Close Loop Feedback System for Device Automation

Ankur Ganorkar and Surendra Bhosale

***Abstract*—The short message system (SMS) of a standard mobile phone can be used for much more than just exchanging cryptic message. This application uses a mobile for a remote site monitoring and controlling external equipments. The SMS service provided by the service providers are comparatively low cost. Hence a highly efficient and low cost system can be implemented for a variety of industrial applications to control the status of the devices as well as monitor their status periodically.**

***Index Terms*—Short message system, mobile phone.**

I. Introduction

The aim of the project is to investigate a cost effective solution that will provide controlling of home or industrial appliances remotely and will also enable security against intrusion in the absence of owner. The home and industrial appliances control system providing remote access to the appliances along with security was required to be developed. Therefore this paper proposes a system that allows user to be control machines ubiquitously and also provide security on detection of intrusion via SMS using GSM technology.

The short message service (SMS) of a standard mobile phone can be used for much more than just exchanging cryptic message. This application finds a humble mobile working in a remote site monitoring and controlling external equipment. This system accommodates the SMS techniques together with the micro controller technology that are used in a wide variety of applications in industry via computer peripherals, business machines and robotics that are related to process control and machine tool applications. This Automation system design is user friendly and it is possible to operate it from anywhere is the world. Thus this project increases the range from which devices can be controlled remotely, making life simpler in the 21st century.

Fig. 1. Basic concept of feedback control system

Manuscript received May 11, 2012; revised June 18, 2012.

Ankur Ganorkar and Surendra Bhosale are with Department of Electrical Engineering Veermata Jijabai Technological Institute, Matunga (East), Mumbai-400019, India (ankur.ganorkar@gmail.com).

II. Literature Survey

The various methods for implementation of the concept are listed below:

A. By Using Bluetooth

Bluetooth technology is set to revolutionize business and consumer markets, enabling quick and easy data connections among a wide range of computing and telecommunications devices without wires or cables[1], [2]. For the same reasons, it has the potential to change the face of industrial automation

Disadvantages: Both theoretical investigations and practical test has proven Bluetooth's reliability, but it has to be understood that Bluetooth is a RF-system and care has to be taken while creating products and installing Bluetooth products e.g. antenna position, and encapsulation. Also there is limitation on implementation of such technique due to small coverage range of Bluetooth.

B. By Using GSM Modem

It is a hardware component that allows the capability to send and receive SMS to and from the system [3]. The communication with the system takes place via RS232 serial port. Cell phone can be attached at the place of GSM hardware but it limits the hardware functionality such as sending or receiving of SMS.

C. By Using PC

Acronym for supervisory control and data acquisition is a computer system for gathering and analyzing real time data. These systems are used to monitor and control a plant or equipments in industry. A PC based system [4] gathers information, such as where a leak on a pipeline has occurred, transfers the information back to a central site, alerting the home station that the leak has occurred, carrying out necessary analysis and control, such as determining if the leak is critical, and displaying the information in a logical and organized fashion. PC based systems can be relatively simple, such as one that monitors environmental conditions of a small office building, or incredibly complex, such as a system that monitors all the activity in a nuclear power plant or the activity of a municipal water system.

But its main disadvantage is we can control it from only one remote station.

D. By Using IVRS

Most of the service provided in today's world are VOICE INTERACTIVE, You call up your bank and computerized voice will speak to you and guide you to enter a particular number from your phone to get the desired service[5]-[7]. This service is only available through the fast speed computers and having huge amount of memory.

Using interactive service (IVRS) for Industrial

applications, you may switch on/off devices using your mobile phone or landline phone. And not only can you switch on/off devices, but also provide a FEEDBACK in case of security threat, or any safety Parameters goes beyond safety limit.

The only possible disadvantage is output quality of voice may be poor due to some interference.

E. By Using SMS Technique

The proposed system "Closed loop feedback control system for device automation" is used to control the functions of a device from a remote area through the SMS of a mobile phone using personal computer. From the transmitting section using a mobile phone, short messages are delivered to the Nokia Mobile Phone. In the receiver section this mobile is connected to the Personal Computer. This in turn is connected to micro controller, which controls the motion of the stepper motor.

It compensates all the drawbacks of the landline telephone due to the inclusion of enhanced feedback and monitored facility. It acts as a better remote mobile operation. This project can be modified according to the industry requirements. Only an attempt has been made here to control the motions of the stepper motor using this developed system. This could be further more researched, wherein the same application can be utilized to control any other hazardous devices or similar devices in place of the stepper motor.

III. Block Diagram of the Proposed System

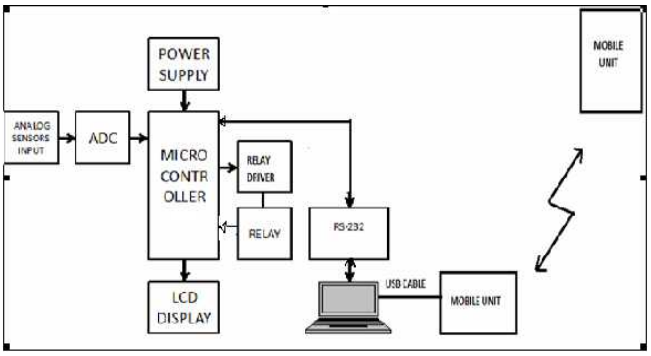

Fig. 2. Block diagram

The explanation of the block diagram is as given below:

A. Remote Mobile Unit

This mobile handset is used to send sms's. This sms is used to check the status of the industrial devices i.e. whether the devices are ON or OFF. A message is delivered to this remote unit indicating the status of device or an emergency.

B. PC

It comprises of the database and a software application which is the core part. Messages to control the industrial processes are received by the mobile phone kept in the receiving side and are read by the personal computer for which the software for PC connectivity is enabled through the USB CABLE. The application always monitors the inbox of the mobile and the received SMS is accepted only if the transmitted mobile phone number is available in the database of it.

C. Sensors

Sensors will measure the various parameters at the place where process is carried on. The sensors output will be processed & converted into voltage. Their equivalent output will be then digitized using A/D converter. The A/D converter used is IC 0808.

D. Microcontroller

The output of A/D converter will be given to a micro controller which will convert this parallel output into serial output and will transmit it to transmitter. If the data received by microcontroller is beyond a limit then it will perform programs to control those parameters. The microcontroller will provide the information to the pc about the various processes via RS-232 serial cable and vice versa.

IV. Working of the Project

The short messages such as device on, device off etc., (at a time only one) are delivered to the mobile phone, which is kept at the receiving end from the transmitting section using a mobile phone. In the receiver section this mobile is connected to the personal computer through the com port. The master micro controller is connected to the parallel port through the octal buffer and line driver. One of the ports of the micro controller is connected to the device driver through the actual buffer and line driver. The device whose motion is controlled is connected to a driver. Another port of the micro controller is connected to the LED indicators via the octal buffer and line driver. The necessary power required to all the parts are supplied by the supplies.

Messages such as stepper on, stepper off etc to control the motion of the stepper motor are received by the mobile phone kept in the receiving side and are read by the personal computer for which the software for PC connectivity is enabled. The application always monitors the inbox of the mobile and the received SMS is accepted only if the transmitted mobile phone number is available in the database of it. If not, simply it shows the message. "Received message from unauthorized phone" and message will be deleted. This ensures that the system is highly protected and cannot be operated by any unauthorized persons.

The micro controller reads the data and delivers the corresponding information to control the motion of the stepper motor. At the same time the corresponding LED will indicate the status of the motion what is going on and also indicates the various commands received by the mobile. Feedback is generated by the server PC which transmitted back to the user mobile via secured wireless link as a sms based feedback or ivrs feedback.

V. Advantages, Limitation and Future Scope of the Project

A. Advantages

- Provides security and safety.
- User is updated with current status of the device irrespective of his/her location.
- Real time analysis is also possible as the server is used to

store the status of the devices.

B. Limitations

In case of network failure there would be a delay in the operation i.e. transmission as well as feedback.

C. Future Scope

- It can have more accurate digital sensors so that even the slightest error can be detected which can generate an alarm at the user end.
- The data can be transmitted to the mobile station i.e. handsets or satellites can be used to transmit the data worldwide.
- For higher data speed fiber optic cables can be used.

ACKNOWLEDGMENT

The authors would like to thank Veermata Jijabai Technological Institute, Mumbai, INDIA for supporting this project work.

REFERENCES

[1] N. Sriskanthan, F. Tan, and A. Karande, "Bluetooth based home automation systems," *Journal of Microprocessors and Microsystems*, vol. 26, pp. 281-289, 2002.

[2] H. Kanma, N. Wakabayashi, R. Kanazawa, and H. Ito, "Home appliance control system over Bluetooth with a cellular phone," in *Proc. of ICCE 2003, IEEE International Conference on Consumer Electron*, pp. 380-381, 2003

[3] C. Felix and J. Raglend, "Home automation using GSM," in *Proc. of ICSCCN 2011, IEEE International Conference on Signal processing, communication, computing and Networking Technologies*, pp. 15-19, 2011.

[4] B. Koyuncu, "PC remote control of appliances by using telephone lines," in *Proc. of IEEE Trans. Consumer Electron.*, vol. 41, no. 1, pp. 201-209, Feb. 1995.

[5] R. Nunes and J. Delgado, "An Internet application for home automation," in *Proc. of MELECON 2000, 10th Mediterranean Electro technical Conference*, vol. 1, pp. 298-301, 2000.

[6] P. M. Corcoran, F. Papai and A. Zoldi, "User interface technologies for home appliances and networks," *IEEE Trans. Consumer Electron.*, vol.44, no. 3, pp. 679-685, Aug. 1998.

[7] N. S. Liang, L. C. Fu, and C. L. Wu, "An integrated, flexible, and Internet-based control architecture for home automation system in the Internet era," in *Proc. of ICRA '02, IEEE International Conference on Robotics and Automation*, vol. 2, pp. 1101-1106, 2002.