"Agricultural Robot"
(Irrigation System, Weeding, Monitoring of Field, Disease Detection)

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ABSTRACT: The purpose of the project is to build a multipurpose agricultural robot which can perform various operations on field. One of the important profession in India is farming so it is essential to look out for automation in field work to reduce man power. Here this project focuses on farming work features like automatic irrigation system, monitoring of the field using parameters as temperature , soil moisture , humidity , raining , presence of any animal on field these all parameters are monitored from field and transmitted to mobile unit using GSM module. As well as here we analyze disease spread on plant using interfacing of camera and image processing technique by taking an sample of leaf. This analyzed disease is display on GUI interface where remotely we monitoring field using this project.

KEYWORD: Agricultural robot – Automatic irrigation system, Weeding, Remote monitoring of field, disease analysis using MATLAB with GUI interface , motion detection for presence of animal on field.

I.   INTRODUCTION

A.   Automatic irrigation system:

In the field of agriculture, use of proper method of irrigation is very important from yield point of view and scarcity of water. This system introducing automatic irrigation system by using PIC18F4520 controller, Various sensors were used to detect need of water supply to the field as soil moisture sensor and rain drop sensor. For wireless communication between robot and farmer GSM module were used which gives transmits status of sensors as well as receives commands from GSM to turn on and off the pump motor.

Rain drop sensor and soil moisture sensor gives information about moisture level of the soil which will then transmitted to mobile through SMS using GSM module. Farmer can give command using simple SMS to ON and OFF the water supply pump according to reading taken from sensor to the field. This whole operation is wireless and remotely operated for automation in irrigation system.

B.   Monitoring of the field:

A Wireless Sensor Network (WSN) consists of a large number of wireless sensor devices working collaboratively to achieve a common objective is to check current status of the farm and according to that whole information is collected and display on LCD as well as transmitted to mobile unit using GSM n displays on GUI model for controlling purpose. Using this proposed system we can monitor farm from remote location also can controlled using giving an command. The sensors used are as follow:

a.   Motion sensor:

Motion sensor is used to detect presence of any animal in farm which may harm plants and as human body or animal continuously an infrared radiations helps to detect presence and which activates an motion sensor's crystalline material which give immediate command to microcontroller if any animal is present. Controller send signal to alarm to horn as well as this status SMS to farmer so that they can take corresponding action.

b.   Soil moisture sensor:

Soil moisture level of the soil is calculated repeatedly to check whether farm requires water or not. This information is send via SMS to farmer where he commands to start or stop the motor according to moisture level of the soil. also this moisture level is displayed on LCD which placed on robotic section continuously.

c.   Temperature sensor:

Temperature should be taken in consideration for measuring and monitoring, as temperature affects the crops if varies suddenly. In proposed system LM35 temperature sensor module were used which is analog in nature is again converted into digital using formula:

$$T= temp*0.48876$$

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The adequate temperature required for healthy plant growth.

d.   Rain drop sensor:

This sensor works through a series of exposed parallel traces on board which produces electrical variations when drops or water volume changes. By using microcontroller (PIC) it is fairly easy to convert the analog output from the sensor to digital value. If raining is there on field sensor gives command to controller which is then transmitted to mobile through GSM, upon receiving response from farmer water pump motor will stop.

C.   Weeding:

In proposed system, separate weeding robot is introducing having cutter blades are fitted below robot for cutting unwanted grass in crop. When the level of grass is increase above specific level then the cutter robot start weeding operation using IR transmitter and receiver. For that three motors is used, two motors for the robot and one for cutting bled. This reduces the man power as well as time.

D.   Disease detection:

In agricultural field, protection of crop from various disease is important factor, so this system used to analyze disease for which camera is placed above robot on field. Plant leaves diseases detection is used captured images for diseases detection. Image processing considers four basic types of images for processing.
1. RGB Image: This is collection of three primary colors M x N matrices: Red, Green and Blue. All these matrices contain the range between 0 and 255.
2. Indexed Image: This is combination of two M x N matrices with an indexed image using G gray levels. This matrix has intensity values between 1 and infinity.
3. Intensity or grayscale image: A grayscale image is also called as intensity images because of the matrix values are represented by intensity. It has only one image matrix and the matrix contains the values between zero and 1.
4. Binary Image: It has only one image matrix and the range of the values between 1 and 0.

II.   LITERATURE SURVEY

Throughout the earlier years many devices and technologies has been utilized to provide automation in farming and accordingly to reduce efforts of farmers. After doing literature review in the area of agriculture, various applications provided a solution to reduce manpower like Camera based detection of disease on plant, automatic irrigation system, smoke and fire detection, seed plantation machine. One project presented system combination of such technology together having automatic irrigation system, cutting feature, monitoring of the field from remote location, disease indication spread on plant.

With this project we show that how we use the sensor's and electronics circuit for agriculture industry also. Some time one experiment change the whole world, so it's the duty of engineers to try something different for the future science. May be we don't know which one would click and verify the concept. In this project we show that how we use moisture sensor and rain drop sensor to control the working of water pump. The proposed system is an embedded system which will closely monitor and control the microclimatic parameters of a field to control water provided to farm and to detect disease spread on plant to avoid any loss of farm. This proposed system also includes motion sensor

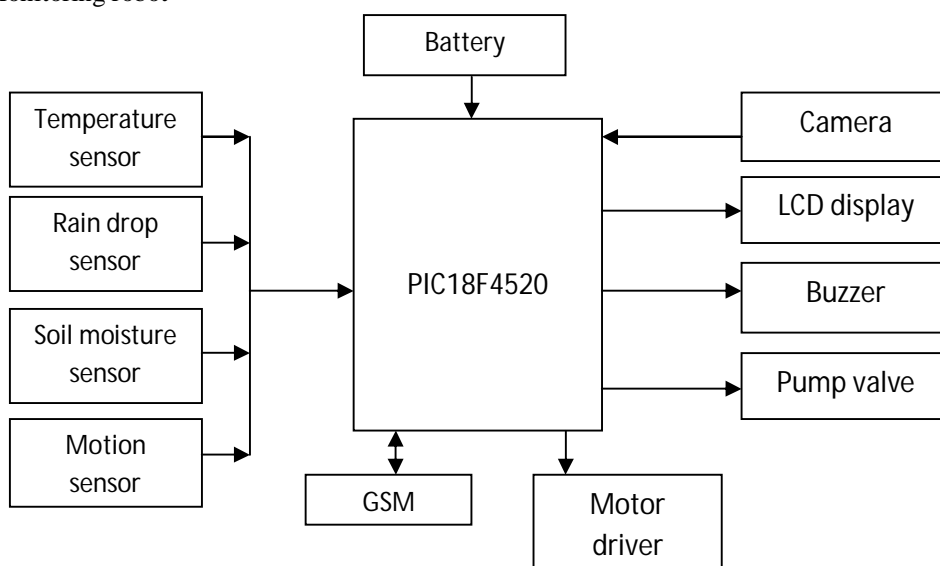# International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)
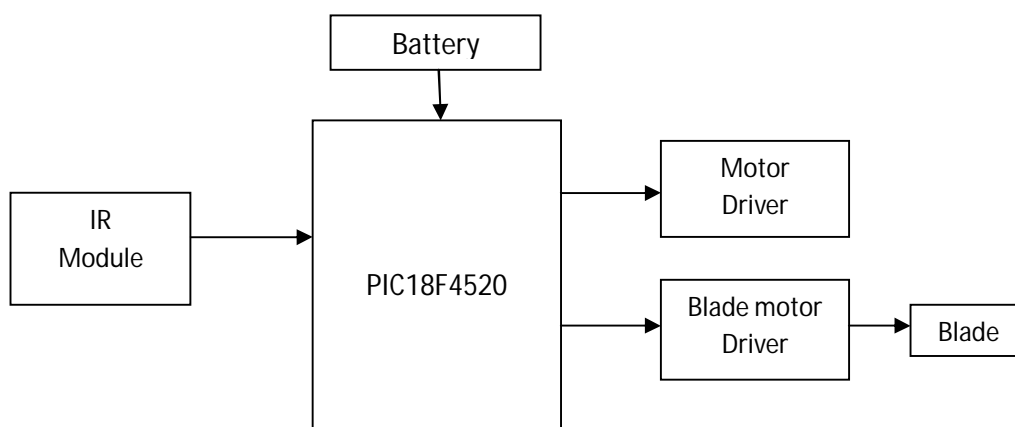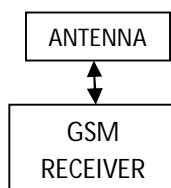
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which recognize any presence of animal on field. If any presence detects it blows alarm on robot section as well as transmit SMS to farmer through GSM module. Disease is analyzed using camera placed on farm which takes leaf sample and transmitted to farmer monitor where it compares with database and gives disease information which will useful for spreading of pesticides on plants. This robot also introducing weeding feature having cutter fitted below robot for cutting unwanted grass in crop.

III. BLOCK DIAGRAM

A. Field section
a. Monitoring robot

b. cutter robot

B.   controlling section

a.   GSM section

```
        ┌──────────────┐
        │   ANTENNA    │
        └──────────────┘
               ↕
        ┌──────────────┐
        │     GSM      │
        │   RECEIVER   │
        └──────────────┘
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b.   Disease detection section

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        ┌──────────────┐
        │     GUI      │
        └──────────────┘
               ↑
        ┌──────────────┐
        │   DATABASE   │
        └──────────────┘
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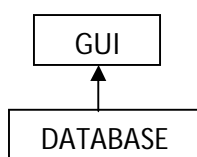
IV.   PROPOSED WORK

In this project we can covered the four topics this are automatic irrigation system, weeding, remote monitoring system, disease detection. As irrigation is the main part of agriculture. Labor-saving and water-saving technology is a key issue in irrigation. Microcontroller based automatic plant irrigation system allows a simple and low cost method for irrigating the crops automatically. In the proposed system we use GSM technology. Here we have four sensors are soil moisture and rain drop sensor for irrigation purpose and temperature, motion to monitor and also control the agriculture parameters. When any of these sensors generates a low signal, the controller enables the GSM modem to send the message of the particular parameter and display the status of sensors on LCD. Farmer can give command through GSM to ON/OFF the pump motor as per the input data from sensor. GSM is used to inform the user about the exact field condition. The information is given on user request in form of SMS. GSM modem can be controlled by standard set of AT (Attention) commands. These commands can be used to control majority of the functions of GSM modem and the sensing data will be displayed on the LCD.

Motion or PIR sensor is based on basic principle of pyroelectricity, Certain crystalline material have property to generate a surface electric charge when exposed to thermal infrared radiation. This principle is used in presented system where PIR sensor detects radiation exerted by human or animal body. This presence of lives in farm may harmful to crops so controller commands to blow the alarm and send message to farmer about presence.

When unwanted grass is present between crops, many efforts requires for cutting so to reduce this manpower another feature designed is weeding. Cutter robot use blades to cut grass and is also protect our crops to cut down by using IR sensors which detect crop if came in between cutting path then robot will turn 90° and continue to cut the grass.

Another important feature added in proposed system is disease detection. as in agricultural field farmer have to face loss if farm is affected by some disease, then pesticides should be spread over the farm on time for which disease should recognized to farmer on correct time before any loss. Our project introducing disease detection using image processing technology, camera is placed on robot section on field which captures leaf sample and send it to remotely placed monitor through GSM. For graphical interface to user we were used GUI where leaf sample is converted to binary image, some disease affected reference samples are available with which captured image is compared and disease is detected so that farmer can spread pesticides over crops.

V.   RESULTS
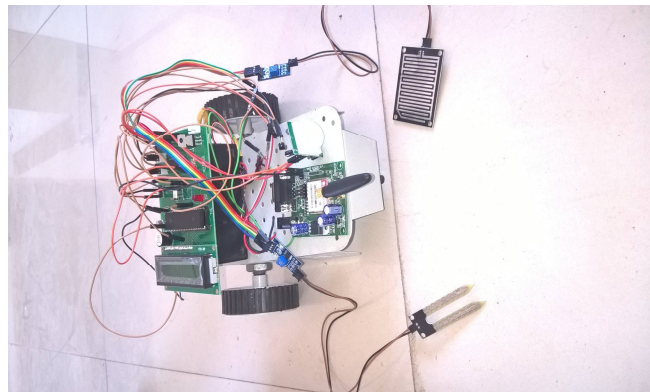
Fig. Monitoring robot
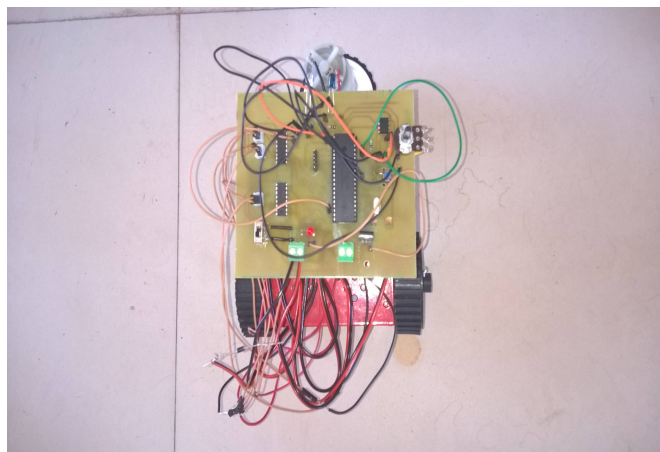
fig. Cutter robot
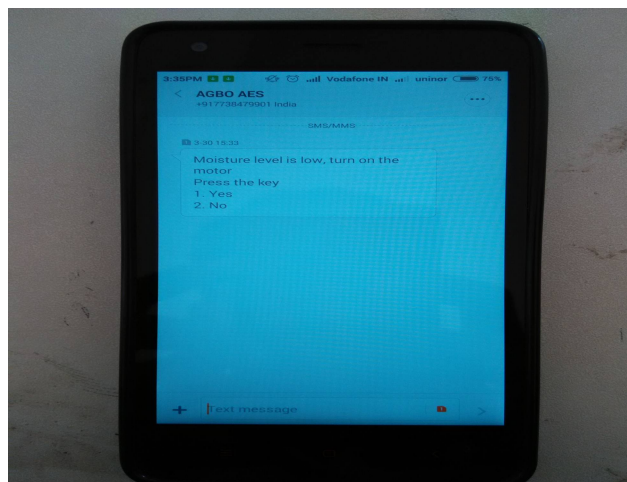
Fig. SMS indication

Fig. Leaf sample

VI.   CONCLUSION

1.   The proposed systems have remotely controlled which reduces the man efforts ,wastage of water as well as power consumption.
2.   Use of technology in the field of agriculture plays important role in increasing the production as well as

3.   SMS based remote control for irrigation pump is beneficial for the human generation , because mobile is most recently used technology now a days.
4.   This system also used for automatically grass cutting by using cutter.
5.   Disease can be detected after testing of leaf sample.

VII.   ADVANTAGES

1.   This system reduce the man power and saves the time.
2.   The main purpose of these system is to find out the proper requirements of the crop.
3.   Mechanical weeding is done easily.
4.   This system can find disease using wheather conditions and soil , leaf sample.
5.   It can monitor the farm using camera and sends data to remotly placed monitoing system for controlling using GSM.
6.   Automatically plant irrigation can be done.

VIII.   DISADVANTAGES

1.   No any protection provided to robot in raining

IX.   FUTURE SCOPE

1.   The performance of the system can be further improved in terms of the speed, memory capacity.
2.   The system can be modified with the use of some additional features such as seed plantation , spraying of pesticides.

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