FULLY AUTOMATIC ROBOT USED FOR SPRAYING MEDICINES FOR CROPS.

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ABSTRACT:
This paper presents an engineering solution to the current human health hazards involved in spraying potentially toxic chemicals in the confined space of a hot and steamy glasshouse. This is achieved by the design and construction of an autonomous mobile robot for use in pest control and disease prevention applications in commercial greenhouses. The effectiveness of this platform is shown by the platforms ability to successfully navigate itself down rows of a greenhouse, while the pesticide spraying system efficiently covers the plants evenly with spray in the set dosages.

I INTRODUCTION:

In this project that is automatic robotic system for spraying pesticide and fine monitoring of the agricultural fields helps the farmer to benefit in many different aspects.

The farmer can spray the pesticide with the help of the autonomous robot which can be automated as well as manually controlled in two different modes

The farmer can also use the same autonomous robot to keenly monitor the field for dry crops and infected crops in the middle without the human intervention

With the above features the farmer can be benefitted as described below. The disadvantages are over come compared to manually spraying pesticides are listed below.

Manually spraying pesticides consumes more time.

Farmers expose to pesticides while spraying may cause series skin and health related problems even including eyes.

There is a possibility that farmers can come across poisons snakes and insects.

By implementing this project by the farmers in their fields can overcome the drawbacks which are listed above.

This project can be implemented using embedded system along with wireless technology. As we know that in today's world embedded system is playing one of the major roles in our everyday life. By bulk manufacturing this system, the farmers can get this for a very affable cost.

Objectives
The main objective of proposed work is as follows:

1.To provide automatic spraying capability to an Arial vehicle.

2.To use sensor fusion concept using accelerometer and gyroscope for direction orientations of Arial vehicle.

3.To design and use efficient algorithms for achieving desire rotation of motors for purpose of getting direction speed and spraying pressure.

4.To implement the system based on Arduino platform.

LITERATURE SURVEY

In order to finalize the work, the reviews of following literature have been taken. Spoorthi . S , Dr: B.Shadaksharappa, Suraj.S , V.K.Manasa [1] have presented system called FREYER Drone. FREYR drone is designed to produce a quad copter containing pesticides that spray across the farm that both reduces the work of farmers but soon concludes its work. Pesticides and fertile products are of prime importance for crop production in agricultural areas. This will develop a user-friendly farming interface. The FREYR Drone is a quad copter spray pesticide for agriculture that helps farmers to spray the pesticides throughout their land to reduce work, which may evenly spray on their farm. The farmer can use an android application to control the drone, and can also use the drone interface Wi-Fi (ESP-8266) module in connection to the application. It precisely drives the land area of that farm land through GPS irrespective of the crop form and the pesticide-spritzing drone will accomplish the job. Paolo Tripicchio and Massimo Satler [2] have presented Drone use is increasingly popular in agriculture. Drone use is increasingly popular in agriculture. The paper provides a new approach to differentiate elds by the use of a RGB-D sensor. Two different measurement algorithms were designed to make sure they were successful in the classification of the plowing techniques. In commercially available unmanned air vehicles, the system can easily be integrated. Experimental tests show that the proposed methodology can provide an adequate classification of elder plowing depths. Arnab kumar Saha, Jayeeta Saha, Sachet Sircar, Soummyo Priyo Chattopadhyay, and Himadri Nath Saha [3] Presented IoT-based crop quality enhancement drone on farm. The need for an increased population and agriculture is

growing in popularity for aerial vehicles that are not owned. Drones with suitable cameras, sensors and integration modules make agriculture simple, efficient and precise. The solutions that are proposed for these drones can help improve the scope of the further development by integrating them into various conceptual machine learning and Internet of Things. This paper highlighted the work in this field and suggested solutions that can be incorporated into the drone through the Raspberry Pi 3B module

2.1 PROBLEM STATEMENTS.

In this project one part of the field can be sprayed by the robot and to spray for the remaining part it should be manually shifted. This type of system is very helpful for agriculture purpose where need to spray the pesticide to different crops. Currently we use a system that increases the human effort and it also not comfortable. This pesticide sprayer robot move infields and robot has sensors to detect the plants on both sides. In this system we use small tank for pesticides and motor. If it detects plant then automatically it will starts to spray. This system also has a wireless camera which can capture the image and display it on the display. By making some modification we can use this system for other type of application..

3.1 METHODOLOGY.

It is the systematic, theoretical analysis of the methods applied to a field of study. It comprises the theoretical analysis of the body of methods and principles associated with a branch of knowledge.

A robotics –based guidance method is presented to guide a robot platform which is designed independently to drive through the crops in a field according to the designed concept of open architecture. Thus, the robot platform is designed in real time to guide the platform on the basis of detection of crop using sensor. The purposed system is basically developed to implement agricultural production. This type of system is very useful in agriculture field where we need to spray the pesticide to different crops. This system automatically sense crop of both sides by using sensor.

Arduino is heart of this work and system. The Arduino Uno is a microcontroller board based on the Atmel's ATmega328. It has 14 digital

input/output pins and 6 analog inputs. It can be powered via USB connections or with an external power supply. As shown in Fig no 3.1. It contains everything needed to support the microcontroller ;simply connects it to a computer with an USB cable. Arduino IDE supports windows, Mac OSX or Linux.

3.2BlockDiagram
**Robotic Vehicle Receiving Section**
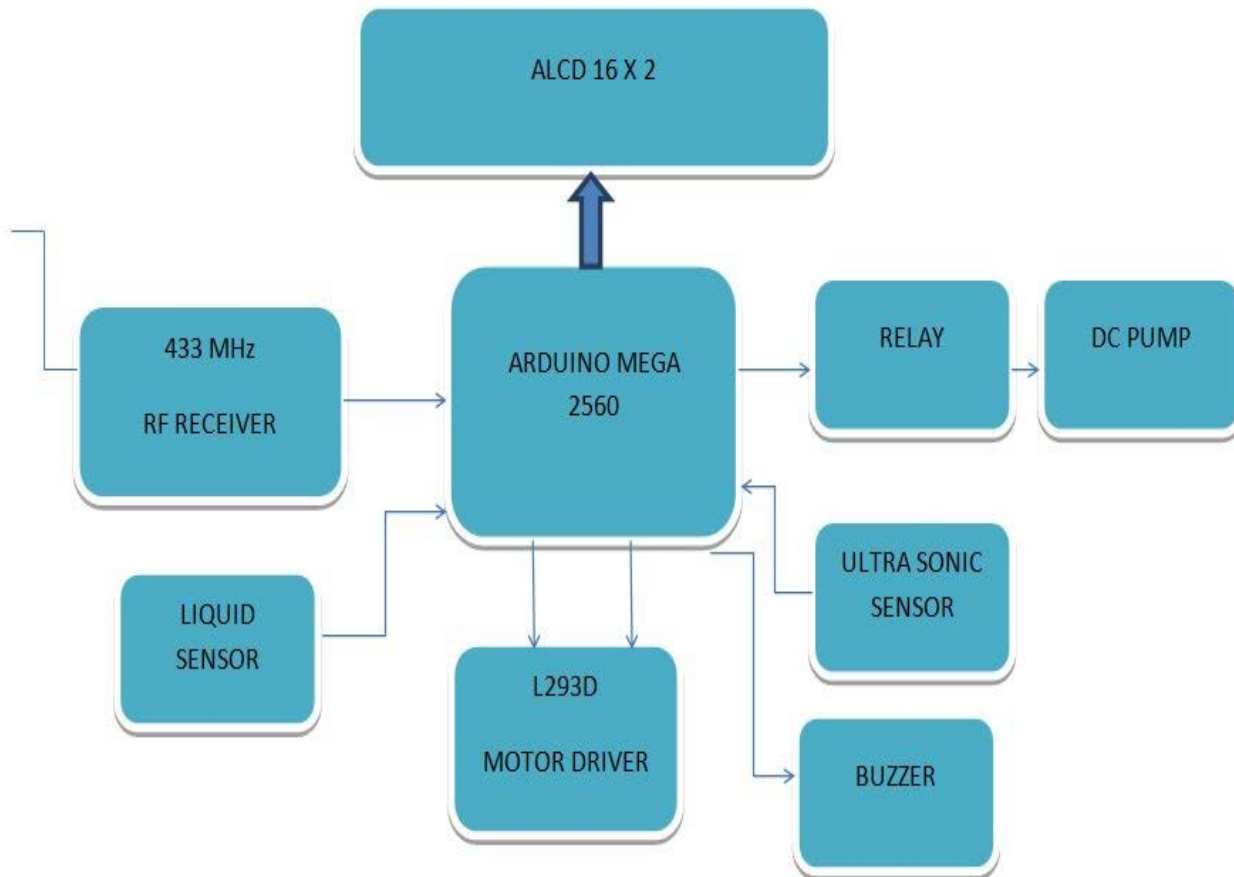
Manual Control Transmittersection
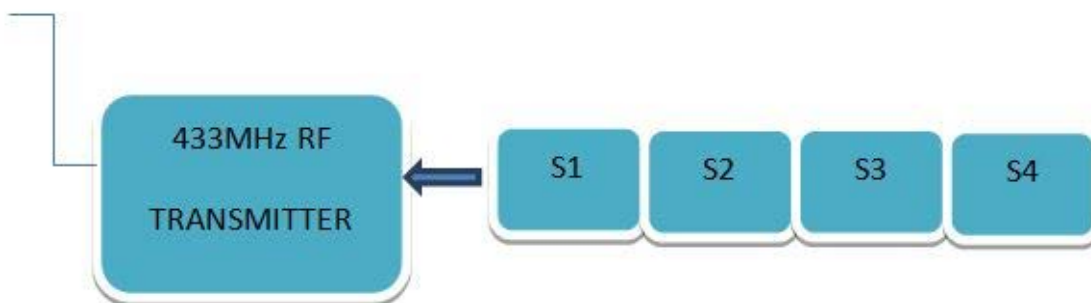
And +5volts power supply
Role:
+5V and +12 V is required for driving the main control system. +5 V is used to source the micro controller IC, OP-AmpIC ,LCD Display, IR Sensors, Relay Switching, Keypad etc. +12V isused to source the DC motor driver ICL392D and the DC geared motors. These voltages areobtained from a group of 12V batteries, rectifiers, Regulator & Filter. As explained below.
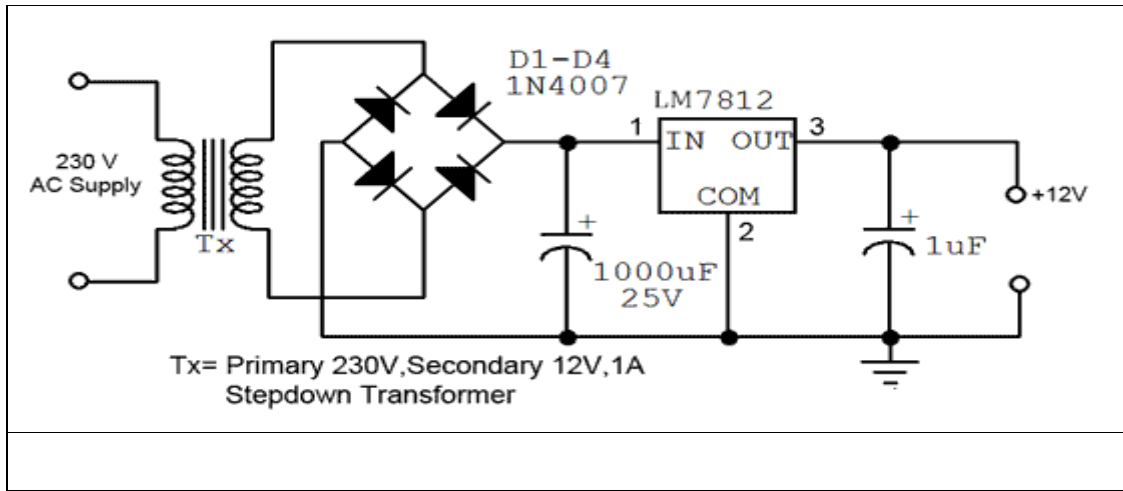
Here this circuit diagram is for +12V regulated (fixed voltage) DC power supply. These power supply circuit diagram is ideal for an average current requirement of 1Amp. This circuit is based on ICLM7812. It is a 3-terminal (+ve) voltage regulator IC. It has short circuit protection, thermal overload protection. LM7812 IC is from LM78XX series. The LM78XX series IC is positive voltage regulator IC for different voltage requirements, for example LM7805 IC is made for 5 volt fixed output voltage . There is LM79XX IC series for negative voltage.

A transformer(Tx=Primary 230 Volt, Secondary 12 Volt, 1Amp step down transformer) is used to covert 230V to 12V from mains. Here used a bridge rectifier made by four 1N4007 or 1N4003diode to convert AC to DC . The filtering capacitor 1000uF,25V is used to reduce the ripple and get a smooth DC voltage. This circuit is very easy to build. For good performance input voltage should be greater than 12Volt in pin-1 of IC LM7812. Use a heat sink to IC LM7812 for safeguarding it from overheating.

Component Specification

Fixed Voltage Regulator (7812)
Capacitor (1000microf and 1microf)
Diode (IN14001)

Component description
Fixed Voltage Regulator (7812)
7812 is a voltage regulator integrated circuit. It is a member of 78xx series of fixed linear voltage regulator ICs. The voltage source in a circuit may have fluctuations and would not give the fixed voltage output. The voltage regulator IC maintains the output voltage at a constant value. The xx in 78xx indicates the fixed output voltage it is designed to provide. 7812 provides +5V regulated power supply. Capacitors of suitable values can be connected at input and output pins depending upon the respective voltage levels..
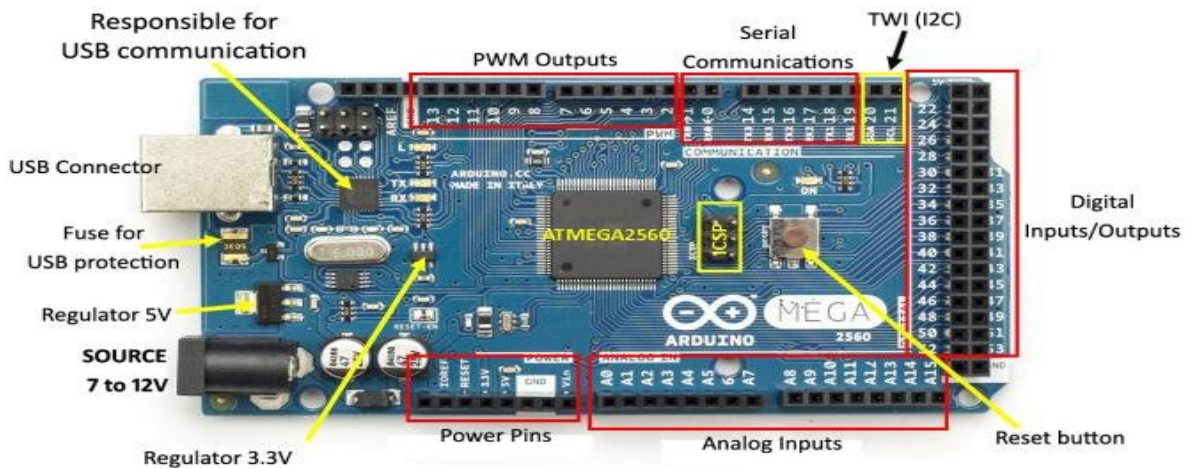
The Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to- DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Uno, Duemilanove or Diecimila.

The Mega 2560 is an update to the Arduino Mega, which it replaces.
Additional features coming with the R3 version are:
□ ATmega16U2 instead 8U2 as USB-to-Serial converter.
□ 1.0 pinout: added SDA and SCL pins for TWI communication placed near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board and the second one is a not connected pin, that is reserved for future purposes.
□ stronger RESET circuit.

TECHNICAL SPECIFICATIONS	
Microcontroller ATMEGA2560	
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/ O Pins	54(of which 14 provide PWM output)
Analog Input Pins	16
DC Current per I/O Pin	40mA
DC Current for 3.3V Pin	50mA
Flash Memory	256KB of which 8KB used by boot loader
SRAM	8KB
EEPROM	4KB
Clock Speed	16MHz

LCD (LIQUID CRYSTAL DISPLAY)
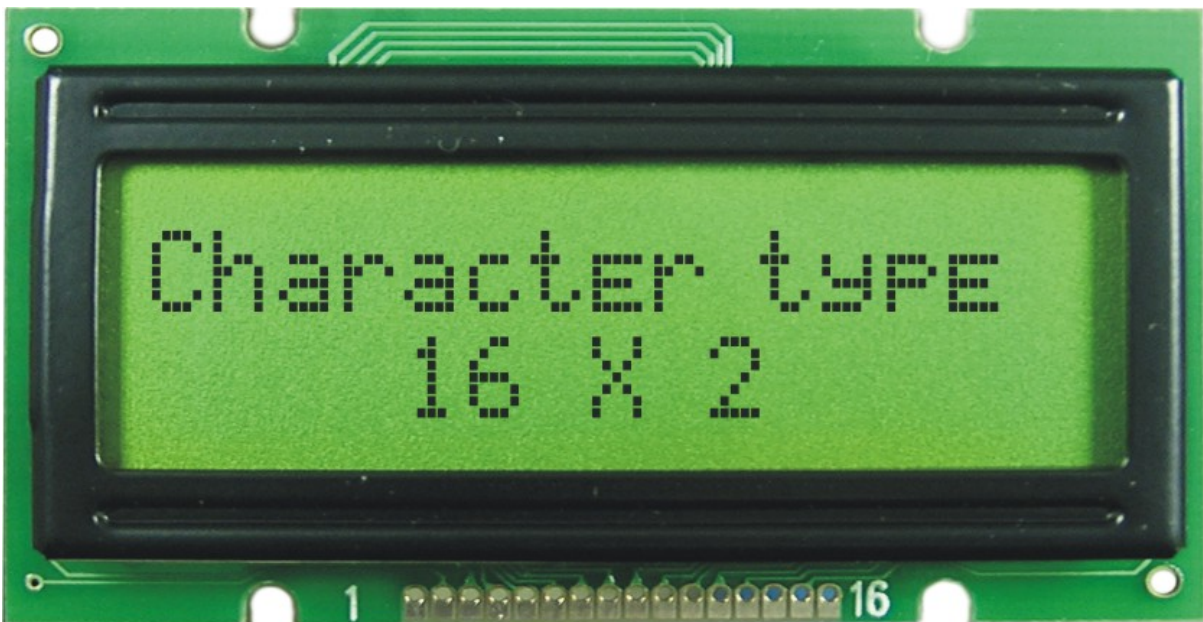
LCDInterfacing
Role:

In this system we used LCD display it is an 16x2 display, it means 16character and 2 lines and it is used to display the alphabets and numeric characters and it is totally 128 bytes of instructions and each character contains 5x7 matrix, it also consists of internal processor because to process the operation, it contains (D0-D7) data lines and register select pin(RS),Enable(E), Read/write Pin(R/W), registers pins are divided into two registers those are command register and data register when ever command register goes high it sends the command or when register select pin goes low it receives data, and enable pin is used for enabling controller and read/write pin is connected to ground and LCD different pins are connected to different ports to the microcontroller like P0.0-P.07 to LCD display, RS is connected to P2.0,Enable is connected to P2.1 and Read/Write is connected to ground the below shows how the LCD interface to the controller.
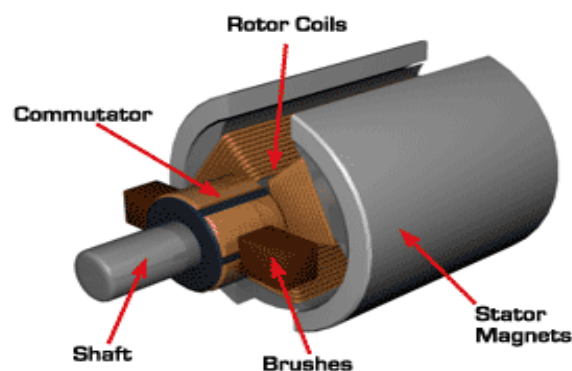
LCD (Liquid Crystal display)

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Click to learn more about internal structure of a LCD.

DC MOTOR

Motor driver using L293D
Role:

It is the main part of the system, we implemented the moving robot system, in order to move front and back we required two geared DC motors and it requires +12volts since we used AT89S52 microcontroller it is operated on +5volts and it does not drive the motors so we use the H-bridge L293D DC driver circuit and it drives the motor and it accepts +5volts from the microcontroller and drives the +12volts to the DC motor, and microcontroller ports P1.0-P1.3 are connected to the DC motors by writing bits to ports it gives direction and below shows the

directions of the DC motor.
P1.0 P1.1 Motor 1
10 Motor in clock wise direction
01   Motor in counter clock wise direction
P1.2 P2.3 Motor 2
01 Motor in clock wise direction
10   Motor in counter clock wise direction

This is another tutorial for microcontroller interfacing series. This is all about how to interface/control a simple DC motor using microcontrollers. Controlling a DC motor is nothing but controlling the direction and speed of a motor. It is very necessary to go through motor controlling concept, if you are designing an autonomous robot.

Relay and relay driver
Role:
Relay and relay driver circuit used to act like as a switching circuit by using transistor. And it requires +5volts the transistor base is connected to the microcontroller portP2.7 and collector is connected to one end of the relay circuit and relay is in normally open condition, the relay output is connected to the DC pump whenever transistor is in on condition by the microcontroller it sends logic one to the transistor base and it act like as close switch. The transistor output is connected to relay circuit and relay make circuit as close contact and pump goes to on condition.

Relay
Relay is an electromagnetic device which is used to isolate two circuits electrically and connect them magnetically. They are very useful devices and allow one circuit to switch another one while they are completely separate. They are often used to interface an electronic circuit (working at a low voltage) to an electrical circuit which works at very high voltage. For example, a relay can make a 5V DC battery circuit to switch a 230V AC mains circuit

Pin Diagram
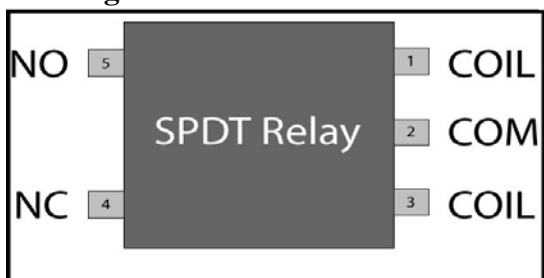
A relay switch can be divided into two parts: input and output. The input section has a coil which generates magnetic field when a small voltage from an electronic circuit is applied to it. This voltage is called the operating voltage. Commonly used relays are available in different configuration of operating voltages like 6V, 9V, 12V, 24V etc. The output section consists of contactors which connect or disconnect mechanically. In a basic relay there are three contactors: normally open (NO), normally closed (NC) and common (COM). At no input state, the COM is connected to NC. When the operating voltage is applied the relay coil gets energized and the COM changes contact to NO. Different relay configurations are available like SPST, SPDT, and DPDT etc, which have different number of changeover contacts. By using proper combination of contactors, the electrical circuit can be switched on and off. Get inner details about structure of a relay switch.

WATER LEVEL SENSOR

**Water level using reed relay**
Role:
Since this system is automatic spraying machine to the crops so, it requires the tank . Once the tank is empty it indicates the level of the tank by using water level sensor. The water level sensor is mainly constructed with reed relay. Reed relay means it is one of the relay and it is operated under less voltage. Water level sensor mainly consists of core and magnet, when ever magnet goes to top reed relay act as close switch and it is indicate that tank is full. When ever the magnet goes down the reed relay act as open switch and it sense that tank is empty and automatically spraying stops the vehicle movement also stops. water level sensor requires +5volts and it is controlled by microcontroller, the microcontroller P2.6 is connected to water level sensor.
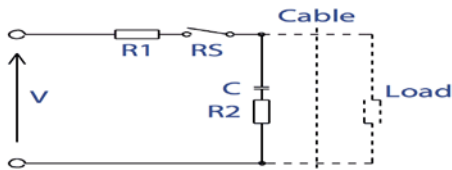
Water level sensor appearance

Water tight seal ring
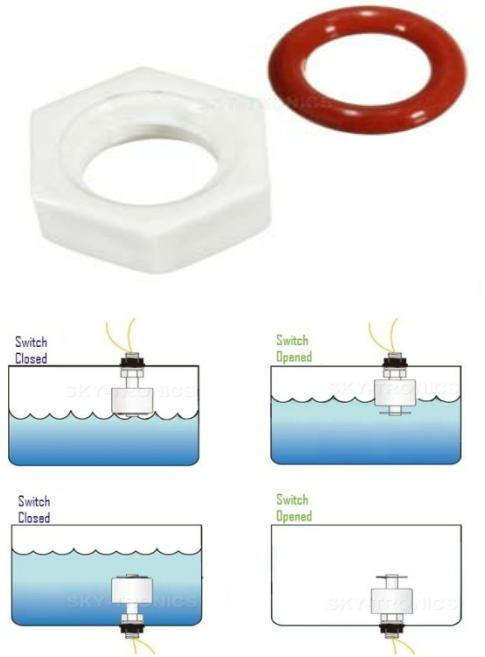
## How to protect a Reed Switch from specific loads

Reed switches can exhibit a high degree of reliability. Their contacts are sealed in an ultra clean environment at a predetermined pressure or vacuum, specifically chosen for their intended areas of application. The contact material, the size of the switch and the mechanical form may also be developed with some particular application in mind. Reed switches can be used at low level in circuits passing Pico and micro amps, with associated switch insulation resistance in the order of 10E14 if required, through to high voltage versions capable of switching 15kV or power versions that can handle several amps. Careful attention should be paid to the manufacturers'

published technical literature, to ensure the correct switch type and sensitivity range within that switch type is selected. It is assumed, in this application note, that the most suitable switch has been selected for the intended application and that the remaining problems are associated with the external factors that influence switch life, particularly external load applications.

One of the most reliable, well-proven technologies for liquid level sensing is a float switch. This type of switch comprises a magnet contained within a float, as well as a magnetic reed switch contained within a fixed housing. The movement of the float, due to the changing liquid level, will cause the reed switch to operate (i.e. close or open) at a particular level. This tried and trusted technology is based on a relatively simple design that offers long term reliability without the need for the user to calibrate thes witch.

Flow Chart of Implementations of Project
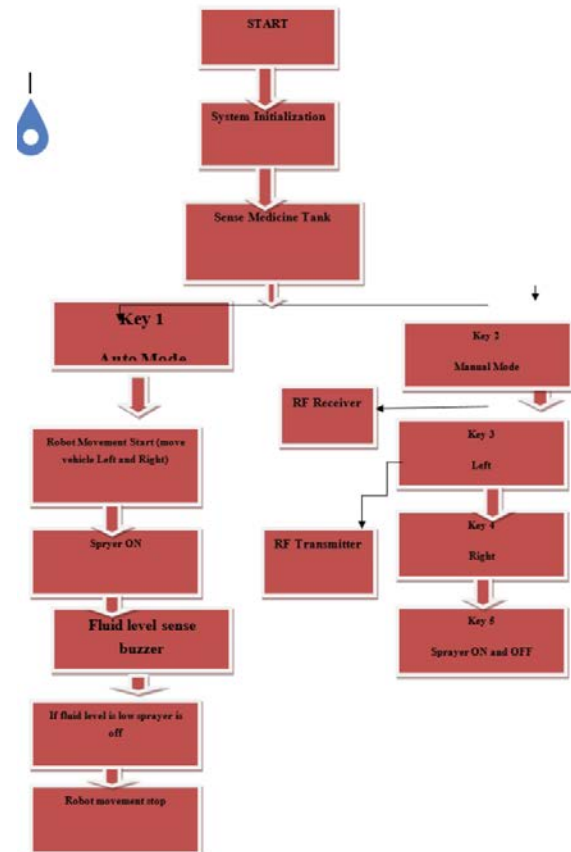
Conclusion

We can conclude that this system makes the development in the agricultural field by providing a proper pesticide for a crop, as this system works without any human interrupts this work easy and faster; and also saves the cost.

This also attracts youths to do agriculture and also makes work easy for the farmers.

References
[1]Spoorthi.S,Dr.B.Shadaksharappa, Suraj.S,V.K.Manasa.“freyrdrone”:p estic ide/fertilizers spraying drone – an agricultural approach”.2017 Second International Conference on Computing and Communications Technologies (ICCCT'17).978-1-5090-6221-8/2017 IEEE.

[2] Paolo Tripicchio and Massimo Satler . “Towards Smart Farming and Sustainable Agriculture with Drones”.2015 International Conference on Intelligent Environments.978-14673-6654-0/15 $31.00 © 2015 IEEE. DOI 10.1109/IE.2018.29.

[3] N. Zhang, M. Wang and N.Wang, “Precision agriculture” a world wide overview vol.36,pp.113-132,2016