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Advanced Atomizer

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***Abstract*— Advanced atomizer (sprayer) is system which can be used for agricultural field. Advanced atomizer is concept used for chemical spraying in agriculture. For complete growth of crops proper spraying is required. The traditional method of spraying is through human being but this system approaches automatic spraying using robot. The proposed design is a precision agricultural robot for chemical spraying. The proposed system consists of semi-automated robot and remote. The system is divided into of two parts, robot side part (field side) and remote side part (user interface). It mainly consists of RF (Radio frequency) module to send and receive specific commands. The main purpose of this system is to avoid direct contact of human with chemicals and improve the quality of spraying.**

Keywords—Robot controlling, level sensor, Rf module, microcontroller.

I. INTRODUCTION

India is an agricultural based country. Most of the people are dependent on this traditional agricultural business. This is most dominant profession in India though mostly neglected. All the work done by Indian farmers entirely depends on the man power. More the man power a farmer can get the more his output is going to be. There is a disadvantage of this traditional method of spraying is it can sometimes become hazardous to the heath of workers and farmers. It is very dangerous and has long term disabilities. This will further reduce the man power which we can use for other effective purposes. There are several areas in farming which can be easily reduce, make more accurate and productive. One of them is spraying the chemicals over the field for protection. It is mainly done by hand by the farmers with none protection.

E.gil, J. Llorens and X. Fabregras have used uneven rate sprayer for getting better efficiency of the sprayer application process for tree crops. Paper describes the description of sprayer model developed for vine yards. Deviation in canopy width along the height of row crop is electronically measured using several ultraviolet sensors placed on sprayer and used to change the emitted flow rate from nozzles in real time [1]. Dr. Erd Ozkan, Dr. Heping Zhu and Dr. Richard Derksen have researched on evaluation of various spraying equipments for effective application of fungicides to control Asian soybean rust in this sprayer control treatments with conventional boom sprayer spray performance from the boom sprayer with canopy opener very similar to air assisted technology [2]. PCH Miller and Mc butler Eilis had work on minimizing drift and off target exposure from boom sprayer applications from conventional boom sprayers is mainly function of it. In this paper the author approaches new spraying techniques droplet size allocation created by nozzle adjustment in accordance with height of boom and speed at time of spraying [3]. Mohd. Marzuki mustafe Ani Hussain, karul Hawari Gazli have proposed real time precision automated weed control system could also reduce need for chemicals. This system is developed using image processing. The main vision of this technique is to recognise the weed type. There are two techniques used GLCM and FFT for the weed recognition [4].

II. CONSTRUCTION

A. *Design of chemical tank*

Tank is required to store chemical pesticide. Robot moves in field for spraying chemical pesticides. So design a tank in such a way that it can store minimum 10 liters chemical pesticides and able to carry by robot. So to design tank we need to calculate the weight and volume of tank.

B. *Design of robot frame*

Robot carries tank and electronic circuit. Tank is placed on upper on robot trolley and electronic part is placed in robot trolley on base of robot.

1. Chemical containing Tank
2. Level sensor
3. Solenoid Valve
4. Motor pump
5. Robot trolley
6. Right Sided Spray
7. Camera
8. Left Sided Spray

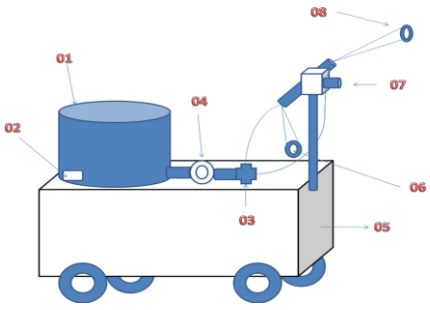

Fig.1 Sketch of model

III. PROPOSED SYSTEM

In this dissertation work it is proposed to carry out design and fabrication of controlling system for agricultural atomizer. The proposed work intends to design automated agricultural atomizer with remote monitoring and controlling system. It is required to design a user friendly system. This system which includes processing unit, level sensor, signal conditioning unit, spraying unit, camera and RF trans-receiver for monitoring agricultural atomizer. This whole system will be interfacing with robot. This will be control by remote device. This robot has dc motor which can be controlled by user. This sprayer will adjust arms of sprayer according to crop height, for monitoring level of chemical with help of level sensor.

The spraying unit consists of dc motor coupled with pump system. It will provide nozzle which will further get divided into two paths that is left side spray and right side spray. Each controlled by a solenoid valves. If crops in the field are in right side, then right sided sprayer will be ON, if crops in the field are in left side, then left sided sprayer will be ON. This action will be controlled by processing unit and the user. This system also monitors level of chemical inside tank by using level sensor and signal conditioning unit. If chemical in tank comes to lower level which senses by level sensor which will be converted into digital by using signal conditioning unit and sends to processing unit. Processing unit will send this information to controlling unit and it will be indicate on display. The camera is interfaced with the controller for collecting information and monitoring actual process in farm and there RF trans-receiver is provided to transmitting and receiving data from controller. Camera take continuous snap of field which will give information from field like height of crop and is accordance with height of spray will adjust. Also it will give visual feedback about disturbances occurring at the field.

Remote side circuit consists of display, controller unit and RF trans-receiver. The receiver will be mobile unit so that it can be very useful for user. This will allow the user to have the control over the device remotely while operation. The direction or path of that robot is controlled by remote device which will operated by user. This remote device consists of a display which will have chemical level monitoring capability and information from field.

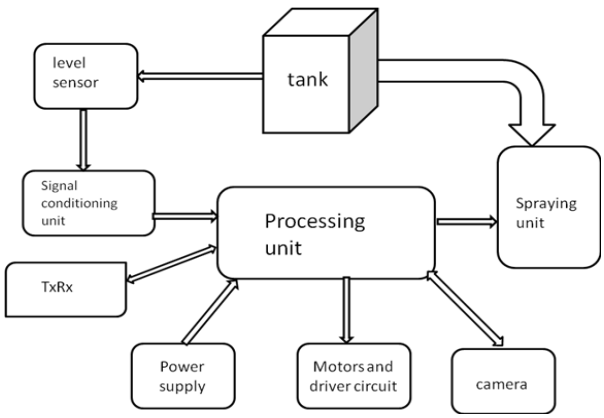

Fig.2: Robot side circuit

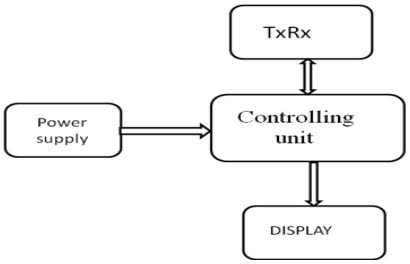

Fig.3 Remote side circuit

A. *Level sensor:*

As given in synopsis level senor is given to signal conditioning unit. This unit is design using operational amplifiers. The problem regarding signal conditioning unit is that it requires negative supply and therefore we cannot provide it because we use 12v battery supply hence changing polarity is difficult and provide negative supply will increase circuitry so we are designing level sensor using potentiometer. The wire of float sensor is given to 3 terminal potentiometer middle terminal of pot is common and knob of pot connected to float sensor. Middle terminal of pot is given to first pin of Analog to digital converter (0808). The value is set between 0-255 if the tank is full then value given by analog to digital converter is 255 as level in tank is decreases the value is decreases from 255 to 0. If level in tank is empty then value display on liquid crystal display is 0

B. *Rf module*

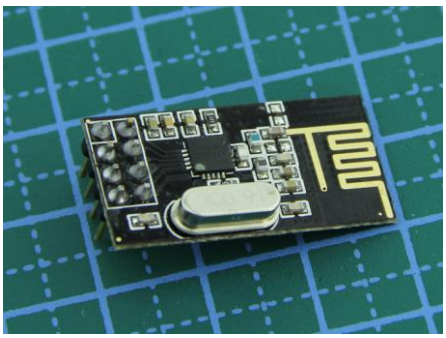

Fig. 4: NRF 24L01 Rf module

Features:
- Supports Baud rate 9600
- Works on ISM band (2.4 GHz)
- 1 to 30 bytes dynamic payload length
- Automatic packet handling
- Authentication based packet communication
- Auto re-transmits if no authentication
- No complex wireless connection software
- Designed to be as easy to use as cables.
- No external Antenna required.
- Plug and play device.

C. *Microcontroller*

The AT89C52 is a low-power, high-performance CMOS 8-bit microcomputer with 8K bytes of Flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel's high density nonvolatile memory

technology and is compatible with the industry standard 80C51 and 80C52 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C52 is a powerful microcomputer which provides a highly flexible and cost effective solution to many embedded control applications.

D. Camera interfacing using Android phone

As mobile phones have GPRS/3G facility, it is then proposed to use this available system which reduces the hardware and increases reliability. Now a day's android operating system is available which is providing huge platform for number of applications. Android is operating system developed by Google Inc. Company and made open source platform for mobile application. Android phones are available at very low cost and its applications are at free of cost. Android phones are available everywhere with huge number of free applications. "IP webcam" is a one of the free application available for monitoring system. It enables android mobiles camera as IP camera and is accessible from PC, laptop, mobile phone from anywhere with required internet connection. IP Webcam turns android phone into a network camera with multiple viewing options. It enables user to view camera on any platform with VLC player or web browser. Features include:Video recording in webcam or MPEG4 (on Android 4.1+)

1) Audio streaming in wav, opus and AAC (AAC requires Android 4.1+)
2) Motion detection with sound trigger, Tasker integration.
3) Date, time and battery level video overlay.
4) Sensor data acquisition with online web graphing.
5) Video chat support

E. Analog to digital converter

Key Specifications

1) Resolution 8 Bits
2) Total Unadjusted Error ±1⁄2 LSB and ±1 LSB
3) Single Supply 5 VDC
4) Low Power 15 mW
5) Conversion Time 100 µs

F. Keypad

Keypad is used for controlling robot there are different robot operations are performing with help of 4*4 keypad interfaced with microcontroller. It controls operation like forward-backward left-right movement of robot. It also controls spraying mechanism if we want both sprayers i.e. left and right both sprayer will on if we want once as per requirement the action will be taken and height adjust of sprayer is also control by keypad.

IV. WORKDONE

The complete work of the project completed in two parts

1. *Remote side circuit*
2. *Robot side circuit*

1. Remote side circuit:

This circuit consists of microcontroller, liquid crystal display, RF module and keypad for controlling robot. This circuit is nothing but user interface for user. Using this circuit different controlling of receiver side circuit can be done. It consists of different interfacing part they are given below in figure 4

a. Interfacing of RF Module
b. Interfacing of Keypad
c. Interfacing of LCD

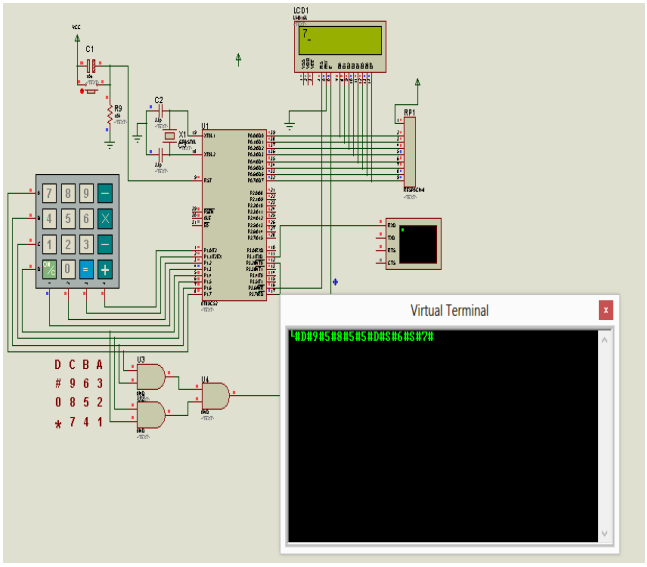

Fig. 5 Proteus simulation of remote side circuit

2. Receiver side (Robot side) circuit:

At the receiver, interfacing of microcontroller with analog to digital converter (ADC) liquid crystal display (LCD), RF module and level sensor is required. So this circuitry can be work on commands which are given by Remote side circuit which is present at transmitter side.

The interfacing of these modules is elaborated as follows:

a. Interfacing of ADC with controller
b. Interfacing of level sensor
c. Interfacing of RF module-Receiver
d. Interfacing of LCD

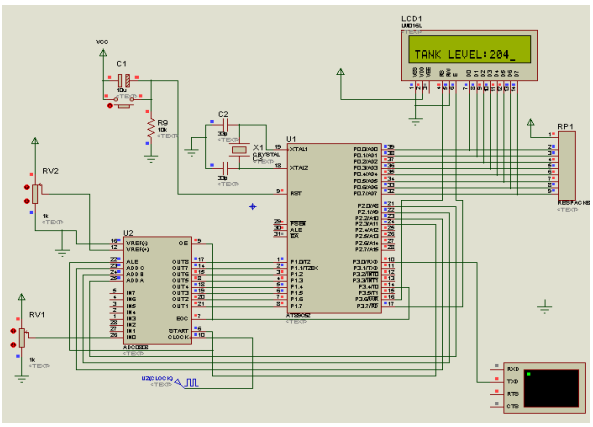

Fig. 6: Simulation of robot side circuit

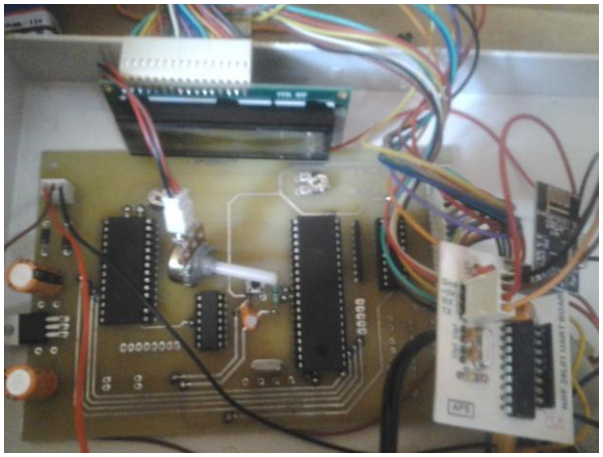

Fig. 7: Hardware implementation of robot side circuit

V. CONCLUSION

Designed system would be of great use to the farmers. It reduces farmer's efforts and time. The efficiency of proposed system is better than traditional sprayer.

VI. ACKNOWLEDGEMENT

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