IoT and CAN based Industrial Parameters Monitoring and Controlling

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Abstract - The work presented in this paper projected the design of an automated system which is sensor based for smart monitoring and controlling of industrial applications. Automated system helps in reducing the human efforts and provide better monitoring and controlling to reduce the faults in the system. In the present project, a new solution is adopted for the traditional monitoring and controls of Industrial applications through the implementation of Internet of things (IOT) and CAN bus. IOT is a network of devices connected via communication technologies to form systems that monitor, collect, exchange and analyze data [4]. In the industrial fields many parameters like temperature, humidity, light, fire, water level etc. needs to be monitor and control. For this purpose AVR controller interface with CAN. A Visual Basic application is included in the system which will be monitor and controla1ll the activities of the system in user controlled mode or system controlled mode.

Keywords **-** IOT, AVR Controller, CAN Bus, V.B. Software, ESP8266, SSR

I. INTRODUCTION

The industrial field monitoring requires more manual power to monitor and control the industrial parameters such as temperature, humidity, fire, water level, light etc. This is one of the most upcoming issues in the industrial sectors. If these parameters are not monitored and controlled properly, it leads to harmful situations. Many industries are facing these kinds of situation because of some manual mistakes. Andin that kind of harmful situations, again the manual power is required to control the parameters. Sometimes, if this control process not handled properly, it results in an occurrence of major accidents. With the implementation of upcoming technologies, it is very easy to overcome the greater issues in the industrial automation. In the industrial monitoring fields, the various sensors such as fire sensor, temperature sensor and light sensor are used for sensing the parameters and these sensed values are processed by the AVR microcontroller. The processed values are then displayed through V.B. on PC. Finally, with the help of CAN bus communication the overall industrial parameters are monitored through a single PC. The CAN bus communication is a wired communication and it is working under the priority of the message i.e., CAN is a message based protocol [2]. The speed of CAN controller MCP2515 is 1MbpS up to 420 meters and it will change with change or variation in length of system [3].

II. OBJECTIVE

The objective of this project is to design the monitoring and control system for industrial parameters by connecting sensor devices to AVR for detecting the errors and automatically correct the error using CAN bus communication and internet of things. This system helps in reducing the high manpower requirement in the industrial monitoring fields by monitoring the overall industrial parameters through a single PC (V.B.).

III. EXISTING SYSTEM

Olden methods, the industrial parameters are monitored through individual LCD displays. With the help of various sensors, the parameters are sensed and the values are processed by the controllers. Then, the processed values are displayed in the individual LCD displays which are connected to the controllers. But with existing system very few parameters can be monitored and controlled. Those parameters are controlled through Arm controller, PIC controller and Raspberry pi controller. For monitoring the parameters in different locations, the individual microcontrollers and LCD displays are required. In some systems parameters are just monitored through 16x2 LCD display, without controlling actions. The parameters have to be monitored continuously. If the sensed parameter value exceeds certain value at the instant of monitoring, the control process will be handled by the workers of the industry.

IV. PROPOSED SYSTEM

In this system, various sensors are connected to AVR microcontroller. The implementation of CAN bus protocol with AVR microcontroller and generated data monitored and controlled through V.B. software and which can be observed and controlled though IOT. This system helps to monitor and control overall parameters from single PC as well as from internet through IOT. This system reduces the high human power requirement for all this purpose and automatic control over all parameters through CAN bus save time as well. The industrial parameters are temperature, humidity, fire, water level or fuel level, light control by above systems. These five parameters are analog quantities.

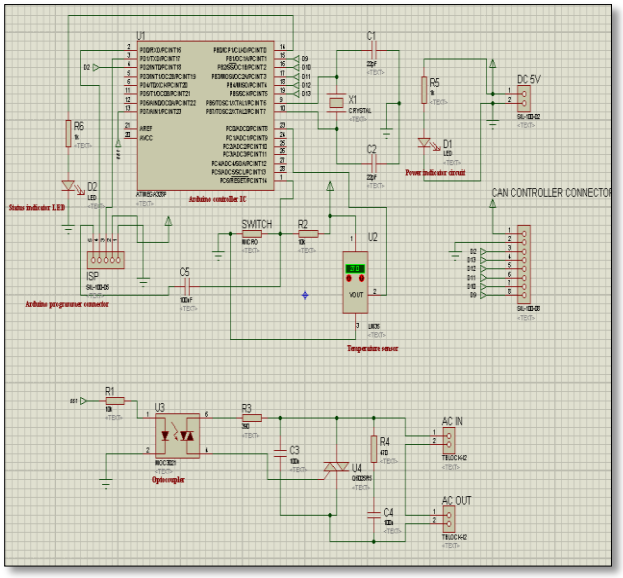

Figure 1: Proposed system block diagram

- **Specifications**

1. Microcontroller - ATmega328
2. Operating Voltage- 5V
3. Supply Voltage (recommended) - 7-12V
4. Maximum supply voltage (not recommended) - 20V
5. Digital I/O Pins - 14 (of which 6 provide PWM output)
6. Analog Input Pins - 6
7. DC Current per I/O Pin - 40 mA
8. DC Current for 3.3V Pin - 50 mA
9. Flash Memory - 32 KB (ATmega328) of which 0.5 KB used by bootloader
10. SRAM - 2 KB (ATmega328)
11. EEPROM - 1 KB (ATmega328)
12. Clock Speed - 16 MHz

The interfacing of CAN controller and AVR done with Proteus and Ares software. In this system on board 7 parameters are interfaced with each other. The parameters are CAN controller, MCP 2515, AVR, SSR (Solid State Relay) and TTL converter C.P., Sensor, ESP 8266(for IOT), P.C.(for V.B. software). The main advantage of this method is that all parameter interfacing is consists of on board programming. There is no need of removing the AVR IC for programming. Mainly we set one threshold value for each parameter, if the parameter value increases over the threshold or specified value then the value firstly sensed by AVR microcontrollers and controlling actions take place through SSR, and all system monitored and controlled though internet, and can show these on LCD display and visual basics software. The internet of things takes a look and control actions as well through IOT servers. The data is uploaded on internet through the Node MCU ESP8266. This is connected with internet through the WIFI and uploads these data on IOT server (thinkspeak.com). All parameters monitor and control in real time which makes the system even smarter.

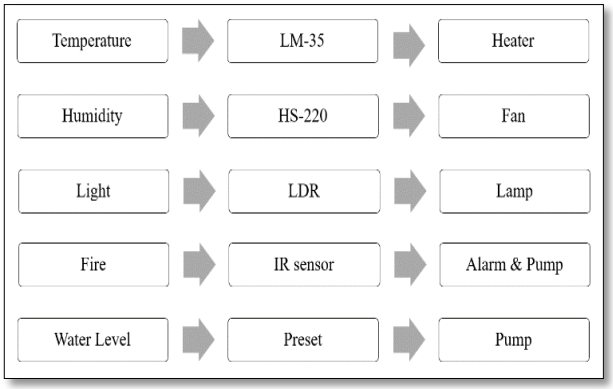

Figure 2: Proposed system block diagram

V. SOFTWARE USED

- Visual basics 6.0 Software
- Arduino IDE software
- Proteus and Ares software
- Internet of things

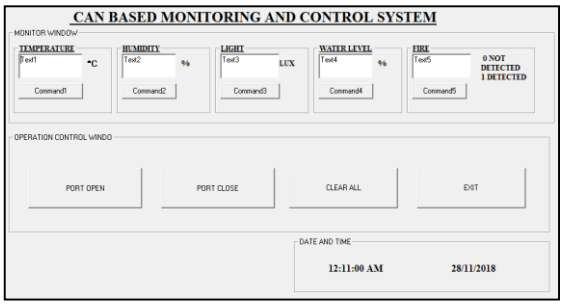

Figure 3: Visual Basic (V.B.) 6.0.

VI. OPERATION AND WORKING

The main purpose of this project is to monitoring and controls the industrial parameters using internet of things and CAN protocol interfacing with AVR microcontroller and V.B. software.

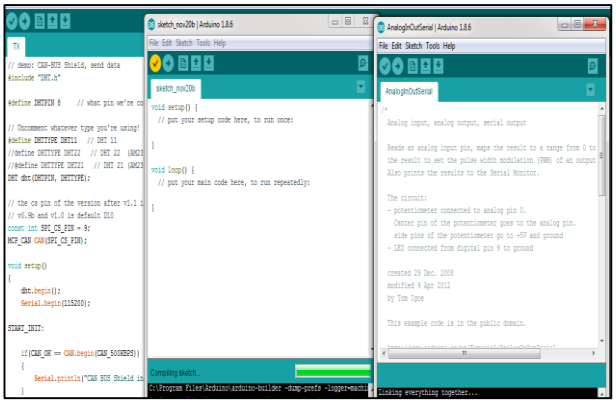

Figure 4: ARDUINO IDE Software

This project is used to reduce the human power with monitoring overall parameters through single PC an internet with help of CAN bus communication system and increase the safety in industries as well. After monitoring these parameters the controlling action takes place automatically

without help of human worker or manual operations. The operation of each sensor interfaced with separate AVR. Microcontroller and CAN controller as well. These CAN controllers' acts as slave controller and connected to the one master CAN controller. These CAN controllers give provision to controlling devices to communicate with each other, the CAN controller work on the priority base so it automatically make priority for control each parameter [3]. The maximum speed for this operation is 1MbpS. Then these data transmitted to the computer (V.B.) through RS232 cable and with help of ESP-8266 data transmitted to internet server so we can monitor and take controlling actions through the internet over anywhere [5].

Figure 5: Board for temperature sensor with CAN and AVR interfacing

Another thing is to take appropriate control action over the parameters and devices. The parameter senses the analog values, and then this value processed with help of the AVR microcontroller and same value displayed on the LCD. The main function is to set threshold value of a parameter.

- **Applications**

1. Xoscillo: open-source oscilloscope
2. Scientific equipment
3. Arduinome: A MIDI controller device that mimics the Monome
4. OBDuino: A trip computer that uses the on-board diagnostics interface in most modern cars
5. The Humane Reader and Humane PC from Humane Informatics: low-cost electronic devices with TV-out that can hold a five thousand book library (e.g. offline Wikipedia compilations) on a microSD card
6. Ardupilot: drone software / hardware
7. Arduino Phone

If the parameter value increases from threshold value or set value then several devices take action on it with the help of AVR microcontroller. For example, if the temperature decreases to 45ºC and the set threshold point is 50ºC then the heater will turn on and making that temperature above 50ºC. This same system applied for all equipment. For humidity sensor water sprayers are there, for light sensor light intensity controllers are there, for fire control water sprinklers are there, for water level indicator level indicators and pump controller are there. This controlling action takes place from visual basics software from the PC which having user control mode and automatic control mode (system control) and from internet of things server as well. The generated data linked with the server through ESP-8266 module and data showed in the form of graph system. With the help of this monitoring and controlling the industrial parameters the manual mistakes made by the workers can be avoided. Therefore the workers in industry will work on the safe zone. And the big control room concept will be avoided by using CAN communication protocol and industrial internet of things and visual basics. Since CAN bus is wired network so its use in limited areas but with help of IOT we increased its area of operation and control. The industrial database and servers have to be in safe zone for avoiding its misuse.

VII. CONCLUSION

As a conclusion, the objective of this system to monitoring and controlling the temperature, humidity, light, fire and water level in several locations through a single Personal Computer can be possible with the help of various sensors, AVR microcontrollers, by the application of CAN bus communication, Visual Basics and IOT. The proposed methodology also eliminates the concept of huge control room, complicated wired network required for monitoring and controlling above parameters. This system also provides automatic control over the parameters increases safe value, so the harmful situation can be avoided through this project.

VIII. REFERENCES

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