DESIGN AND IMPLEMENTATION OF AUTOMATIC CONTROL OF DOL STARTER FOR IRRIGATION SYSTEM USING GSM, BLUETOOTH, TIMER

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Abstract:
With the advancement of automation technology, life is getting simpler and easier in all aspects. In today's world Automatic systems are being preferred over manual system. Automatic system is a growing system of everyday object from industrial machine to consumer goods that can complete.
tasks while you are busy with other activities. India's population is reached beyond 1.2 billion and the population rate is increasing day by day then after 25-30 years there will be serious problem of food, so the development of agriculture is necessary.
Today, the farmers are suffering from the lack of rains and scarcity of water. The main objective of this project is to provide an automatic irrigation system thereby saving time, money & power of the farmer. The traditional farmland irrigation techniques require manual intervention. With the automated technology of irrigation, the human intervention can be minimized. Different starting methods are employed for starting induction motors because Induction Motor draws more starting current during starting. To prevent damage to the windings due to the high starting current flow, we employ different types of starters. The simplest form of motor starter for the induction motor is the Direct Online Starter. The DOL starter consist of a MCCB or Circuit Breaker, Contactor and an overload relay for protection. Electromagnetic contactor which can be opened by the thermal overload relay under fault conditions. Typically, the contactor will be controlled by separate start and stop buttons, and an auxiliary contact on the contactor is used, across the start button, as a hold in contact. The contactor is electrically latched closed while the motor is operating.

Introduction: India is the country of village and agriculture plays an important role for development of country. In our country, agriculture depends on the monsoons which has insufficient source of water. So, the irrigation is used in agricultural field In Irrigation system, depending upon the soil type, water is provided to plant. In agriculture, two things are very important, first to get information of about the fertility. of soil and second to measure humidity content in air. Nowadays, for irrigation, different techniques are available which are used to reduce the dependency of rain. And mostly this technique is driven by electrical power and on/off scheduling. In this technique, humidity sensors are placed near the plant and near the module and gateway unit handles the sensor information and transmit data to the controller which in turns the control the flow of water through the pump.

Objective
The idea behind this project is powered by the problems faced by the Indian Farmers. You might have noticed that in most of the cases the crop-fields are located far away from the farmer's residence. Farmers have to travel significant distances to go to their crop.
fields. Irrigation is an essential part of farming. As we know, it needs to be done daily, and due to this fact, whatever may be the distance between farm and home, the farmer has to go to their crop fields every day to turn on the irrigation system and supply water to crops. There are two cons of this daily travel to crop fields, waste of both time and money. So, we felt like traveling is not a viable option when it can be done remotely. With GSM based agriculture motor control it's that simple, sitting at home, clicking a button on your smartphone and controlling motors! Note that this project is very easy to do and can be done with minimal do and can be done with minimal hardware and efforts. So, whether you're a beginner or an electronics expert, you will be able to do it. microcontroller family with standard

hardware into a board with inbuilt bootloader for plug and plays embedded programming. Arduino Software comes with anIDE that helps writing, debugging. and burning program into Arduino. The IDE alsocomes with a Serial Communication window through which can easily get the serial datafrom the board.

Pin Description of Arduino UnoPower (USB / Barrel Jack)
Every Arduino board needs a way to be connectedto a power source. The Arduino UNO can be powered from a USB cablecoming from your computer or a wall.
power supply (like this) that is terminated in a barreljack. In the picture above the USB connection is labeled (1) and the barrel jack islabeled (2).
The USB connection is also how you will load codeonto your Arduino board.
More on how to program with Arduino can befound in our Installing and Programming Arduino tutorial.
Pins (5V, 3.3V, GND, Analog, Digital, PWM,AREF)
The pins on your Arduino are the places where youconnect wires to construct a circuit (probably in conjunction with a breadboardand some wire. They usually have black plastic 'headers'that allow you to justplug a wire right into the board. The Arduino has several different kinds of pins, each ofwhich is labeled on the board and used for different functions.
GND (3): Short for 'Ground'. There are severalGND pins on the Arduino, any of which. can be used to ground your circuit.
5V (4) & 3.3V (5): As you might guess, the 5V pinsupplies 5 volts of power, and the 3.3V pin supplies 3.3 volts of power. Most of thesimple components used with the Arduino run happily off 5 or 3.3 volts.
Analog (6): The area of pins under the 'Analog In 'Label (A0 through A5 on the UNO) are Analog In pins. These pins can read the signalfrom an analog sensor (like a temperature sensor) and convert it into a digitalvalue that we can read. plug your Arduino into a power source. If this light doesn'tturn on, there's a good chance. something is wrong. Time to re-check your circuit.2.3Bluetoothed.

Digital (7): Across from the analog pins are thedigital pins (0 through 13 on the UNO).
These pins can be used for both digital input (liketelling if a button is pushed) and digital output (like powering an LED).
PWM (8): You may have noticed the tilde (~) next tosome of the digital pins (3, 5, 6, 9, 10, and 11 on the UNO). These pins act as normaldigital pins but can also be used. for something called Pulse-Width Modulation (PWM). We have a tutorial on PWM, but for now, think of these pins as being able tosimulate analog output (like fading an LED in and out).& AREF (9): Stands for Analog Reference. Most of thetime you can leave this pin alone.
It is sometimes used to set an external referencevoltage (between 0 and 5 Volts) as the upper limit for the analog input pins.Reset Button Just like the original Nintendo, the Arduino has areset button (10). Pushing it will temporarily connect the reset pin to ground andrestart any code that is loaded on the Arduino. This can be very useful if your code doesn't't repeat, but you want to test it multiple times. Unlike the original Nintendo however blowing on the Arduino doesn'tusually fix any problems.
PC. HC-05 Bluetooth module provides switchingmode between master and slave mode. which means it able to use neither receiving nortransmitting data.
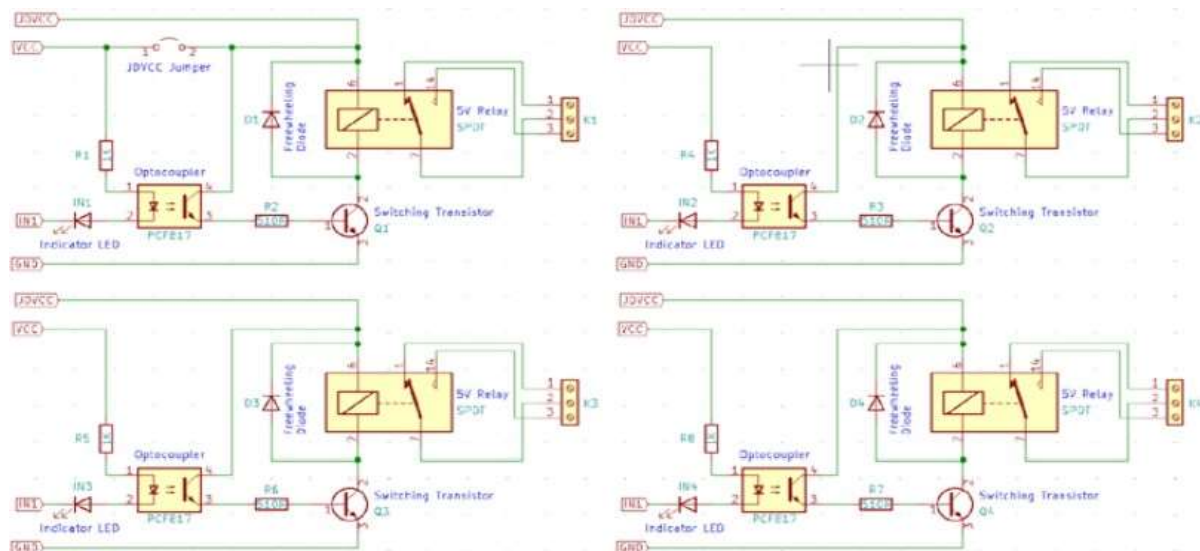
Specification:
Model: HC-05.
Input Voltage: DC 5V.
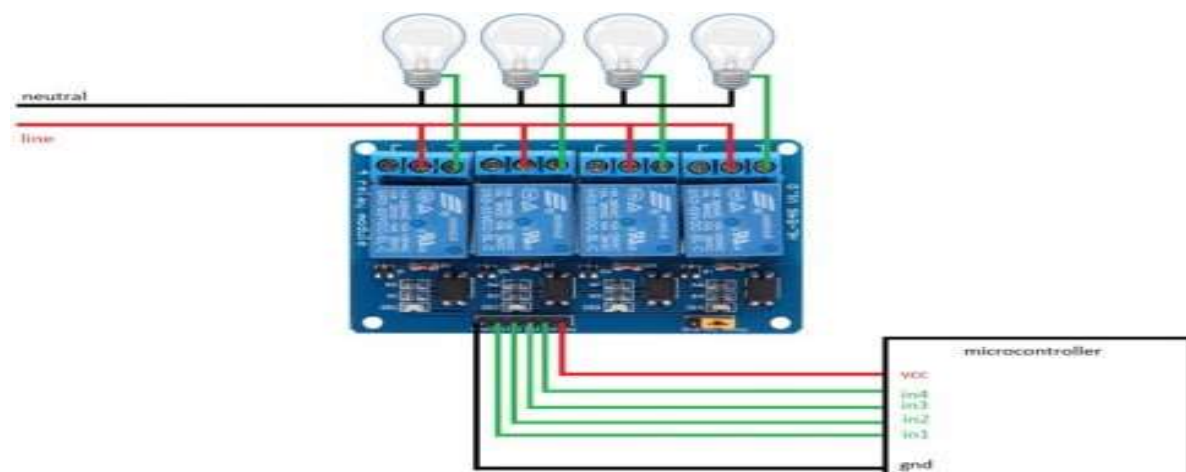   Communication Method: Serial Communication
Internal Circuit Diagram for Four-Channel Relay Module
Four channel relay:
How To Use the Four-Channel Relay Module?

The four-channel can be used to switch multiple loads at the same time since there are four relays on

the samemodule. This is useful in creating a central hub from where multiple remote loads can be powered.
It is useful for tasks like home automation. Where the module can be placed in the main switchboard and canbe connected to loads in other parts of the house and can be controlled from a central location using a microcontroller.

What is Direct Online (DOL) Starter?
DOL Starter (Direct Online Starter) is also known as "across the line starter". DOL starter is a device consist of main contactor, protective devices and
overload relay which is used for motor starting operations. It is used for low rating usually below 5HP motors.

In direct online starter method of motor starting, themotor stator windings is directly connected to the main supply where theDOL protect the motor circuit from high inrush current which may damage the overallcircuit as the initial current is much more higher than the full rated current.

SYSTEM IMPLEMENTATION :
Switch is connected across the sensor and GSMmodule. Based on the switch position only the.
system operated in either sensor mode orGSM mode. Power supply is connected to the power supply port of the Arduino withintegrated adaptor. Relay is output to the Arduino to that relay motor is connected. Buzzer isalso the output of the Arduino is connected to Arduino digital pin
GSM Discription
As for the above information we have understood thenetwork of GSM.
which is used to transfer the data with the high speedand security by allocating the band width.
To utilize the network over a long distance betweenthe devices MODEM is used.
The word MODEM means the process of Modulationand De-modulation.
The device which acts as a GSM Modem uses a wireless network which is similar to a dial-up modem.
. But the dial-up is the fixed lines which transferselectronic signals over wire but
whereas GSM Modem transfer the data via radio waves.information of the user and also its allocated frequencies, this card is known as SIM
(Subscriber Interface Module). By using this SIM inthe GSM Modem, we can connect.
To wireless network under the globe. This SIM card hasthe information of
1.   User mobile number.
2.   User international number
3.   Belonging state of user.
4.   Security key of user.
5.   Personal information of user.
6.   Some other codes.
By the help of SIM in this project we take a GSMModem of model number SIM-900 which provides us with the frequency 900MHzconnected to the global network. But the functioning of GSM Modem depends uponthe instruction set which uses.Attention commands (AT: commands).In general amobile uses more than 3000 AT commands for the operations of each application likemessage, call list and other features. But the GSM Modem or the Module SIM 900 ismade to use less than 50 commands for the functioning.
The following functions can be done by using someAT commands like
1.   AT+CMGD to delete message.
2.   AT+CMGF to select message format.
3.   AT+CMGL to list the message.
4.   AT+CMGR to the message.
5.   AT+CMGS to send message.
6.   AT+CPIN to check that SIM is ready or not.
7.   AT+CREG to network registration.
A brief description of the difference betweenSIM900 and SIM800 GSM modules. SIM800 modules are upgraded version of its previoussuccessful GSM/GPRS/GPRS module. series SIM900. There are multiple sub versions ofeach series, each of which cater to a different 14 set of users and applications

Four channel relays:
The four-channel relay module contains four 5V relay and the associated. switching and isolating components, which makes interfacing with a microcontroller. or sensor easy with minimum components andconnections. There are two terminal blocks with six terminals eachand each block is shared by two relays.
The terminals are screw type, which makes connections to mains wiring easy and changeable. The switching transistor act as a buffer between therelay coils that require high.

currents, and the inputs which don't draw muchcurrent. They amplify the input signal so that they can drivethe coils to activate the relays.The freewheeling diodes prevent voltage across the transistors when the relay is turned off since the coilsare an inductive load. The indicator LEDs glow when the coil of therespective relay is energized, indicating that the relay is active. The optocouplerform an additional layer of isolation. between the load being switched and the inputs.

The isolation is optional and can be selected using the VCC selector jumper. The input jumper contains the main VCC, GND,and input pins for easy connection using femalejumper wires. The inputs for this module are active low, meaningthat the relay is activated. when the signal on the input header is low. This is because the indicator LED and the input of the optocoupler are connected in series to the VCC pin on one end, so the other end must be connected to theground to enable the current flow. The optocouplers used here are the PCF817, which isa common optocoupler and can also be found in through packaging.

GSM is both output and input signaling device
Connected across the Arduino pins. Soil moisture
Sensor is the input of Arduino directly connected to the Arduino's:

Result:
For system operated in Bluetooth mode:
It is observed that the motor will ON when the Bluetootwill connect to
For system operated in GSM mode:
For system operated in Timer mode:
It is observed that the motor will be on through timer module using mode1 mode2mode3 and timer will be set through setting switches and then it will be ON.

Conclusion:
Irrigation plays a vital role for economic in any developing countries like India. Over the years, professionals involved in irrigation implemented manual method of irrigation. The manual method has lots of drawbacks and is quite unreliable for irrigation of big areas. Irrigation has direct impact on cost and production of final product. This system aims to eradicate the traditional manual method of irrigation which needs to be improved over the time. This prototype has many advantages which make it a good alternative to the current approaches since it facilitates the farmers to assist them in daily needs of the monitoring and controlling the field environmental parameters with minimum cost and user friendliness