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Examination of Infected Plants with AI Robots using the Techniques of Image Processing.

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ABSTRACT

The main objective of this paper work is to employ the notion of image processing technique to detect the infected plant in farming areas in order to prevent the spreading of infection to other plants. This is achieved with the help of robot which finds infected plant regions. The robot will check the level of infection which had spread in plants and intimate the user that the particular plant has been infected at certain levels with grade specification. The infected plant is been detected by Radio Frequency Identification (RFID), a dormant technique of artificial intelligence. The proposed paper and research work focuses on the infectious plants, which causes a great loss for the lives of plants. And in order to overcome this situation, the robots can be used which reduces the burden of the farmers as well as the extinct of plants.

Keywords: Image Processing, Artificial Intelligence, Robot, Radio Frequency Identification (RFID).

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INTRODUCTION

In olden as well as now-a-days, the farmers are suffering a lot due to the infectious diseases' in plants which leads to a greater loss for farmers. To triumph over this situation, the recent technological developments in the field of robotics and image processing have extended a great leap. This finding of this infectious plant is been identified by a robot. It is been embedded with a RF reader, and a camera which is been installed for the scanning operation to find whether the plant has been infected or not. This is where the accuracy is achieved by image processing and then the levels are calculated according to the spots detected in plants automatically. It sends a report of the level of infection about the plant which has been infected so that the farmer can easily be aware of the condition of their field. The advantages of research work are depicted as follows;

1. Infection detection prevents farmers from greater loss.
2. Easy access of data via report is simple.
3. Individual checking of plants and individual report generation make user to access the problem in a easy way.
4. Regular updating makes simple for user to access.
5. User friendly.
6. Power panels makes robot to charge freely.

COMPONENTS REQUIRED FOR THE INNOVATIVE SYSTEM – ROBOT FINDING INFECTED PLANTS

Camera

Camera used here is ordinary surveillance camera which is portable and more efficient in comparison with other cameras. This camera is not meant for video capturing but it is for taking only the snaps of what it sees. High resolution and fast synchronization are the key features of this camera.

Driving Module

In this robot, two driving modules are used one is the base driving module, that contains all the circuits of connectivity, the whole driver set up was a range rover driving module comprises of four motors for four wheels and the whole motors are controlled by the driver circuit. The key feature is most reliable and capable of running in steep, swamp and hard areas. And other is connected to the camera stick contains one motor for up and down action.

GPS and GSM

The position where the robot has to move which is set up through the GPS in accordance with the plants in the field this Global Positioning System is used greatly in many areas to find track and also for this robot to run under specified the latitude and longitude. GSM can be synchronized globally for any action to take place live transmission is achieved using this GSM.

RFID and Reader

This technique comprises of a tag with numbers printed on it and a reader is used to read the number transmits the data matches with the database this is one methodology of simple implementation to access the database and also to retrieve the information with short span of time.

Microprocessor

ARM processor is used to control all the operations of the robot which is the highest efficiency processor which controls which manages and organize all the working in a specified manner. Processor programming languages is emulated to perform all the operations of the robot. Extraction, transmission processing, controlling, are achieved using this processor.

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Battery

High efficient batteries are used to run this whole setup which is rechargeable solar panels can be fixed to charge up the batteries for further free use.

CONSTRUCTION OF THE PROPOSED MODEL

The proposed architecture diagram explains the functionality of the inventive system.

This robot has two sides one is the transmitter side and other side is the receiver.

Transmitter Side

In this side a RF reader is there to identify the plant number each and every plant is fitted with RF id tags this reader reads the id and recognizes the id number of the tree. And some sensors like proximity are fixed for obstacle detection .Camera the main unit of the robot fixed over the stick connected to the motor to rise up and down for taking snap around the plant. Two driving modules one is for the robot to run around the field and other for this camera stick to run up and down .Global Positioning System is used to set the robot motion of where to stop and where to run around a perimeter of the field .GSM is used for transmitting the captured information from the field to the user side globally. So that the user can access the robot globally and the user can access and retrieve the data where ever the user need.

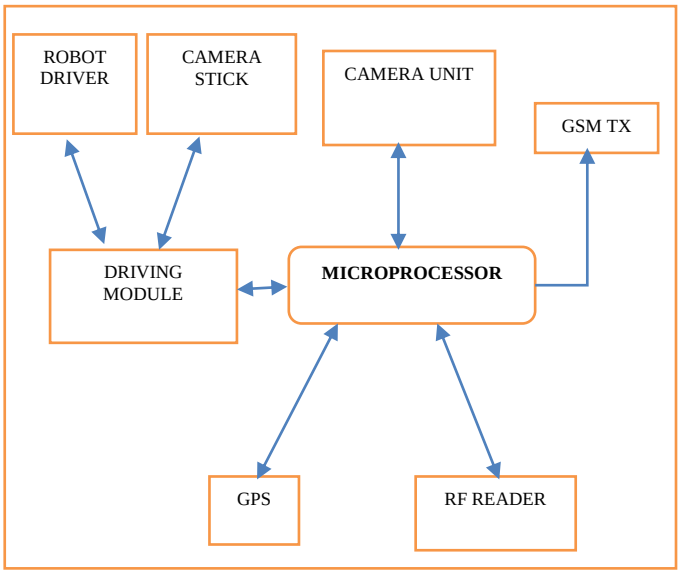

Fig. 1 Transmitter Side

Receiver Side

The receiver side comprises of GSM receiver which receives the transmitted information from the transmission side to the computer which has image processing software to process image.

Fig. 2 Receiver Side

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Working Model

A plant fixed with a RF ID the ID is used to specify the ID number of the plant resembles particular plant this is achieved by RF ID reader fixed in the robot .The robot runs in such a way that the position of where it has to stop and the distance between two plants is specified through GPS so that the robot runs accordingly through the field and stops exactly near every plants and reads the ID and specify to the user side that the particular plant has been checking and then camera which has been fixed over a camera stick over the robot captures images of the plants at particular height levels up to the end of the plants then the captured image is send to the user side through GSM transmission protocol .over the receiver side the GSM receiver receives the transmitted information and then the data are fed to the computer .

In this the captured image is proceed one by one if any spots are detected in plants leaf the spots are detected by spot detection methodology in image processing technique and then the amount of spot present in leaves are counted and matched with the pre fixed reference data if the counted spot are more than the reference data then the risk factor is high and so the scanned plant id number and the risk factor is maintained in a separate database for the user reference as report .The user checks the report and start proceeding the control actions for preventing other plants from being infected. The measurement matching and report generation is achieved by artificial intelligence. Periodically the robot runs around the farming area and updates the count level of infection in plants.

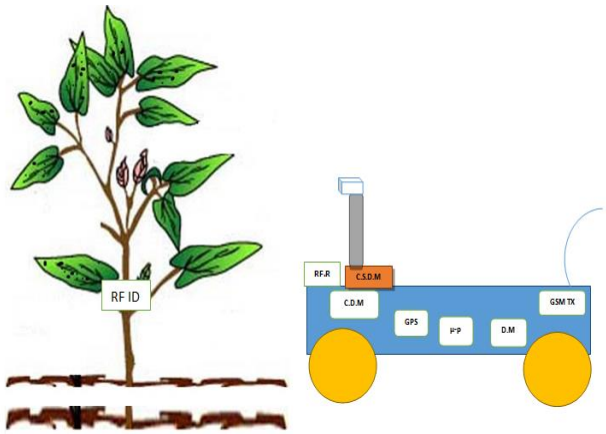

Fig. 3 Working Model of the System

IMPLEMENTATION TECHNIQUES

Spot Detection Methodology

This method is used to find the spots or perceptions in an image this method is greatly used in this paper work to find the number of spots in the leaf by using MAT Lab software this is used to find the level of infection in plants.

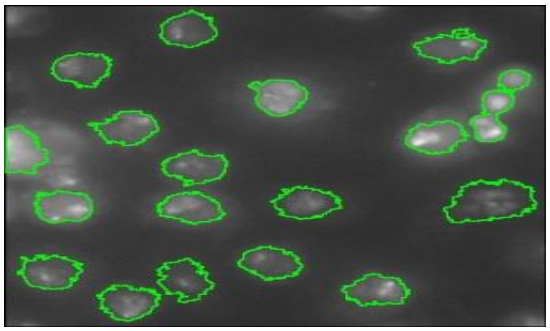

Fig. 4 Detection of Spots

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Count Measurements

The levels of infection is measured using the spots in the plants consider a situation spot in plants are counted as number five this is referred as normal level this recognition is achieved by setting up an reference value for this process to achieve say spot count limit ranges from five to ten is considered as normal level and if exceeds the percentage of infection levels will be increased periodically the robot captures the image and the plant checks the levels of infection and saves the details of individual plants and if the count levels are high then risk factor of the farm will be increased. And every cycle the database is updated automatically. The below image resembles the levels of infection in plants which may lead to a great loss.

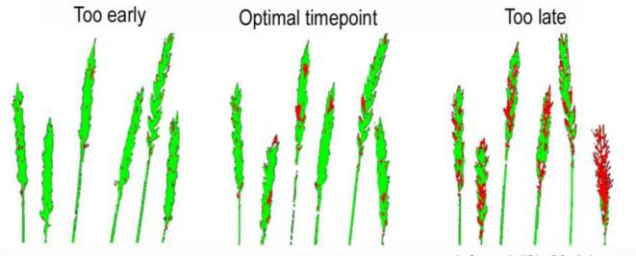

Fig. 5 Measurement of Infection

RESULTS AND DISCUSSIONS

Database

The database is maintained in such a way that the condition which has been set up as the reference matches the levels with the reference level and generate the report.

TABLE I. DATABASE SHOWING CONDITIONS OF INFECTIOUS PLANTS

S.NO	PLANT ID NUMBER	CONDITION
1	124536	LEVEL GRADE – A
2	132456	LEVEL GRADE – A
3	154641	LEVEL GRADE – A
4	154666	LEVEL GRADE – C
5	123464	LEVEL GRADE – D
…	….	……
∞	∞	LEVEL GRADE

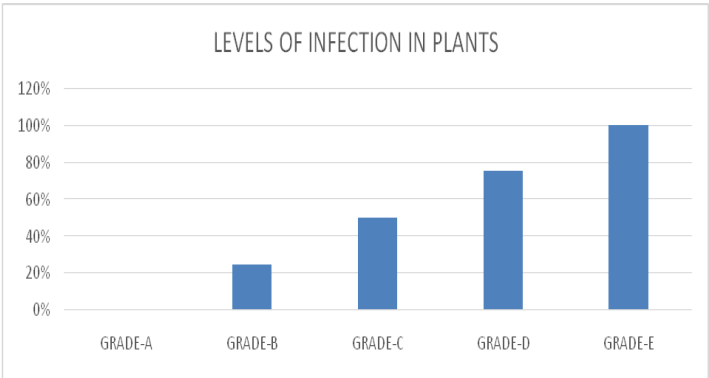

Fig.6 Performance Analysis at different Grades

TABLE II. GRADES AND INFECTION LEVELS

GRADE	LEVEL	COUNTS
GRADE-A	NORMAL	NO SPOT
GRADE-B	25% INFECTED	3-5 SPOT
GRADE-C	50% INFECTED	5-8 SPOT
GRADE-D	75% INFECTED	8-12 SPOT
GRADE-E	100% INFECTED	12-15 SPOT

CONCLUSION

This robot is one of the eco-friendly robot mend only for infection detection makes this robot a farmer friendly robot many developments are present in robotic field this robot will be one of the best systems utilizes image processing and artificial intelligence techniques for achieving perfect output continual cycle of updating the data and producing reports of the infected plant conditions are achieved in this robot. In the area of agriculture to find infection problems this robot will be a great solution.

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