2nd National Conference on Recent Innovation in Engineering, Science, Humanities and Management
REVA University, Yelahanka, Bangalore, (India)
29th-30th March 2019 www.conferenceworld.in ISBN : 978-93-87793-79-8

Implementation of Agribot and Disease Detection in Plants

Sumana R[1], Sunethra B B[1], Swarnalatha B N[1], Vinuthana N R[1], Md Tauseef[2]

[1]School of ECE, REVA University ,[2]Assistant Professor, School of ECE, REVA University

ABSTRACT

The advent of robotics in farming has been a trending technology because of its accuracy and precision.Automation of all the processes involved in agriculture improves the yield and thus reducing time consumption and also the human power. Designing and implementing such a robot needs consideration of farming environment and availability of resources in those environments. Also, the crop produced might get damaged due to crop diseases such as Altemaria leaf spot, Cersopora leaf spot, Bacteria blight and Red spot. Image processing technique is applied to identify these disease and suitable pesticide is sprinkled to the infected leaf. ARMLPC2148 micro controller is the main control of the agribot This paper mainly focuses on automation of agricultural processes by an agribot and disease detection in plants.

Keywords- Agribot, Automation, Pesticide sprinkling, Precision agriculture, Image processing.

I. Introduction

Agriculture is the backbone of Indian economy. The conventional method of agriculture included use of cattle to plough, but the process became considerably time consuming but resulted in low productivity and income and also majorly depended on human labour. When it comes to monitor a huge farm, which requires a detailed research making it tedious and time consuming. Hence, automation is the need of the decade. Designing of a robot is mainly based on its efficiency, precision and automation. It is also necessary to implement the upcoming technologies for higher accuracy.

The algorithm of an agricultural robot should be such that it should be able to perform all the processes involved in farming beginning from digging, sowing seeds, levelling, water sprinkling and harvesting. While designing it there are many criteria which has to be focused on like the accuracy required, area of the land it is to be worked on, resources available and most important it's cost should be affordable by a farmer.At each and every process all the criteria has to be considered thereby reducing labour work.. For example, consider the process of seeding initially the area has to be set. Then, the depth to which the seeds has to be sown and distance between each row has to be properly navigated. Robots designed should be such that it must overcome the disdvantages of the conventional methods of agriculture and should be an efficient system.

The agricultural robot not only performs the operations of digging, seeding, levelling, and water sprinkling but also focuses on identifying the diseases present in crops. This identification is possible by implementing the

process of image processing. This works on the principle of combination of color and texture feature extraction. When a disease is identified, suitable pesticide is sprinkled to the respective leaf by a pesticide sprinkler.

II. Related Work

2.1 Dheeb Al Bashish[1], the author has worked on the concept of leaf disease detection using a technology of image processing. The traditional method of identifying leaf disease in large fields manually is very difficult and also time consuming. But with the help of computer based image processing, leaf disease can be recognized automatically and it can be treated in the initial stage itself. This paper tests on few diseases which affects the crops such as Early Scorch, Cottony mold, Aslen molol,late scorch and tiny whiteness. The proposed system can successfully detect and classify the examined disease with an average precision of 93%.

2.2 Pranjali B. Padol[2], Agriculture is the main production input for Indian economy. Grape has been one of the majorly grown crops in India. But, due to various types of diseases, there is a decreased rate in growth of these plants. About 20-30% of grape plants are affected to diseases. Research were done to overcome this problem and hence they came up with the ideas of image processing and SVM techniques. Image processing is performed to identify the leaf disease whereas classification of leaf disease by its colour and texture feature is done by SVM classification technique. This technique has an accuracy of 88.89%.

2.3 F Auat Cheein[3] /The application of automation in precision agriculture has become a trend in the field of agriculture and is gaining a lot of attention fron scientists. Agricultural robotics is the autonomous machines to control all the agricultural processes.The agricultural robots not only work towards achieving the aim of precision agriculture but also has brought many changes in agriculture. It can also monitor and supervise most of the tasks by itself, reducing human interference. But, however some of the information has to be provided explicitly.

2.4 Manisha Bhange[4], has worked on the web based tools which identifies the diseases in crops. Pomogranate fruit is selected for disease detection. Image of the fruit is given as an input to the system. This image undergoes several processing steps to identify whether it is affected by the disease. Initially, the image is resized and the features are extracted based on colour, size, shape, morphology and then with the help of SVM, the fruit image is classified from non-infected fruit.

2.5 Pranjali B. Padol[5], Precision agriculture is the newly emerging technology in the field of agriculture. Traditionally, farming was done manually which in turn was time and energy consuming and also the labour charges were very high. But in recent years the automated robots hasve come into existence to reduce the time and energy of farmers. These robots can perform all the agricultural tasks autonomously improving the productivity of crops.This automated robot maintains specific depth for digging the soil, an accurate spatial distance while seeding and water sprinkling is based on moisture content of the soil.

ISBN : 978-93-87793-79-8

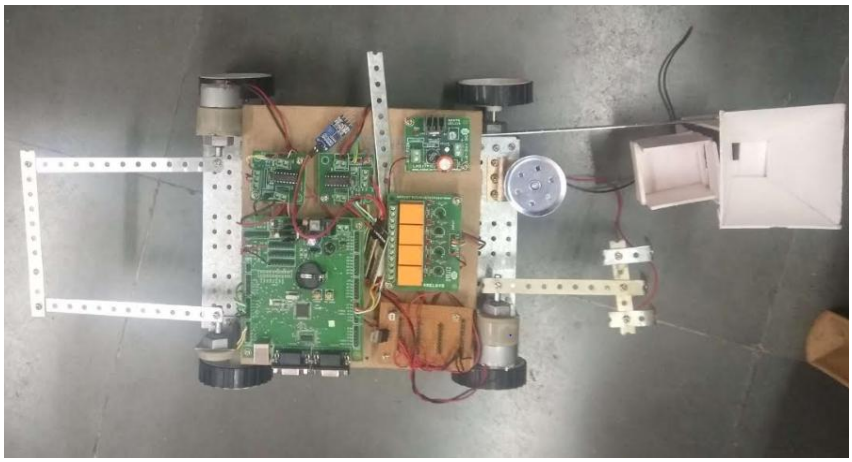
III. Proposed Work

The purpose of this paper is to showcase the present trends in agriculture such as automation of the processes that take place in agriculture such as digging, seeding, harvesting etc to sketch the probable developments for future applications. There are three main categories that we focus on that is the plant cultivation, plant care and harvesting.

The Agribot that we have designed mainly works on four main abilities which are guidance, detection, action and mapping. These abilities are interlinked by system architecture called PADS(Precision Agriculture Data Set) and PFDS(Precision Farming Data Set). PADS gets continuously updated with the information regarding the soil quality and the crop being cultivated and the navigation data of the land and the PFDS takes care of the required the pesticide spraying for the crop. In automating the agricultural practices such as seeding there is a specific machinery that places seeds at a required distance between two rows and also between two crops, maintains the accuracy. Seeding is based on guidance and action.

The project also proposes a way to detect the leaf diseases through image pattern classification with details about the texture and colour feature extraction. The normal and the affected or the diseased leaf images are processed and compared, features such as the colour of the leaf, texture, shape are considered to identify the disease. There is a support vector machine classifier that classifies these images into the type of the disease. When a single feature is used to compare then it's gives a lower accuracy about the disease here the shape feature being the lowest and texture being the highest, but two features such as colour and texture when combined gives a higher accuracy.

Working Model



3.1 Robot Module:

The assembly of the robotic system is built using high torque DC motor, communication module, relay driver circuit, Battery package, microcontroller which is shown in Fig-1. DC motor is started, the vehicle moves along

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the particular columns of ploughed land for digging and sowing the seeds and its movement is controlled by remote guiding device. The remote control transmitter and receiver is shown in Fig-2.

\This system has two main sections, robot section and control section, which are intercommunicated by using communication technologies. The control section as well as robotic section possesses via ploughing unit, seed dispenser, and seed storage, robotic system with motors, microcontroller, and power supply. The microcontroller is brain of this system, which gives the order of suggestions received to all the networks, and sensible factors processed by their corresponding embedded programs. Robotic mechanism runs by their internal motors and motor drivers that drive the motors in desired directions.

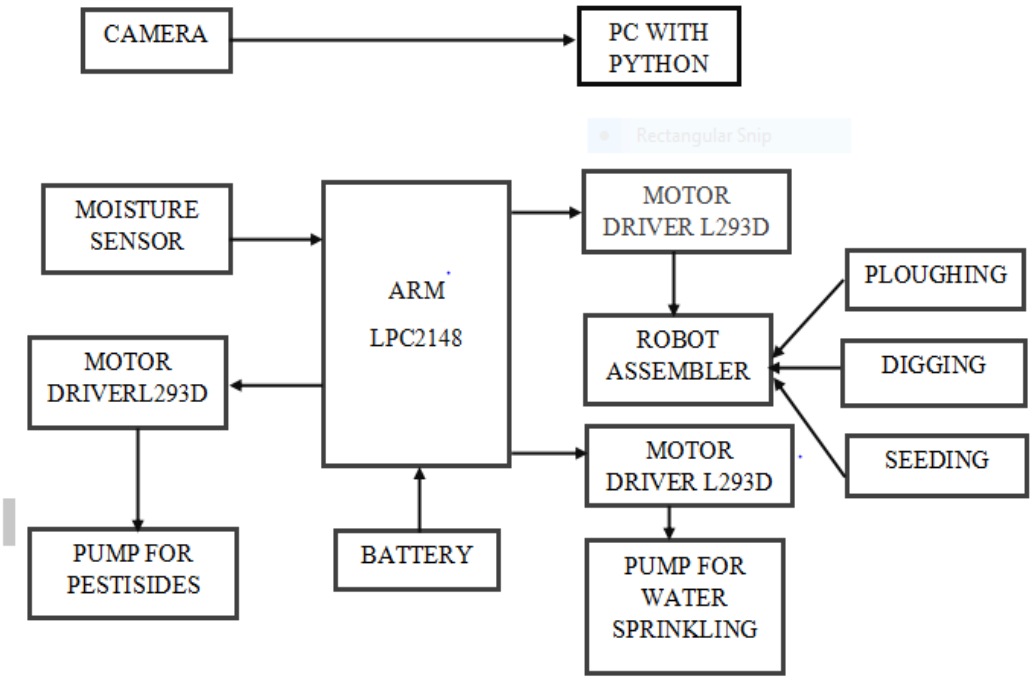


Fig-1.Block Diagram Of Agricultural Robot

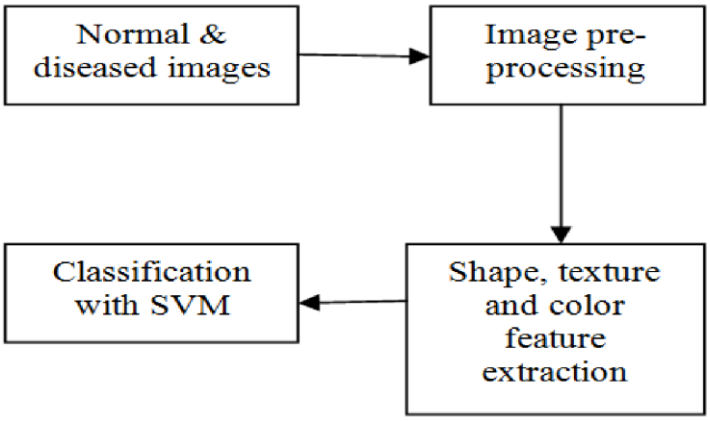


Fig-2. Block Diagram For Image Processing

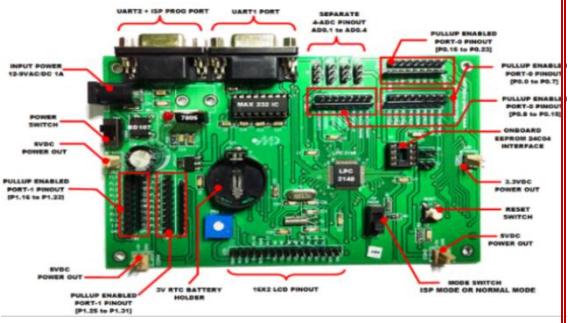
Hardware and Software Requirements

Hardware Requirement	Software Requirement
1. Microcontroller ARM LPC 2148 2. Relay circuit 3. DC motor 4. DC motor drivers 5. Moisture sensor 6. Pesticide pump 7. Digital Camera	1. Bluetooth and WIFI module 2. Keil µ Vision 3. Python3

IV. HARDWARE DESCRIPTION

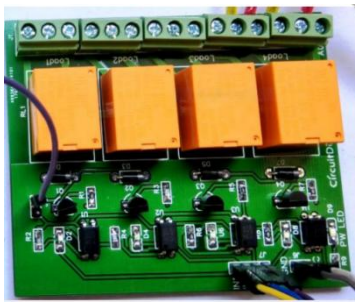
ARMLPC2148

This micro controller belongs to ARM7 family. It is an ARM7TDMI-S based high performance 32-bit RISC Micro controller with Thumb extension. It has 12 MHz crystal for system Clock and 32KHz crystal for RTC



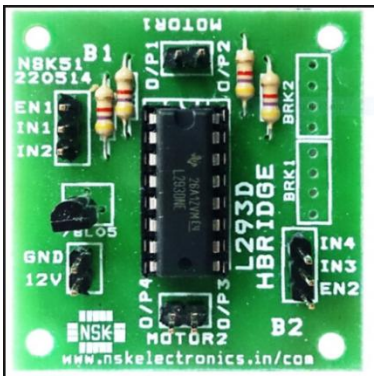
4 RELAY CIRCUIT

This circuitdesign is based on isolated PCB for 4 relay.In this paper by using this relay board, we can operate 4 set of AC alliances such as digging, seeding, leveling and water sprinkling. It has 3 pin screw terminal for connecting applience. Voltage of this relay module is 4V and maximum current is 250A .This relay circuit function as the coupling between input and output circuit



L293D DC MOTOR DRIVERS

L293D is a motor driver which drive the DC motor. It is a 16 pin IC which controls a set of DC motors in any direction simultaneously. It works on the concept of H-Bridge.



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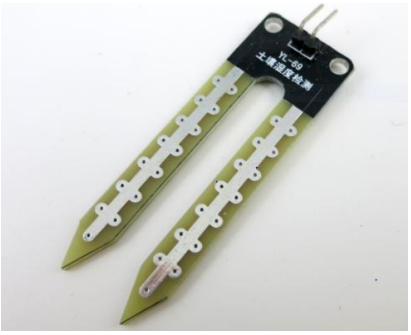
DC MOTORS

It is an electromechanical device which convert the electrical energy in to mechanical energy and this can be achieved by produced a continous angular rotation that can be used to rotate pumps , fans , etc

MOISTURE SENSOR

The moisture sensor consist of two probes which are used to measure the volumetric content of water. The two probes allow the current to pass through the soil and then it gets the resistance value to measure the moisture value . When there is more water, the soil will conduct more electricity which means there will be less resistance. Therefore the moisture level will be higher.



Advantages

- Robust monitoring system.
- Aids in precision agricultural practices.
- Early crop disease detection.
- Cost effective and compact.

V. CONCLUSION

It consists of various stages including collection of images of agricultural fruits for creation of database. Image segmentation is performed using clustering techniques. Features of segmented images are stored in database with respective image of agricultural fruits. Using support vector machine classifier we would be finding out the type of disease present in image and give remedies to control it.

- Automated Disease Prediction
- Intimation to Farmer
- Water Sprinkling based on Moisture Levels
- Pesticides Sprinkling Automation

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