Stabilized Control in Micro Chips using Scada System Techniques

Md Nihal Farhan1*, S. Nivash1, A. Monisha1 and A. Manjusha Chandran2

1Department of Electronics and Communication Engineering
SRM University, Chennai – 603203, Tamil Nadu, India; farhan.nihal@gmail.com, nivashs09@gmail.com, nimo8584@gmail.com

2Department of Computer Science Engineering, Rajalakshmi Engineering College, Chennai - 602105, Tamil Nadu; India; monypblr@yahoo.co.in

Abstract

Background/Objectives: SCADA is a technology which helps in Controlling and Data Acquisition in any machine which is compatible with it. SCADA is established in Mining, Shearer machines and lot more. The objective of this paper is to bring down SCADA systems in Application to Electronic devices which a common man use in a daily life.

Methods/Statistical Analysis: The method used here is a circuit breaker. This circuit breaker is equipped with the sensors used to monitor the environment of the working device, when anything reached critical, the circuit breakers activate the countermeasure to cut off the device. Typical example is that the IC can handle up to 5v to 9v input current, when exceeded, the IC is damaged.

Findings: one of the finding mentions here is the telephone network goes down and fail to work when a component of it stops working. To avoid this problem, SCADA system is installed in the circuit. When the temperature hits the threshold, it cuts the power to the circuit and initiates the backup circuit. This technology can also be implemented with Mobile devices where the battery is cutoff when there is critical point in which the battery will explode. To avoid this problem, we establish this system in the mobile phone which does the same principle work of cutting the circuit when the battery bulges or about to explode.

Applications/Improvements: We can improve this technology to use in IT industry with reliable Integrated Circuits and super computers which can handle BIG DATA speeds and which are compatible with all the Programming languages.

Keywords: Microchip, RF Frequencies, Sensors, SCADA, Stabilized Control

1. Introduction to SCADA

Supervisory control and Data Acquisition, were used in Electric and Mechanical Utility power control systems for over sixty years. Each had separate beginnings and went through various evolution cycles before implementation, and finally came together with Network Analysis and other functions to become computer based Energy Management systems. In SCADA, a supervisor can monitor any equipment fitted with this system. The main feature of this system is that we can operate and device from all around the world. This is done using a network which is operated on physical and data link layer of OSI layers.

2. History of Work in Related Field

SCADA system is also being used in Coal Mines for the detection of explosive atmosphere to prevent the catastrophe by using the wireless detection system. The use of this system eliminated the manual human work and prevent the possible human error. SCADA system is installed in many operators which work for the control of Shearer, Pump load system control, cooling water pumps. This System guides the Shearer to control the level of mining by stabilizing the work load and by balancing the forward approach. If we replicate the use of the system in our day today electronic devices, the configuration of the system.
can be made as given in Figure 1 shown at the lower level as the Block Diagram of SCADA Network.

It can be inferred from the above that the system can be established in electronic devices which we use in our daily life and the functionality of our devices can be made safer with optimum performance outcomes.

3. Proposed System Working

Before the invention of SCADA, the life time of the devices was very less due to excess heat loss and lot more physical conditions which a human cannot detect it by engineering. With the use the SCADA technology, the monitoring of the devices started which leads to proper maintenance of the equipment and energy saving. This system can monitor the systems which a normal human cannot. This system was first introduced in sports cars and vehicles by Lamborghini in early 1990’s. This system is set up along with the car’s hydraulics to monitor the raising heat in the system when the engine is working. This system has temperature and pressure sensors installed in it. Any rise in temperature is detected by the temperature sensor and this cause the hydraulics liquid’s pressure to change, which will be detected by the pressure sensor and the necessary counter measures will be activated by the system with a warning and if ignored, the system will shut down the engine power supply.

The latest breakthrough of the SCADA system is to apply it in electrical equipment using smart electronic circuitry. We know that lot of our generated power goes waste and according to statistics the power wasted by our country per week can light Singapore for a day. This has to be rectified to increase our performance and to save the resource and energy. Most of the power is lost at the power generation unit due to excess heat of the equipment or the loss can be occurred in the transmission line. If this problem is rectified, then lot of money and energy will be saved. With the knowledge of all the latest technology, the SCADA is the best option to avoid such problems just by installing the SCADA system circuit on the power line network. The electronic circuit of the SCADA system is as given in Figure 2 shown at the lower level as Proposed System with SCADA.

4. Features of the Proposed System

The features in SCADA
- Flexible and open architecture
- Multiple medium interface
- Alarm Handling and Trending
- Access Control
- Automation
- Logging, storing, Report Generation
- Network Security

SCADA is very flexible as it can be interfaced with any working device and is used to set up a monitoring unit and also a control unit and it’s a multiple medium interfacing unit where lot of devices can be interfaced and
monitored. The main advantage in multiple interfacing is to perform automation of the appliances. The additional features like alarm handling and trending is used to warn the supervisor about the faults that happen during the operation of the machine. The access control mechanism provides one to access the system from any corner of the world with high security providing the easy way to control the equipment and stop or start the system from any part of the world. The next feature SCADA provides is automation in which the devices will be interfaced with sensors like temperature, pressure, motion sensors to perform the set of preprogrammed operations.

SCADA provides hi security over the network. It uses the coded signals like Manchester coding to interface the devices to the network. The data which is sent on to the network is encrypted and any active or passive attack do not stand a chance to steal the data.

5. Hardware and Working

It consists of microcontroller, power supply, relay drivers and relays and programmable logic controllers, A to D converters, heater element RS 232 (serial communication), and DB 9 cable to connect to the computer. The software used here is DAQ software along with R studio to implement the monitoring and controlling of the systems. 8051 micro controller with 8bit memory are used. Relays are the switches which make or break the circuit and plays an important role for cut off the circuit when the temperature goes high. The main component of the circuit is PLC (Programmable Logic Circuit) which is programmed using Kiel u-vision 5 software to perform the functions of alarming when the threshold is reached. The circuit is equipped with analog to digital converter which is used to convert the analog data into digital data and sent the information over the digital network. RS232 is a serial communication chip, the functioning of this chip is to convert the data from/to the network into the language understood by the connected component. This device is connected to the pc and circuit which operates on the different set of languages and interfaces both the devices in a compatible way so as to make both work with a common language/software. The heater is a heat sensor used to detect the change in heat. DB 9 connector is a cable to connect the circuit and the computer. The software sets highest, middle and low threshold points and when the highest point reaches, the circuit cut off itself to protect the entire appliance. The circuit diagram and the DB 9 connector of the proposed system is as given in Figure 3, 4 shown at the lower level as Circuit diagram of proposed system, DB 9 connector.

Figure 3. Circuit diagram of the proposed system

Figure 4. DB 9 connector.

It has 9 pins out of which 3 is connected to the transmitter and 2 is connected to the receiver. Here computer is the receiver and circuit is the transmitter.

This circuit can be used widely in both electrical and electronic devices to control and monitor many circuits. The use of this SCADA provides us with many new circuits which can be implemented to protect the circuit from being damaged.
6. Discussion

1. The telephone network goes down and fail to work when a component of it stops working. Let it be an integrated chip. To avoid this problem, SCADA system is installed in the circuit. This system will now monitor the temperature of all the integrated circuits and if there is a drastic change in the temperature or if the IC is given the power more than that of its threshold, then the system detects and switches the alternate IC and stops the power supply to the given effected Integrated Circuit to protect the circuit from being damaged. The example can be set for the above as given in Figure 5 shown at the lower level as Integrated Circuit with SCADA

2. Another application of SCADA in electronics is to protect our mobile phones from being damaged due to excess charge and also to prevent the phone from being exploded due to the excess pressure which is applied on the mother board of the phone while charging. SCADA system in such an application is done through wireless technology. This wireless technology is operated on the RF range of frequencies. The work of this chip is to detect the variation in the load applied on the motherboard when the mobile is in charging mode and discharging mode. The chip is connected along with the GSM module to work at RF frequencies. When the pressure sensor detects the variation in pressure, it sends the information to the system in which SCADA is established via a transmitter and SCADA network is provided with a receiver to read the signal’s information sent by the SCADA chip. When the signal indicates warning of the possible explosion, the SCADA system transmit the counter measures to the mobile device with a SCADA chip to warn the user about the increase in pressure. If the user still continues to use the mobile while charging, this system sends a code with programmed signals to the chip and the chip switches off the mobile. This prevents the circuit to explode. The same system can be established in laptops and other electronic devices to prevent the excess heat loss and to increase the battery life of the electronic equipment and the example of the above can be set as given in Figure 6 shown at the lower level as Laptop Interior

3. Advantages
   - Less transmission losses
   - Monitor and control of electrical appliances from any part of the world
   - Safe and efficient electronics
   - High security
   - Easy to operate and user friendly

4. Disadvantages
   - None of the DC systems are compatible to each other i.e. interfacing is difficult.
   - Where there is safety, the cost goes high.
   - Complex design of the wireless card and network.
7. Conclusion

The application and the use of SCADA provides a better and a safer use of electronic devices and the smart technology provides automation of home and any electronic device in remote industry. The future of this SCADA system is about to bring a revolutionary change in the use of electrical and electronics devices.

8. Acknowledgements

I express my grateful thanks to my guide Mr. S. Nivash, Assistant Professor, SRM University, Chennai. The authors wish to thank the SRM University’s Electronics and Communication department and the department of Computer Science Engineering of RajaLakshmi College of Engineering for providing this opportunity.

9. References

1. Gaushel DJ, Darlington HT. Supervisory Control and data Acquisitions. The Proceedings of IEEE. 1987; 75(12):1645–58.
2. Acero AR, Cano AM, Jimenez Builes JA. SCADA System for Detection of the Explosive Atmosphere in Underground Coal Mines through Wireless Sensor Network. IEEE Latin American transactions. 2014; 12 (8):1398–403.
3. Culaja S, Atlagic B, Sagi M, Bogovac B, Milinkov D. Way towards Efficiency of SCADA Infrastructure. 2012 IEEE 19th International Conference and Workshops on Engineering of Computer Based Systems, (ECBS), Novi Sad, Serbia, 2012. p. 74–81.
4. Moon AH, Iqbal U, Bhat GM. Secured Data Acquisition System for Smart Water Applications using WSN. Indian Journal of Science and Technology. 2016 Mar; 9(10):1–11.
5. Sastry JKR, Ganesh JV, Bhanu JS. I2C Based Networking for Implementing Heterogeneous Microcontroller based Distributed Embedded Systems. Indian Journal of Science and Technology. 2015 Jul; 8(15):1–10.
6. Al-Mamun A, Ahmed N, Ahamed NU, Rahman SAMM, Ahmad B, Sundaraj K. Use of Wireless Sensor and Microcontroller to Develop Water-level Monitoring System. Indian Journal of Science and Technology. 2014 Jan; 7(9):1321–26.
7. Kavitha KVN, Chaurasia S. Mobile-Microcontroller based Wireless Communication for the Control of Appliances Integrated with their Automation. Indian Journal of Science and Technology. 2014 Apr, 7(S4):86–91.