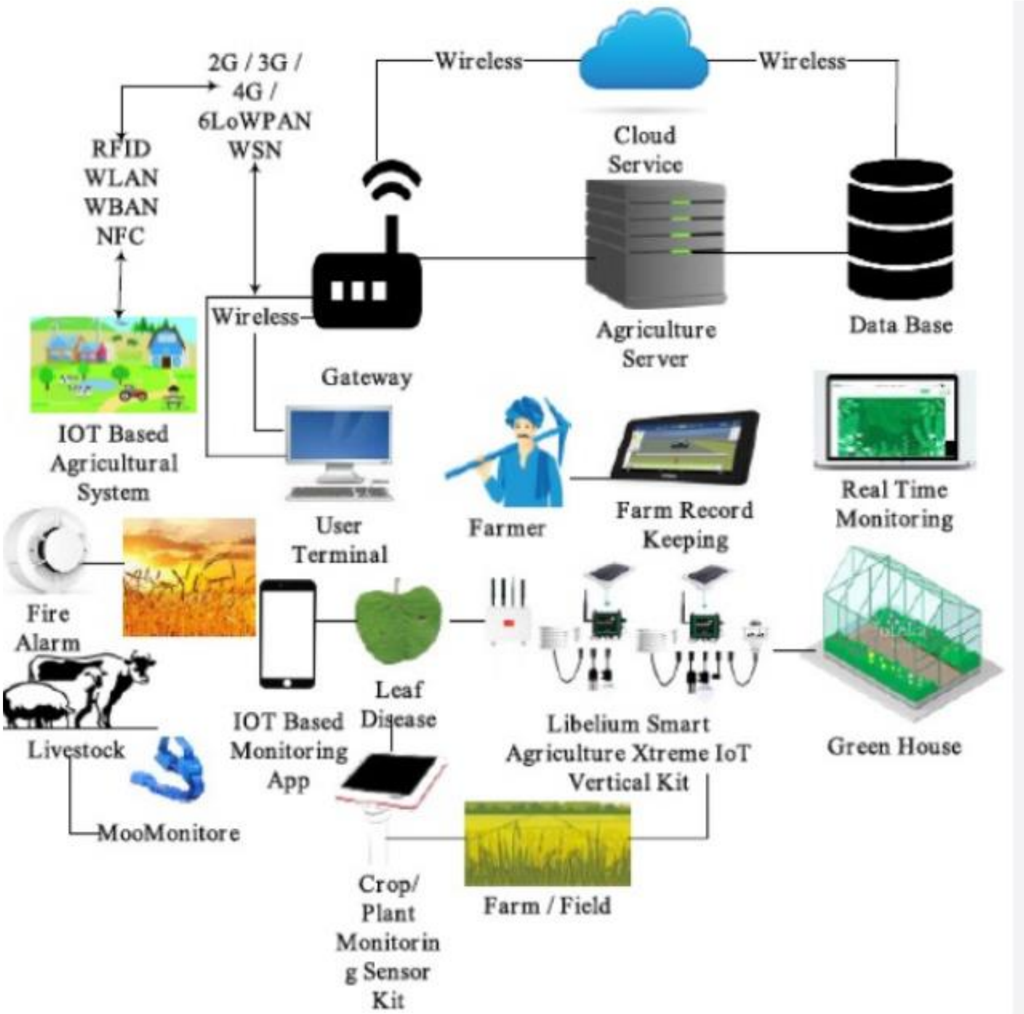
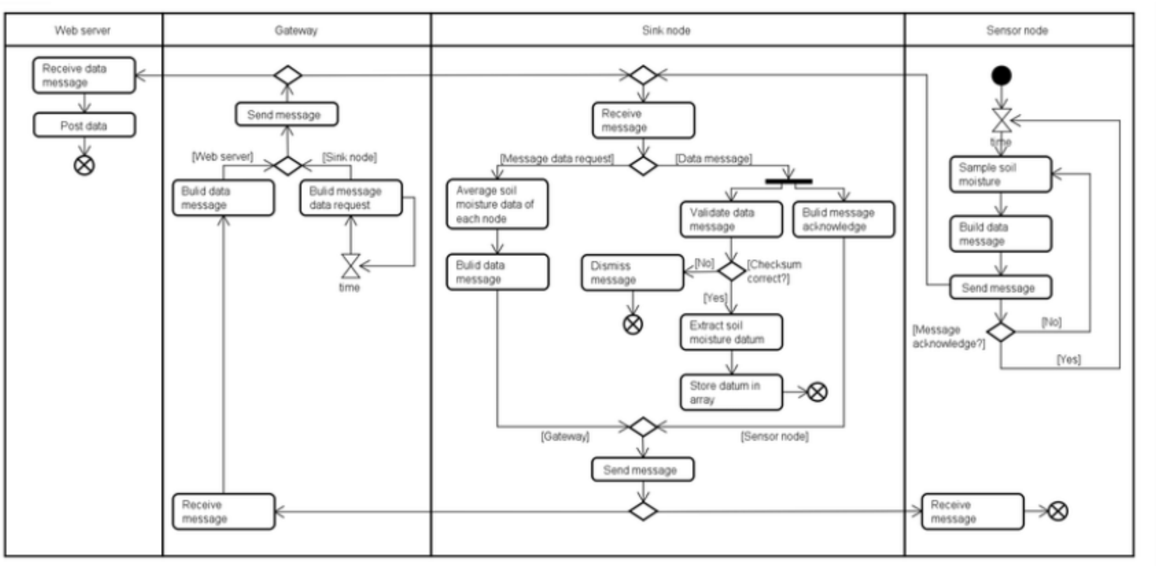


Figure 4. hardware architecture of smart agribot for chilli pest control

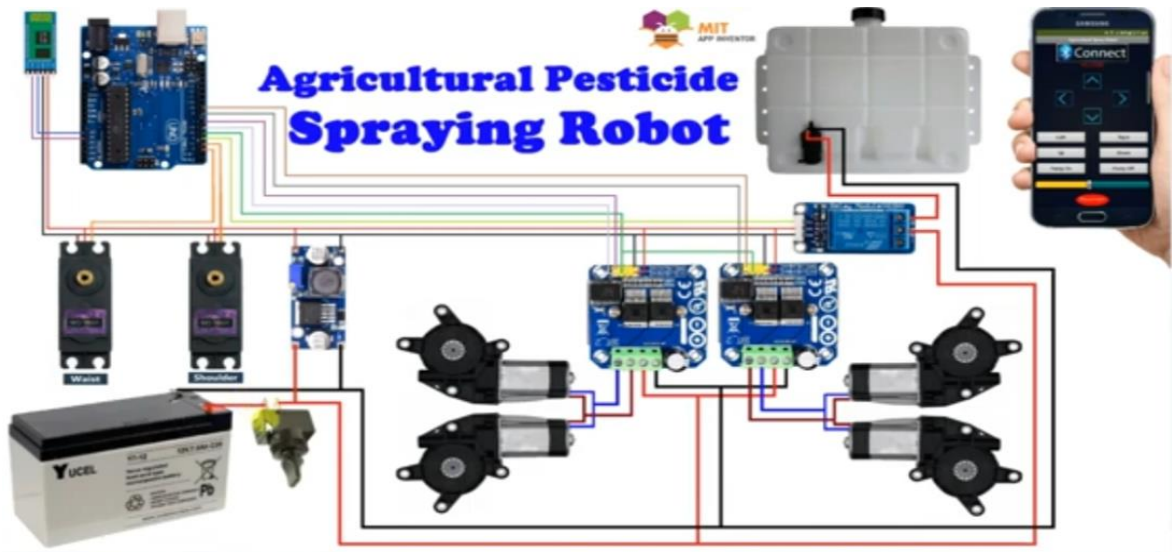
6.2. Software development:

The software program of the project is primarily based totally at the flow chart in figure 5. When the system begins, LM35 will continually experience the encircling temperature. Whenever a fire is broken out, even a small little fire, a temperature rise is occurred. When that happens, LM35 can stumble on the temperature value instantly. At the time while the temperature reaches 40o C or above, microcontroller at the Arduino UNO board will notify GSM module to send an alert message to the user. Value of temperature restriction that may be precipitated with the aid of using LM35 maybe modified withinside the code upon request by the user. The restriction isn't limited to any value since the LM35 sensitively senses any surrounding heat with regards to the temperature range it could count (-55oC to +150oC). During hot climate in Malaysia, the temperature can attain as much as nearly 38oC. Thus, the limit temperature to be detected; 40oC is definitely agreeable according to the Malaysia’s climate.

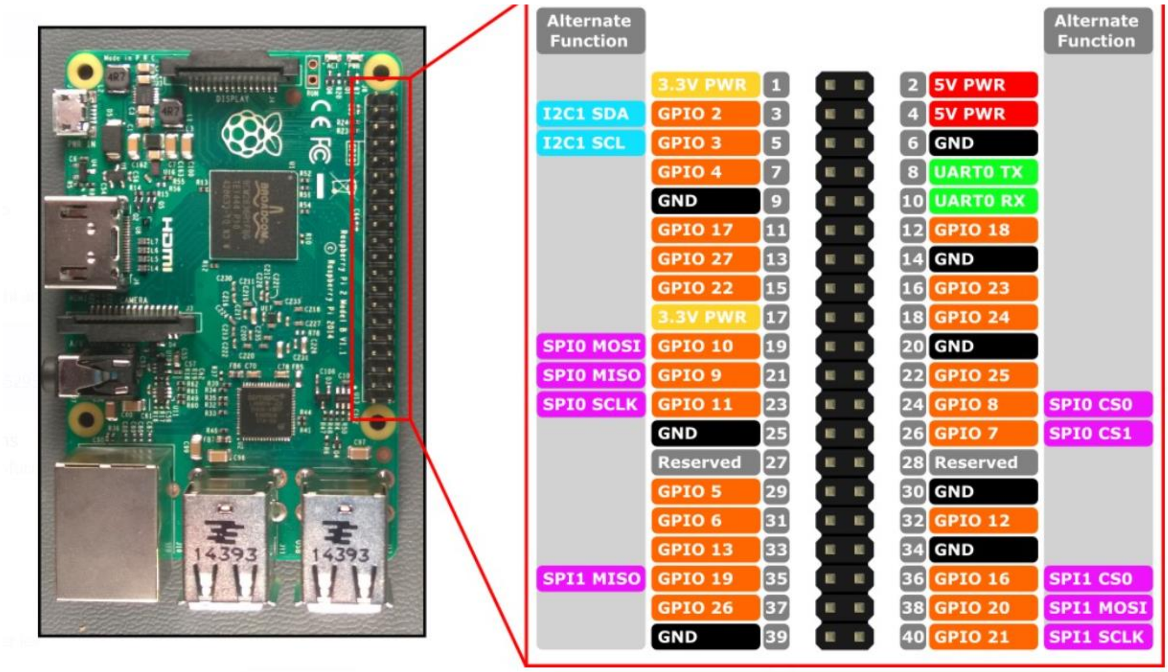


7.SCHEMATIC DIAGRAM OF THE PROJECT

Project schematic diagram



8.PIN DIAGRAM FOR RASPBERRYPI BOARD:



9.CODES IN APPENDIX

(I) For running the wheels:

```
import RPi.GPIO as GPIO
from time import sleep

in1 = 24
in2 = 23
temp1=1

GPIO.setmode(GPIO.BCM)
GPIO.setup(in1,GPIO.OUT)
GPIO.setup(in2,GPIO.OUT)
GPIO.output(in1,GPIO.LOW)
```

```
GPIO.output(in2,GPIO.LOW)

p.start(24)
p.start(25)
print("\n")
print("The default speed & direction of motor is LOW & Forward.....")
print("r-run s-stop f-forward b-backward e-exit")
print("\n")

while(1):

    x=raw_input()

    if x=='r':
        print("run")
        if(temp1==1):
         GPIO.output(in1,GPIO.HIGH)
         GPIO.output(in2,GPIO.LOW)
         print("forward")
         x='z'
        else:
         GPIO.output(in1,GPIO.LOW)
         GPIO.output(in2,GPIO.HIGH)
         print("backward")
         x='z'



    elif x=='s':
```

```
    print("stop")
    GPIO.output(in1,GPIO.LOW)
    GPIO.output(in2,GPIO.LOW)
    x='z'

elif x=='f':
    print("forward")
    GPIO.output(in1,GPIO.HIGH)
    GPIO.output(in2,GPIO.LOW)
    temp1=1
    x='z'

elif x=='b':
    print("backward")
    GPIO.output(in1,GPIO.LOW)
    GPIO.output(in2,GPIO.HIGH)
    temp1=0
    x='z'




elif x=='e':
    GPIO.cleanup()
    print("GPIO Clean up")
    break

else:
    print("<<<  wrong data  >>>")
```

```
print("please enter the defined data to continue.....")
```

(II) For pest detection:

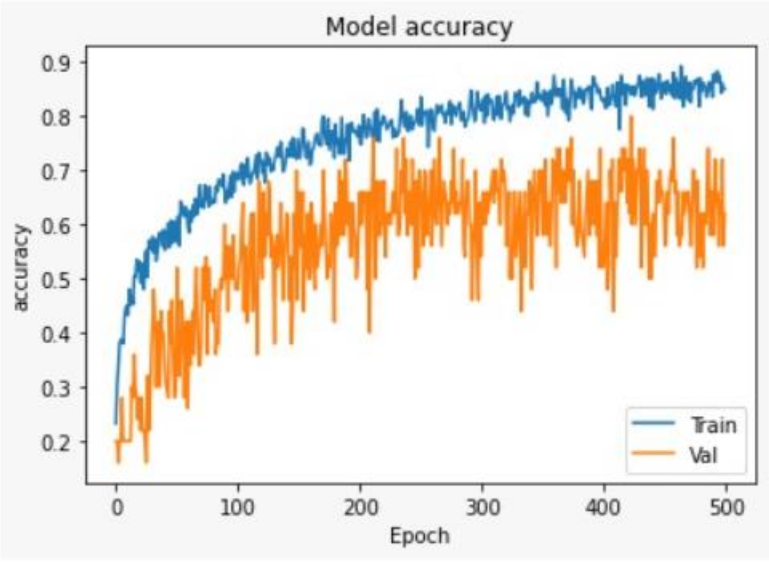
```
import keys
import os
import notecard
from pathlib import Path
from periphery import I2C
import picamera
import RPi.GPIO as GPIO
from run_tf_detector import load_and_run_detector
from run_tf_detector_batch import load_and_run_detector_batch,
write_results_to_file
import time

notehub_uid = 'com.blues.tvantoll:pestcontrol'
port = I2C("/dev/i2c-1")
card = notecard.OpenI2C(port, 0, 0)

model = './md_v4.1.0'
model = ''.join([str(f) for f in Path('.').rglob('*.pb')])

pir_sensor_pin = 4
GPIO.setmode(GPIO.BCM)
GPIO.setup(pir_sensor_pin, GPIO.IN)

def process_image(file_name):
  output_path = './output.json'
  results = load_and_run_detector_batch(
```

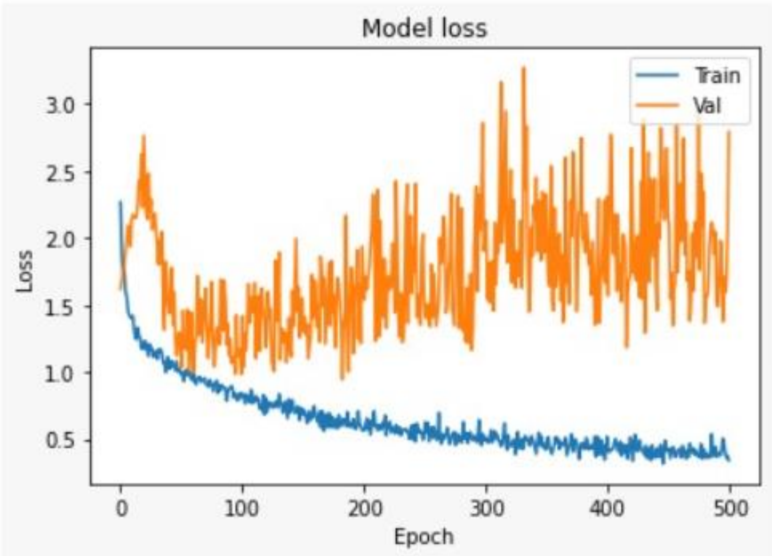
```
    model_file=model,
    image_file_names=[file_name],
    checkpoint_path=output_path,
    confidence_threshold=0.6,
  )
  write_results_to_file(results, output_path)
  return results

def draw_detection_boxes(file_name):
  load_and_run_detector(
    model,
    [file_name],
    str(Path('./images'))
  )

def get_image_name():
  path, dirs, files = next(os.walk('images'))
  file_count = len(files)
  return 'images/' + str(file_count + 1) + '.jpg'

def take_picture():
  camera = picamera.PiCamera()
  camera.resolution = (400, 400)
  camera.start_preview()
  time.sleep(2)
  camera.rotation = 90
  image_name = get_image_name()
  camera.capture(image_name)
  camera.stop_preview()
```

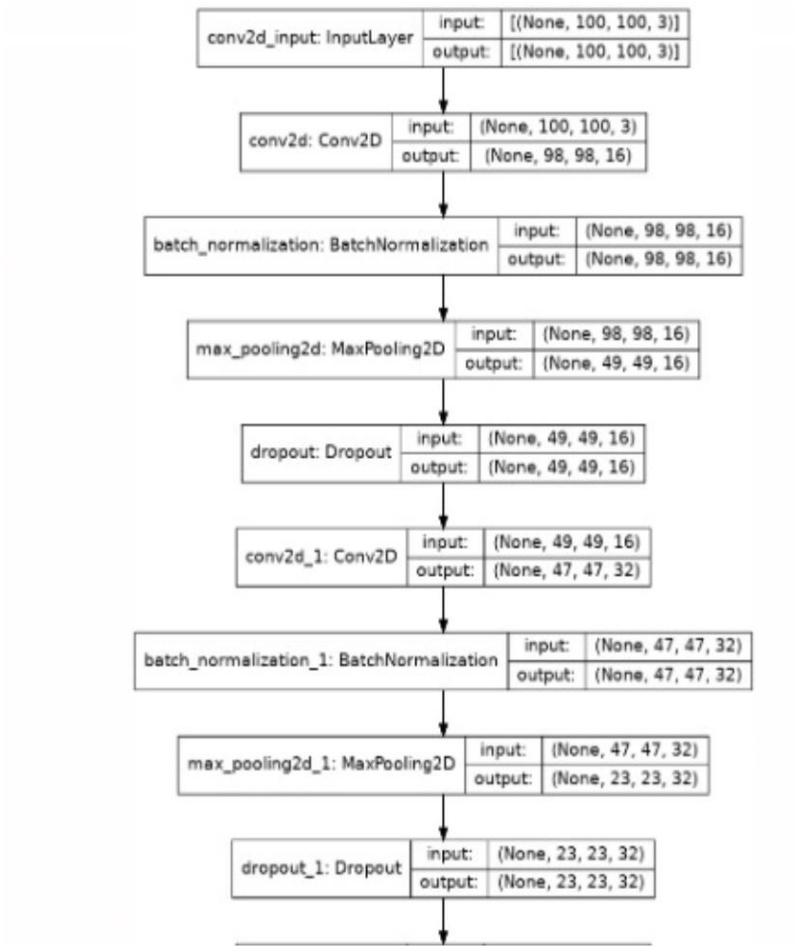
```
  camera.close()
  return image_name

def init_notecard():
  req = {"req": "hub.set"}
  req["product"] = notehub_uid
  req["mode"] = "continuous"
  req["sync"] = True
  res = card.Transaction(req)
  print(res)

def send_to_notehub():
  req = {"req": "note.add"}
  req["file"] = "twilio.qo"
  req["sync"] = True
  req["body"] = {
    "body": "Spotted an animal!",
    "from": keys.sms_from,
    "to": keys.sms_to,
  }
  res = card.Transaction(req)
  print(res)

def is_animal_image(ml_result):
  for detection in ml_result['detections']:
    if detection['category'] == '1':
      return True
  return False
```

```
def main():
  init_notecard()
  while True:
    sensor_state = GPIO.input(pir_sensor_pin)
    if sensor_state == GPIO.HIGH:
      print('Motion detected')
      image_name = take_picture()
      ml_result = process_image(image_name)[0]
      if is_animal_image(ml_result):
        print('Animal detected!')
        send_to_notehub()
      else:
        print('No animal detected')
        os.remove(image_name)

    time.sleep(5)

main()
```

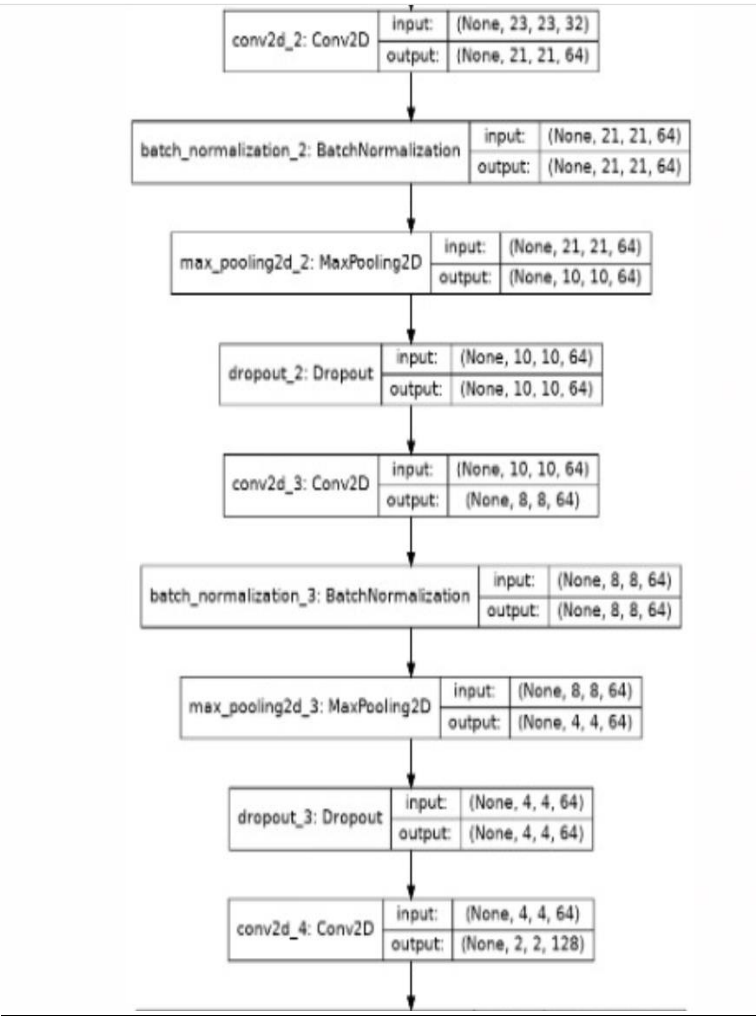
Results and Discussion :

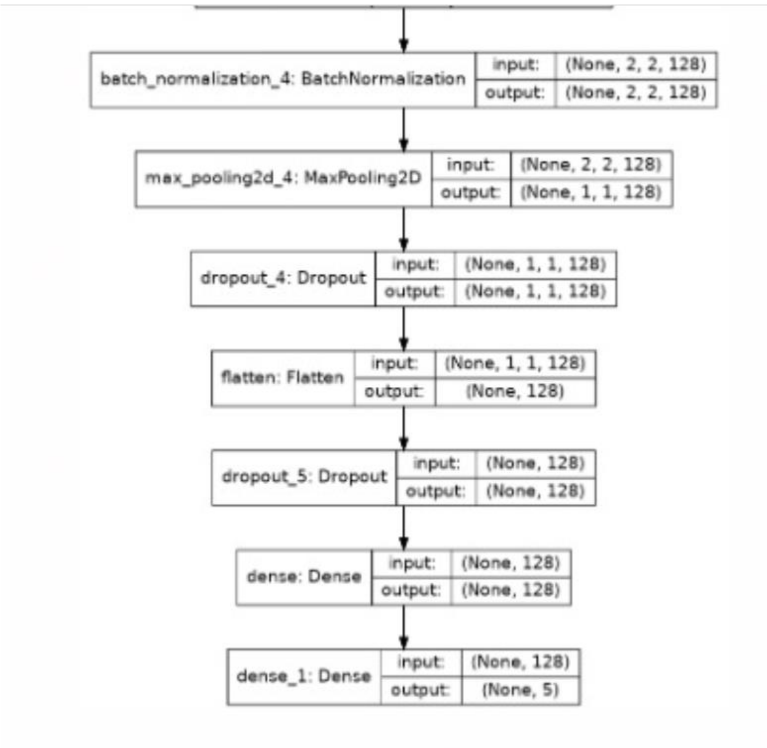






conv2d_input: InputLayer
input:
[(None, 100, 100, 3)]
output:
[(None, 100, 100, 3)]
conv2d: Conv2D
input:
(None, 100, 100, 3)
output:
(None, 98, 98, 16)
batch_normalization: BatchNormalization
input:
(None, 98, 98, 16)
output:
(None, 98, 98, 16)
max_pooling2d: MaxPooling2D
input:
(None, 98, 98, 16)
output:
(None, 49, 49, 16)
dropout: Dropout
input:
(None, 49, 49, 16)
output:
(None, 49, 49, 16)
conv2d_1: Conv2D
input:
(None, 49, 49, 16)
output:
(None, 47, 47, 32)
batch_normalization_1: BatchNormalization
input:
(None, 47, 47, 32)
output:
(None, 47, 47, 32)
max_pooling2d_1: MaxPooling2D
input:
(None, 47, 47, 32)
output:
(None, 23, 23, 32)
dropout_1: Dropout
input:
(None, 23, 23, 32)
output:
(None, 23, 23, 32)


conv2d_2: Conv2D
input: (None, 23, 23, 32)
output: (None, 21, 21, 64)
batch_normalization_2: BatchNormalization
input: (None, 21, 21, 64)
output: (None, 21, 21, 64)
max_pooling2d_2: MaxPooling2D
input: (None, 21, 21, 64)
output: (None, 10, 10, 64)
dropout_2: Dropout
input: (None, 10, 10, 64)
output: (None, 10, 10, 64)
conv2d_3: Conv2D
input: (None, 10, 10, 64)
output: (None, 8, 8, 64)
batch_normalization_3: BatchNormalization
input: (None, 8, 8, 64)
output: (None, 8, 8, 64)
max_pooling2d_3: MaxPooling2D
input: (None, 8, 8, 64)
output: (None, 4, 4, 64)
dropout_3: Dropout
input: (None, 4, 4, 64)
output: (None, 4, 4, 64)
conv2d_4: Conv2D
input: (None, 4, 4, 64)
output: (None, 2, 2, 128)


batch_normalization_4: BatchNormalization
input: (None, 2, 2, 128)
output: (None, 2, 2, 128)
max_pooling2d_4: MaxPooling2D
input: (None, 2, 2, 128)
output: (None, 1, 1, 128)
dropout_4: Dropout
input: (None, 1, 1, 128)
output: (None, 1, 1, 128)
flatten: Flatten
input: (None, 1, 1, 128)
output: (None, 128)
dropout_5: Dropout
input: (None, 128)
output: (None, 128)
dense: Dense
input: (None, 128)
output: (None, 128)
dense_1: Dense
input: (None, 128)
output: (None, 5)

10.APPLICATION AND ADVANTAGES OF THE PROJECT

Applications of the project:

1. It can be used in industry purposes

2. You can use this project at your fields

Advantages of the project:

1) Variations in industry parameters are displayed so supervisors can easily identify faults.

2) It uses a microcontroller circuit. It's reduced, more compact, and more flexible.

3) Compact system and low power consumption.

4) Due to relays in the system, our system cuts off the supply in case of an error.

11.CONCLUSION AND FUTURE SCOPE

Conclusion:

This multipurpose system gives an advance method to sow, plough and harvest the crops with minimum man power and labor, making it an efficient vehicle. The machine will cultivate the farm by considering particular rows and specific column at fixed distance depending on crop.

This project may provide a great scope in agricultural vehicles over the past 20 years. Although the research developments are abundant, there are some shortcomings (e.g., low robustness of versatility and dependability of technologies) that are delaying the improvements required for commercialization of the guidance systems. The application of new popular robotic technologies for agricultural guidance systems will augment the realization of agricultural vehicle automation in the future.

In agriculture, the opportunities for robot-enhanced productivity are immense – and the robots are appearing on farms in various guises and in increasing numbers. The other problems associated with autonomous farm equipment can probably be overcome with technology. This equipment may be in our future, but there are important reasons for thinking that it may not be just replacing the human driver with a computer. It may mean a rethinking of how crop production is done.
Crop production may be done better and cheaper with a swarm of small machines than with a few large ones.

One of the advantages of the smaller machines is that they may be more acceptable to the non-farm community. The jobs in agriculture are a drag, dangerous, require intelligence and quick, though highly repetitive decisions hence robots can be rightly substituted with human operator. Robots can improve the quality of our lives but there are downsides

Future Scope:

1) We use GPS transmitter and receiver so that rang of indication is not limited

2) Instead of mobile SMS at remote location we transmit all parameter at remote location and at there is also another display, which show this parameter

3) We provide 6v 4,5 Ah batter back up to our system so that in case of power failure our project works properly

4) We also add other parameter of transformer for indication such short circuit.

13.REFERENCES

Websites:

- https://iot.tatacommunications.com/product/agribot
- https://www.irjet.net/archives/V7/i7/IRJET-V7I739.pdf
- https://www.ripublication.com/ijaerspl2019/ijaerv14n6spl_44.pdf