Remote Control of Three Phase Induction Motor for Intelligent Irrigation System Using Global System for Mobile Communication

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Abstract- Now-a-days every system is automated in order to face new challenges in the present-day situation. Automated systems have less manual operations so that the flexibility, reliabilities are high and accurate. Hence every field prefers automated control system especially in the field of electronics automated systems is doing better performance. This project is an implementation of the idea of the wireless communication between a mobile phone and a microcontroller. They have to go to the remote area and ON/OFF the appliance. But in this new design, the systems need not be reprogrammed to control another home appliance without changing the programming of microcontroller. The user will make a SMS from his phone and he will be able to control the appliance. This system is developed with ATMEGA328p Microcontroller which is connected to the GSM and the motor. The microcontroller includes the protection against dry running and single phasing.

Keywords: Global system for mobile communication (GSM), Shortmessage status (SMS), ATMEGA328p Microcontroller.

INTRODUCTION

India is basically agriculture country, and all its resources depend on the agriculture output. Agriculture is the most important field as compared to others in India. The underground water level is slowly falling down and as well as rainfall is also reduced due to deforestation. In order to get the maximum yield in agricultural process, it is necessary to supply the optimum quantity of water, and it should be supplied periodically. This is achieved only through a systematic irrigation system. In recent years, there has been a rapid increase in wireless network deployment and mobile devices in the market. With various research that promises higher data rates, future wireless networks will likely become an integral part of the global communication infrastructure. Ultimately, wireless users will demand the same reliable service as today’s wireline network provides. Through our device controller we can represent a safe & secure wireless communication with proper authentication and less loss of data.

Control system is a system where we can start and shut down the system when we want. That’s the main difference between controlled and uncontrolled system. Our project aim is to make system more efficient and reliable. As the name suggest control is for controlling the three phase motor from remote place by using GSM mobile with android application, it will also protects from various fault like over voltage, dry run, sequential phase protection, under voltage etc and ensure that safe operation and provide instant status various way SMS on mobile (message status) through android interface etc. we used GSM network because it world-wide and operate our motor also transferring feedback Information through it thus the use of GSM network we don’t need to establish extra equipment for networking. For example, Instead GSM we used zigbee then we have to create range and more costly, for more safety operation we provide unique identification number system. In agricultural sector we hope our project is become handy and cost effective to operate motor and give it’s protection.

SYSTEMMODEL:

Arduino uno:

Arduino uno is an open source platform used to construct embedded projects. Arduino uno is very simple for both hardware and software. It consists of both a physical programmable and circuit board. Arduino platform is turn into a very popular with people arool started out with electronics for better result. The arduino do not need a isolated bit of hardware in order to bundle new code on to board. Here we use a USB cable. The IDE of Arduino uses a simplified version of c++. The program is simple to learn.
Finally the functions of microcontroller is braked by the microcontroller. Uno is for the most leading boards in the Arduino family group and considerable elect for beginners.

Figure 1: Arduino Uno

GSM Module:
GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services.

GSM (Global System for Mobile communication) is a digital mobile telephone system that is widely used in Europe and other parts of the world. GSM uses a variation of Time Division Multiple Access (TDMA) and is the most widely used of the three digital wireless telephone technologies (TDMA, GSM, and CDMA).

Figure 2: GSM Network Architecture

Liquid Crystal Display (LCD):
An LCD is a flat display panel or it also defines another electronically modulated optical devices that uses the modulating light properties of liquid crystals combined with polarizers. Liquid crystals are combined with polarizers. Liquid crystals do not emit the light directly. Rather using a back light or reflector to provide image in color or monochrome light LCD’S. These are available to display arbitrary images or fixed images with low content information which can be displayed or hide, such as digit and seven segment display, as in a digital clock LCD’S are widely used in LCD televisions, computer monitors, aircraft cockpit displays etc.

Figure 3: Liquid Crystal Display

Power Supply Unit:
Power unit is used to convert AC power to low voltage DC power. In this, we are using +5v & -5v. Transformer primary side has 230/50 Hz, secondary side voltage is step down to 12/50hz. The voltage is rectified using a full wave rectifier. The output is inclined to the filter and the filter is used to remove the unwanted signals. Filter output is connected to the regulator, this regulator is convert constant DC voltage.

Figure 4: Power Supply Unit

AC Motors:
The most common and simple industrial motor is the three phase AC induction motor, sometimes known as the "squirrel cage" motor. Substantial information can be found about any motor by checking its nameplate.

PROPOSED SYSTEM:
The method used to carry out this project is the principle of serial communication in collaboration with embedded systems. This project has a Cell Phone Based Motor Control with SMS Acknowledgment, which will be used as
the electronic device, and also a mobile phone having GSM modem, which is the latest technology used for communication between the mobile and the embedded devices.

System will work like when the user wants to ON/OFF the device; he has to make simple SMS in his mobile defining the messages by pressing key from keypad of mobile phone, for example key 1 is pressed then get a result as ‘MOTOR ON’ in SMS message is displayed to client, the microcontroller inside the system is programmed in such a way that when the modem receives any message the microcontroller will read the message from serial port and verify for the pressed key, if it is correct then it will start performing the desired task. The system block diagram shown below.

Figure 5: Block Diagram.

Features of Proposed System:

This system basically designed for remote control of three phase induction motor in agriculture field for the implementation of an intelligent and smart irrigation system. The following are the features of proposed system.

1. **Remote Controllability**: The induction motor can be remotely controlled using GSM technology just by sending SMS from the client mobiles.
2. **Providing Acknowledgements via SMS**: This system is capable of providing acknowledgements to the clients in the form of SMS to the client’s mobile based on the action performed by the client on remote controlling of motor through SMS.
3. **Indication on LCD Display**: This system is designed to display the status of induction motor with the use of Liquid Crystal Display (LCD).
4. **Motor Status Indication Remotely**: It is even capable of sharing the induction motor status remotely via SMS sent to the client mobile when he desired to know the status of motor over remote condition.
5. **Humidity & Temperature monitoring and remote Indication**: The system is designed for the remote monitoring of Humidity and Temperature of client’s agriculture fields through the SMS sent to client’s mobile.
6. **Remote indication of occurrence of Rainfall**: It is capable of indicating the chance of rainfall to the clients by sending SMS to the client’s mobile, so that the clients can remotely switch off the motor to prevent from over irrigation on agricultural fields.
7. **High temperature warning remotely**: It also indicates the clients if the temperature got high, so that the clients can remotely switch on the motor to prevent their crops from drying and wilting.
8. **Continuous Soil Moisture Monitoring and remote indication**: This system keeps continuous monitoring of soil moisture and warns the clients by sending SMS to the client mobile, if the soil becomes dry, so that the client can switch on the motor remotely.
9. **Automatic turnoff motor on Rainfall**: It is capable of automatic turning off of motor on rain falling cases and indicates the clients by sensing SMS to client’s mobile.
10. **Water overflow prevention and Indication Remotely**: In order to prevent the overflow of water on crop fields the system is capable of automatic turning off motor on reaching the complete wetting of crop field and indicates the clients by sending SMS to client’s mobile.
11. **Automatic state retaining on Power Supply Interrupts**: The system can automatically retained to the motor’s previous state on power supply interrupts, in order to prevent the system waiting for client’s commands on getting power supply.
12. **High Security**: The system has high security that only the registered mobiles can remotely control the system.
13. **Many device controllability**: More than one mobile can be used to control the
motor remotely by registering the mobile numbers on the pre-program.

14. **Power On Indication Remotely:** The system will indicate the clients on getting power supply to the motor so that the clients can run their motor on power supply availability.

15. **Dry running protection:** The clients get SMS when motor went to dry run and system will automatically turnoff motor, to protect from motor damage.

**EXPERIMENTAL RESULT:**

The figure 6 shows the circuit diagram of the project. The outputs displayed on the Mobile Phone. Whenever the client sends the SMS through the registered mobile the proposed system will produces the replay corresponding to send SMS as shown in below figures.

**Figure 6: Circuit Diagram**

System will work like when the user wants to ON/OFF the device; he has to make simple SMS in his mobile defining the messages by pressing key from keypad of mobile phone, for example key “MotorON” is pressed then get a result as ‘MOTOR ON’ in SMS message is displayed to client, the microcontroller inside the system is programmed in such a way that when the modem receives any message the microcontroller will read the message from serial ports and verify for the pressed key, if it is correct then it will start performing the desired task.

**RESULT 1: Remote Controllability:** The induction motor can be remotely controlled using GSM technology just by sending SMS from the client mobiles.

The below snapshot shows the action of turning on the three phase motor by sending SMS as “Motor on” to the SIM places in the GSM module.

**Figure 7: Snapshot of Turning on the Motor.**

RESULT 2: Providing Acknowledgements via SMS: This system is capable of providing acknowledgements to the clients in the form of SMS to the client’s mobile based on the action performed by the client on remote controlling of motor through SMS.

**Figure 8: Snapshot of Turning on the Motor.**

The above snapshot shows the action of getting acknowledgements to the resisted mobile number through the controlling action is done.

**RESULT 3: Indication on LCD Display:** This system is designed to display the status of induction motor with the use of Liquid Crystal Display (LCD).
RESULT 4: Motor Status Indication Remotely:

It is even capable of sharing the induction motor status remotely via SMS sent to the client mobile when he desired to know the status of motor over remote condition.

The below snapshot shows the action of indicating the three phase motor status by sending SMS as “Motor Running” to the SIM places in the GSM module.

RESULT 5: Humidity monitoring and remote Indication:

Figure 12: Snapshot of Indicating atmospheric humidity by SMS on registered mobile.

RESULT 6: Temperature monitoring and remote Indication:

Figure 12: Snapshot of Indicating atmospheric Temperature by SMS on registered mobile.
RESULT 7: Continuous Soil Moisture Monitoring and remote indication:

Figure 13: Snapshot of Indicating soil moisture by SMS on registered mobile.

RESULT 8: Automatic turnoff motor on Rainfall:

Figure 14: Snapshot of Rainfall warning by SMS on registered mobile & automatic turnoff motor.

RESULT 8: Remote indication of occurrence of Rainfall:

It is capable of indicating the chance of rainfall to the clients by sending SMS to the client’s mobile, so that the clients can remotely switch off the motor to prevent from over irrigation on agricultural fields.

The below snapshot show the action of indication of chances of rainfall to the clients by sending SMS to the registered mobile, based on changes in humidity.

RESULT 9: Water overflows prevention and Indication Remotely:

Figure 15: Snapshot of Indicating of occurrence of rainfall by SMS on registered mobile.

RESULT 9: Water overflows prevention and Indication Remotely:

Figure 16: Snapshot of Indicating of overflows prevention by SMS on registered mobile.

RESULT 10: Power On Indication Remotely:

Figure 17: Snapshot of Power On Indication Remotely:
RESULT 11: Dry running protection:

Figure 18: Snapshot of Dry running protection & Indication Remotely.

CONCLUSION:

The cell phone based device control with SMS acknowledgement is an excellent device to operate any electronic equipment from miles away as the mobile technology is becoming advanced day by day; it is used for much other application as device control. As mobile service is used by everyone these days, this system will be very much useful in rural areas as well the device control can be applied in every field like agriculture, home, factories etc. The use of mobile communication in device control has been thoroughly justified and the previous drawbacks and problems have been overcome.

A cell phone having GSM and GPRS based Designs have developed another innovative and Public utility product for mass communication. This is agriculture Appliance Control Device which controls the through SMS received and also gives voice acknowledgement of task. Such Devices can be used at different areas of the human being life. Such offices, houses, factories etc. send command from Mobiles to these devices for ON and OFF the devices. These devices are designed to remotely control the devices from anywhere and anytime. Wireless communication has announced its arrival on big stage and the world is going mobile.

FUTURESCOPE:

If the GSM range is not occurs in some area then the controlling three phase motor using GSM is difficult then instead GSM we used Zigbee for controlling three phase motor because the property of zig bee is creating the range according to user requirement. If user want to seen current operation and status live then we used Digital Camera System It will possible to controlling the three phase transformer, three phase drivers, breakers which is required for Andra Pradesh State Electricity Board(APSEB) using GSM and Android Application.

REFERENCES:

[1] V. Bhaskar and T. Gowri Manohar Department of E.E., S.V. university, Tirupati. A.P. India Email:- Velurubhaskar@ymail.com


[9] The 8051 Microcontroller and the embedded system by M.A.MAZIDI.