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Remote Access to Agricultural Motor through the Usage of GSM and SMS Technologies

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Abstract: Farming is an activity that depends heavily on the conditions that are existent in the environment surrounding the agricultural field. The work of the farmers is affected by the natural conditions such as climate, topography, etc. and also by other anthropogenic elements. This project proposes to develop a system that makes use of GSM and SMS technologies to allow for remote access to the agricultural motor, thereby making a farmer's work much easier and less dependent of the conditions present.

Keywords

GSM, SMS, Agriculture, Motor control, Remote Access

I. Introduction

This project implements the emerging applications of GSM technology. Using GSM networks, a control system has been proposed that will act as an embedded system which can monitor and control an agricultural motor and other devices locally using built-in input and output peripherals.

Remotely, the system allows the user to effectively monitor and control the agricultural motor via the mobile phone set by sending commands in the form of SMS messages and receiving appliances status. The main concept behind the project is receiving the sent SMS and processing it further as required to perform several operations. The type of the operation to be performed depends on the nature of SMS sent. The principle in which the project is based is fairly simple. First, the sent SMS is stored and polled from the receiver mobile station and then the required control signal is generated and sent to the intermediate hardware that we have designed according to the command received in form of the sent message.

The designed control system, which is based on the GSM technology, effectively allows control from a remote area to the desired location in the agricultural field. The application of the suggested system is immense as it provides for reducing the effort in the irrigation process and for more efficient farming techniques. The need to be physically present in order to control the agricultural motor present on a certain location is eliminated with the use of this system.

II. Design of the system

The following is the basic design of the system –

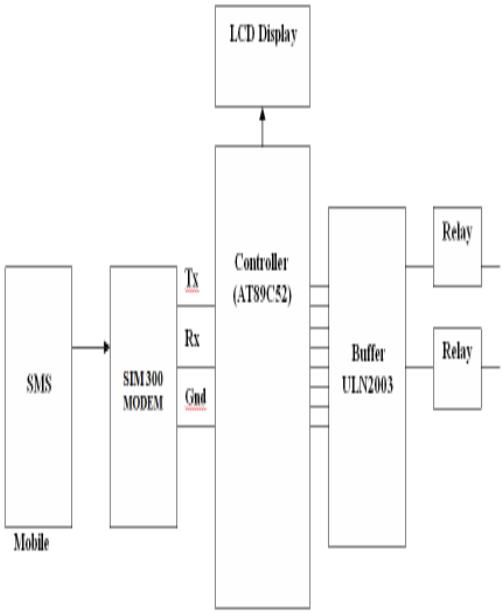

Fig 1: Basic Design of the System

The system makes use of an AT89S52 micro-controller that acts as the brain of the entire system. It controls the transmission and receiving of signals to the motor and from the mobile device. A SIM300 modem is used at the device. The SIM300 modem allows for the usage of AT commands which can be used to read the messages from the modem.

The first mobile station is used as a transmitting section from which the farmer sends text messages that contain commands and instructions to the second mobile station

which is based on a specific area in the agricultural field where the control system is located. The received SMS message is stored in the SIM memory of the phone and is then extracted by the micro-controller and processed accordingly to carry out specific operations. The relay driver (ULN2003) is used to drive the relay circuits which switches the agricultural motor connected to the interface. The LCD is used to indicate the status of the operation performed by the micro-controller and also its inclusion makes the overall system user-friendly.

III. System Operation

The following flow chart represents the system operation –

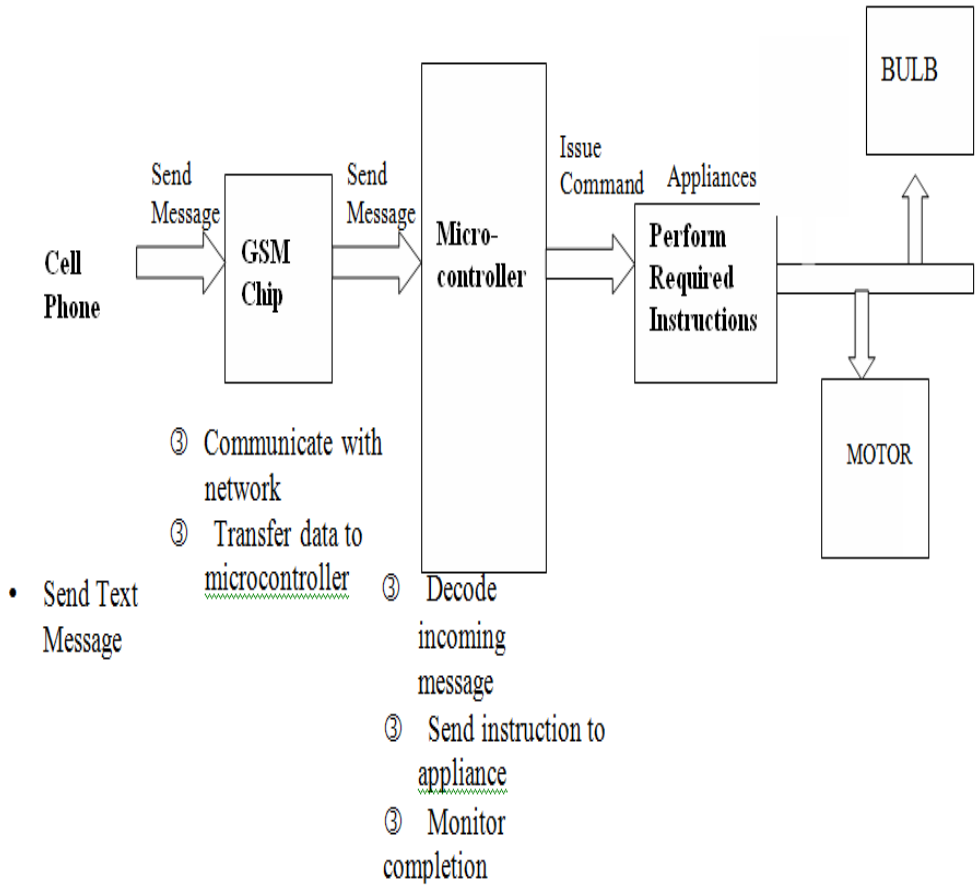

Fig 2: System Operation Flow Diagram

Assuming that the control unit is powered and operating properly, the process of controlling a device connected to the interface will proceed through the following steps –

- The remote user sends text messages including commands to the receiver.
- GSM receiver receives messages sent from the user cell phone.
- GSM receiver decodes the sent message and sends the commands to the micro-controller.
- Micro-controller issues commands to the appliances and the devices connected, i.e. the agricultural motor, will switch ON/OFF.

IV. System Specifications

4.1 Goals and objectives

a. To co-ordinate agricultural motor through Short Message Service.
b. To effectively receive and transmit data via SMS.

c. To eliminate the need of being physically present in any location for tasks involving the operation of the agricultural motor.
d. Minimize the power and time wastage.

4.2 Environment

The control system will include two separate units: the cellular phone and the control unit. There will therefore be two operating environments. The cellular phone will operate indoors and outdoors whereas the control unit will operate indoors within the temperature and humidity limits for proper operation of the hardware.

4.3 Functional Requirements

a. The control unit will have the ability to connect to the cellular network automatically.
b. The control unit will be able to receive the text messages and will be able to parse and interpret text messages and instructions to be sent to the micro-controller.
c. The micro-controller within the control unit will issue its command to the agricultural motor through a simple control circuit.
d. The control unit will control the agricultural motor.

4.4 Technological Considerations

a. Cellular Networks – The widely available networks are based on GSM. This network provides wide area coverage and can be utilized more cost effectively for the project.
b. Communication Protocols – The available communication protocol that we have used is SMS. The SMS is the most efficient because the project requires a cellular communication technique and only a limited data is sent.
c. I/O interfaces between the micro-controller and devices – Serial I/O is considered as options for connection between the GSM receiver and the micro-controller. Using the micro-controller, a control circuit is implemented to control the agricultural motor.

V. GSM and SMS Technology

GSM (Global System for Mobile Communication) and SMS (Short Message Service) technologies have been a major influence in the growth of telecommunications in the world. The extent of mobile usage has been growing exponentially throughout the years. The efficient, secure and highly effective service features of these technologies have been utilized in this project in order to produce a system that allows for remote access for the farmers.

[Ref: 3] Advantages of using SMS :

- SMS Messages can be sent and read at any time.
- SMS Message can be sent to an offline Mobile Phone.
- SMS Messaging is less disturbing while you can still stay in touch.
- SMS are supported by 100% GSM Mobile Phones and they can be Exchanged between different wireless carriers

VI. Software Algorithm

Step 1: Start
Step 2: Phone initialization
Step 3: Get Hardware Software
Step 4: Poll SMS from mobile phone
Step 5: If new SMS received go to step3 else, go to step1
Step 6: Receive SMS
Step 7: Check SMS pattern
Step 8: Control the device based on status
Step 9: Notify end user
Step 10: Go to step1

VII. Results

The system has been designed and tested using a single phase ½ HP motor at an agricultural field, located at a distance of 30 km from the user's location. The motor has been operated successfully, with full functionality being observed by the extent of water flow that is being pumped by the motor.

Fig 3: Water flow coming out of the motor

VIII. Conclusion

The extensive capabilities of this system are what make it so interesting. From the convenience of a simple cell phone, a farmer is able to control and monitor the motor in the agricultural field virtually from any distance. This makes it possible for the farmers to be rest assured that their motor activity is secure and that better water management can be made through the use of this project. The project will allow for improving the efficiency of the irrigation process. The end product has a simplistic design making it easy for farmers to interact with. This will be essential because of the narrow range of technical knowledge that most of the farmers have [10-15].

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