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MULTI-MICROCONTROLLER COMMUNICATION USING CONTROL INDUSTRIAL APPLICATION

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ABSTRACT

In recent years, multiprocessor designs have converged towards unified hardware architecture despite supporting different communication abstractions. Some recent designs have employed a programmable controller to manage system communication. The Master/Slave pattern is most commonly used when responding to user interface controls while displaying data simultaneously. Master/slave is model of communication where one device or process has unidirectional control over one or more other devices. In some systems a master is elected from a group of eligible devices, with the other devices acting in the role of slaves. We have developed a Master Slave Communication using three microcontroller AT89S52 which communicates through RS 232 serial bus. There are three units; first unit is a Master controller Circuit which controls different parameters; second unit is a Sensing unit which acts as a slave and third unit is another slave which is a display system.

Keywords – AT89S52, Master Controller Circuit, Salve circuit, RS-232 protocol.

I. INTRODUCTION

A critical problem in multiprocessors is managing communication between the processors in the system. Individual processor performance is important, but it alone is not sufficient to achieve scalable system performance. To address the communication problem, multiprocessor systems research has explored a broad range of design styles and, in turn, communication abstractions presented to the application. Unfortunately there is so many numbers of and so many types of physical conditions, parameters and settings that we need to employ totally different and dedicated control systems for each requirement. The basic requirement of industrial control and monitoring systems is the response time; therefore, time constraint is the first consideration in designing networked embedded systems [3]. The requirements of controlling action have no limit because controlling parameters are of many kinds. For example, some of these are Analog like voltage, current, temperature, light, Illumination, pressure, proximity and so on, some of these are digital like Time, Date, Calendar, Duration, keypad, switches,. Most of the industrial applications use the analog sensors with transmitters for sensing the process parameters. The benefits of digital technology in the vast world of analog sensors can be implemented by development of appropriate multi sensor embedded system [4]. When connecting multiple devices to a microcontroller, the address and data lines of each device were conventionally connected individually. This would take up precious pins on the microcontroller, result in a lot of traces on the PCB, and require more components to connect everything together. This made these systems expensive to produce and susceptible to interference and noise. The question arises that “can we make a system capable to handle many parameters at ones?” In this paper we targeted to make would be the solution for this question.

The Master/Slave design pattern is very advantageous when creating multi-task applications. It gives us a more modular approach to application development because of its multi-loop functionality. Wired technology has some advantages over wireless technology. It is more secure and no data loss. Wireless gear costs somewhat more than the equivalent wired Ethernet products. At full retail prices, wireless adapters and access points may cost three or four times. The multi microcontroller communication are an integral part of modern industrial environmental as today communications are of much important than ever. The hardware developed is a simplified prototype of the communication models used in industrial environments, with master controller representing the control station from where instruction and commands are sent to different section of the industrial setting, and slaves mimicking the role of location where these command are sent to be executed. More often than not, such destinations are also capable to send latest data to the display station and control station (e.g. sensors) [1].

II. SYSTEM MODEL

The whole system (Multi-microcontroller Communication for Control Industrial Application) is divided into three stations. It consists of a single master and two slaves that together control, display and sensing at condition monitoring of the induction motor in terms of following parameters.

1) Temperature of the running motor in degree Celsius.

2) Revolutions per Minute (R.P.M.) of the rotating shaft of the motor.

The system can work either manually or automatically. As a Manually controlled system continuously scans for all the above parameters and makes it available to user via a Display station (Slave2) and in interactive way. At control station (Master) based on the various parameter value a person which is at control station can take action and make connection to a Computer System via serial communication RS232 for data acquisition. As a automatic controlled system motor can be on or off according to setting of motor’s temperature.

2.1 Block Diagram

The block diagram for the complete system is shown in figure. As shown in figure 2.1 all the sensors are connected with the sensing station i.e. slave 1 and the sensing station is also connected with the display station i.e. slave 2 and control station i.e. master using bus controls transmitting and receiving of the data.

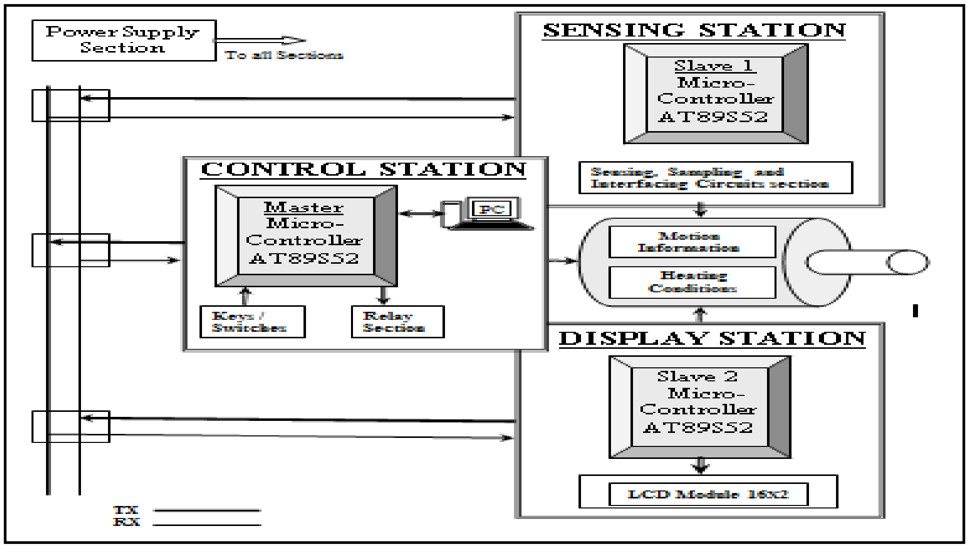

Figure 2.1 Block Diagram of Master/Slave communication.

As in the above system block diagram there are three stations: sensing, display and controlling station. The system can be used at any place where there is a need to know these parameters and /or to control any device or appliances based on it. Some of applications are as follows:

I. In Home, Offices, Complexes to automatically turn on or off appliances like Fan, Coolers, etc. according to temperature of motor.

II. In Industries, where various processes are carried out, and where there is need to make control on process temperature and R.P.M. conditions.

III. In Industries, where various processes are carried out, and where there is need to make control on process temperature and R.P.M. conditions.

IV. In Security devices to get protection against fire, over temperature, over load etc.

In remote station equipment's to continuously monitoring of temperature conditions.

III. RESULT AND DISSCUSION

3.1 **RESULT AND DISSCUSION**

In software implementation, all the test and sample codes have been tested and executed on AT89S52 and an algorithm has been developed.

All the sensors work well and we can monitor the Induction motor speed (R.P.M.) and Temperature data through the system. From experiment, the data was recorded in Table 3.1.

S. No.	Value of Parameter		$\% \text{ Error} = \frac{rpm_1 - rpm_2}{rpm_1} \times 100\%$
	Speed (rpm1) Measured by Tachometer	Speed (rpm2) Measured by System	
1	2947	2954	0.237
2	2950	2960	0.338
3	2952	2962	0.34
4	2953	2964	0.372
5	2953	2965	0.406
6	2952	2963	0.372
7	2954	2965	0.372
8	2953	2964	0.372
9	2953	2964	0.372
10	2952	2963	0.372

Table 3.1 Speed measured by Tachometer / System

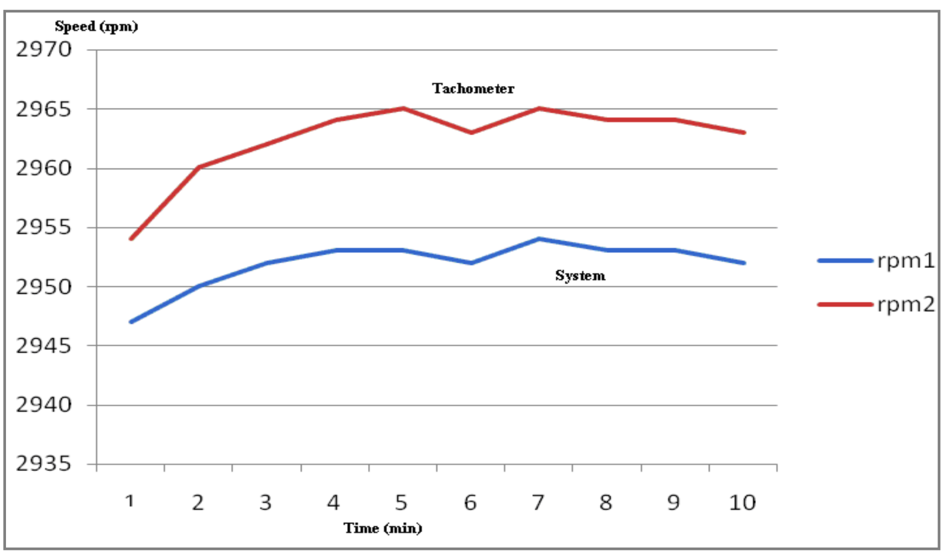

Figure 3.2 speed / time graph

The accuracy of the system can be checked by calculate its standard deviation, s for percentage of error by using Equation 3.1

$$s = \sqrt{\frac{\sum_i (x_i - \bar{x})^2}{n-1}}$$

S = 0.045 **(3.1)**

IV CONCLUSION

In this Paper, we investigated the performance of Master/Slave Communication using RS 232 In particular, we have analyzed the performance of all the sensors work well and we can monitor the Induction motor speed (R.P.M.) and temperature data through the system. The standard deviation percentage [S=0.045] of error is quite small, so it can be concluded that the reading of the system for speed measurement is quite reliable and communication was proper between controller.

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