Automatic Boar Motor Control by Using Cell Phone

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Abstract- This paper provides the development of mobile phones as remote control application for the induction motor pump which is used in agriculture for irrigation. Rural areas in many states of India are plagued by frequent power cuts and abnormal voltage conditions. The developed system ensures that water is distributed to field whenever normal conditions exist based on task specified. This is carried out by exchanging the information between the user phone and GSM in the form of miscalls and messages. This system is developed with ATMEGA32A microcontroller which is connected to the GSM, sensors, water level indicator circuit, current consumption circuit, and motor. The temperature sensor is used to detect the temperature of the motor, water level indicator circuit detect water level, and current consumption circuit detect current consumption of motor. It is expected that system will relieve hardships of farmers relating water distribution to a great extent.

Key words- remote control, SMS, AT commands, micro controller, cell phone.

I. INTRODUCTION

India is basically an agricultural country, and all its resources depend on the agricultural output. With the rapid development of agriculture in India, many automatic technologies have been introduced into agricultural productions. The total rainfall in a particular area may be either insufficient, or ill-timed. In order to get the maximum yield, it is essential to supply the optimum quantity of water, and maintain correct timing of water. This is possible only through a systematic irrigation system-by collecting water during the periods of excess rainfall and releasing it to the crop as and when it is needed.

Most of farmers use sprinkler based or surface based irrigation. Three phase induction motors with direct-on-line or star delta starters are used. For sprinkle based irrigation, farmer first arranges set of pipes with nozzles in the region of distribution of water and then switches on the pump. He waits for specific duration to ensure that water is distributed in sufficient quantity and then shifts the set of pipes to other dry regions and repeats the process. In many cases, the distance between location of pump (water source) and the region of distribution of water (farm) might extend to few kilometers. In case of power failure, farmer has to go back to pump region and wait for power restoration. For surface based irrigation, water is discharged through pipe at ground surface and gradient is created to distribute the water through the various regions. There are frequent instances of burning of motor due to unequal phase voltages and dry running of motor. Repairing cost of pump and non-distribution of water during motor failure period cause substantial reduction in yield of crop.

The aim of this paper is to develop a cost effective solution that will provide remote control of induction motors through mobile phones using missed calls and messages. The mobile user in the world has a tremendous rise during the past few years. Remote monitoring of processes, machines, etc., is popular due to advances in technology and reduction in hardware cost. Remote monitoring through Internet based monitoring is one of common approach [3]. This approach requires PCs (Client/Server) along with additional devices like modems, buffers, etc. For internet connectivity and software support for TCP/IP protocols and control system interaction. The cost of such system varies greatly depending on speed and bandwidth requirements and hence is justified usually for biomedical and industrial applications where intensive data transfer is required. Cellular networks provide Short Messaging Service (SMS) and Multimedia Messaging Service (MMS), approach offers simple interface with only destination cell phone address and message requirement without any header / protocol overhead. So this method is suitable for remote monitoring of systems with moderate complexity. Wireless sensor networks also offer opportunity for remote monitoring [6]. This consists of wireless network of sensor nodes connected to adjacent nodes and Base

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Station (BS). Each node consists of microcontroller, radio-transceiver and set of sensors. BS acts as gateway for Internet connectivity. The deployment entails substantial investments in infrastructure. Major applications are in field of environment monitoring, defense, etc.

II. SYSTEM DESCRIPTION

When power comes to system, it will send motor conditions like water level, temperature on the body of motor, date and time in the form of SMS to user cell phone. Based on that conditions user can operate motor with cell phone by sending SMS or by miscalls. For every operation user can get acknowledgement by SMS.

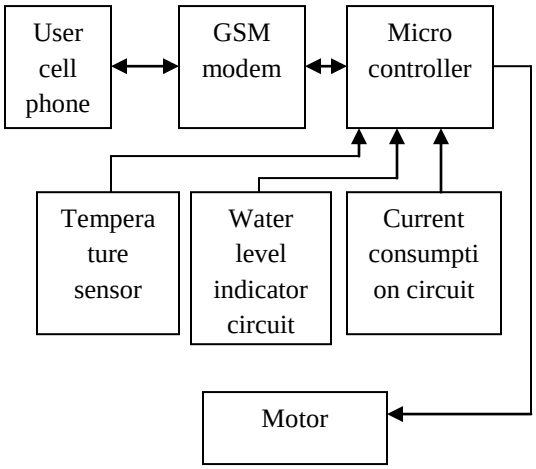

Fig 1 system block diagram

The block diagram of the scheme is shown in fig1. User sends commands to GSM modem through cell phone. GSM modem is interfaced by RS232 to micro controller. Temperature sensor which is placed on the body of motor, water level indicator circuit, and current consumption circuit are connected to micro controller. From these units micro controller receives information and it sends signals to relay which is connected in between micro controller and motor.

A. Cell phone interface

The GSM modem communicates with the user cell phone to intimate the condition obtained for the microcontroller. Serial Port Adapter works in data and AT modes and needs to be properly configured [8]. During power-on condition, SPA is initially in data mode and by sending "///" characters within 3 seconds, the device is moved into AT mode for configuration [6]. In AT mode, series of commands are sent for proper configuration. If match is found, it starts data communication between micro-controller system and GSM. AT commands are sent by sending text strings 'A', 'T', along with specified command strings through serial port to cell phone and are executed on receipt of carriage return [5]. The result codes are sent by cell phone to system (TE) to indicate the status after execution of command.

1. *SMS approach:* SMS is store and forward way of transmitting messages between cell phones. The major advantage of using SMS is provision of intimation to the sender when SMS is delivered at the destination and ability of SMSC to continue efforts for delivery of message for the specified validity period if network is presently busy. The text message is sent to cell phone using CMGS command. CNMI command is used to indicate to TE about the receipt of incoming SMS message from the network. It is observed that most of current cell phones do not support CNMI command.

2. *Miss call approach:* The operational cost of communication between user and GSM is further reduced by using concept of miscall where in no charges are incurred by using only ring signal for information transfer. A voice call is treated as miscall when either calling party disconnects after receiving ring tones or called party does not respond to call within specified time.

B. Micro controller system

AT Mega32 microcontroller has RISC architecture with 32 KB of programmable Flash, 1 KB EPROM, 2 KB SRAM 32-bit General purpose I/O, 8 channel 10-bit ADC, TWI, UART, SPI, JTAG interface support, etc. Ponyprog software was used for flash programming. The software was developed in C language using GCC compiler.

Interfacing diagram of micro controller system shown in fig 2. PA0 is connected to temperature sensor LM35. Port C is configured to control the motor. The pin PC5 is responsible for the connection of Motor control. The MAX232 which converts the 12V DC into 5V Dc and vice versa is connected to the Port C. The transmitter and receiver of the Controller are connected to the 11^{th} and 12^{th} pin of MAX232. Liquid level circuit is connected to PD5. Current consumption circuit is connected to PD4. 9^{th} pin is connected to reset circuit, 10^{th} pin is connected to power supply, 11^{th} pin is connected to ground, and crystal oscillator circuit is connected in between 12^{th} and 13^{th} pins. When user at the system he can operate

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the system by manually and that switch is connected to PD7.

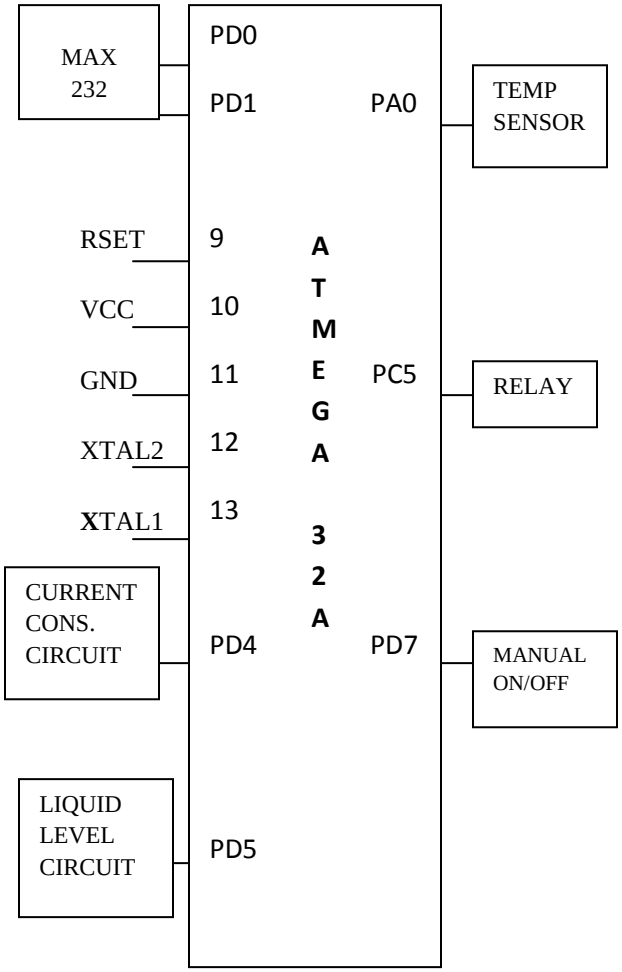

Fig 2 micro controller system interfacing

1. *Temperature sensor:* The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in ^{0}C). It is placed on the body of motor when abnormal temperature occur motor will off automatically.
2. *Liquid level circuit:* in this system use liquid level circuit to determine water level. We can also use sensor for this purpose. But by using circuit we can reduce system cost.
3. *Current consumption circuit:* by using simple full wave rectifier circuit we can measure current consumption and interfacing with controller also very simple because we get digital output.

III. CONCLUSIONS

Thus the developed system enhances the water distribution in the field optimally. The system ensures protection of motor against overloads, overheating and phase imbalances. It also provides automated restarting if normal conditions are re-established. Uniform distribution of water at regular intervals, reduction in labor cost, prevention of unwanted water spillage, minimization of occurrences of motor faults and intimation to user about the completion of task are the major advantage of this system. The use of mobile phone has become more common among the farmers and hence used The system proves to be great boon to farmers whose pump sets are located far away from their homes due to capability of remote control using cell phone and intimation about any abnormal conditions.

The system is designed to have cell phone with inbuilt security against unauthorized users. Any cell phone model can be used for communication so that the system improves its adaptability to use. Low operating cost using messages and missed calls are the major attractions of this system

The future enhancement of this work is to develop the system to help illiterate farmers using spoken commands [4].

The spoken commands are recognized and converted into text message for SMS which helps them to identify the faults and commands easily. Moreover, in cases where non-deterministic response of SMS is not acceptable, dedicated voice based call approach can be incorporated.

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