

Microcontroller Based Substation Monitoring and Control System with Gsm Modem

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Abstract : *The purpose of this project is to acquire the remote electrical parameters like Voltage, Current and Frequency and send these real time values over GSM network using GSM Modem/phone along with temperature at power station. This project is also designed to protect the electrical circuitry by operating an Electromagnetic Relay. This Relay gets activated whenever the electrical parameters exceed the predefined values. The Relay can be used to operate a Circuit Breaker to switch off the main electrical supply.*

User can send commands in the form of SMS messages to read the remote electrical parameters. This system also can automatically send the real time electrical parameters periodically (based on time settings) in the form of SMS. This system can be designed to send SMS alerts whenever the Circuit Breaker trips or whenever the Voltage or Current exceeds the predefined limits.

This project makes use of an onboard computer which is commonly termed as microcontroller. This onboard computer can efficiently communicate with the different sensors being used. The controller is provided with some internal memory to hold the code. This memory is used to dump some set of assembly instructions into the controller. And the functioning of the controller is dependent on these assembly instructions. The controller is programmed using Embedded C language.

Keyword: *GSM Modem, Initialization of ADC module of microcontroller, PIC-C compiler for Embedded C programming, PIC kit 2 programmer for dumping code into Micro controller, Express SCH for Circuit design, Proteus for hardware simulation.*

I. Introduction

Electricity is an extremely handy and useful form of energy. It plays an ever growing role in our modern industrialized society. The electrical power systems are highly non-linear, extremely huge and complex networks [1]. Such electric power systems are unified for economical benefits, increased reliability and operational advantages. They are one of the most significant elements of both national and global infrastructure, and when these systems collapse it leads to major direct and indirect impacts on the economy and national security [2]. A power system consists of components such as generators, lines, transformers, loads, switches and compensators. However, a widely dispersed power sources and loads are the general configuration of modern power systems [3]. Electric power systems can be divided into two sub-systems, namely, transmission systems and distribution systems. The main process of a transmission system is to transfer electric power from electric generators to customer area, whereas a distribution system provides an ultimate link between high voltage transmission systems and consumer services. In other words, the power is distributed to different customers from the distribution system through feeders, distributors and service mains. Supplying electricity to consumers necessitates power generation, transmission, and distribution [4]. Initially electric power is generated by using electric generators such as: nuclear power generators, thermal power generators and hydraulic power generators and then transmitted through transmission systems using high voltage. Power departs from the generator and enters into a transmission substation, where huge transformers convert the generator's voltage to extremely high voltages (155kV to 765 kV) for long-distance (up to about 300 miles) transmission [4]. Then, the voltage level is reduced using transformers and power is transferred to customers through electric power distribution systems. Power starts from the transmission grid at distribution substations where the voltage is stepped-down (typically to less than 10kV) and carried by smaller distribution lines to supply commercial, residential, and industrial users [4]. Novel electric power systems encompassing of power transmission and distribution grids consist of copious number of distributed, autonomously managed, capital-intensive assets. Such assets comprise: 1.) power plants, 2.) transmission lines, 3.) transformers, and 4.) protection equipment [1].

Electric utility substations are used in both the transmission and distribution system and operate independently to generate the electricity. A typical substation facility consists of a small building with a fenced-in yard that contains transformers, switches, voltage regulators, and metering equipment that are used to adjust voltages and monitor circuits [4]. A reliable and efficient process of these networks alone is not very significant when these electricity systems are pressed to their parameters of its performance, but also under regular operating conditions. Generators and loads are some components that coerce the continuous dynamic behavior [5].

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Luo Qi



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Smart Grids for Smart Cities, Volume 2 O. V. Gnana Swathika, K. Karthikeyan, Sanjeevikumar Padmanaban, 2023-06-06
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conference will be as successful and stimulating as indicated by the contributions presented in this volume Dr S Kannadhasan **IoT and Analytics in Renewable Energy Systems (Volume 2)** O.V. Gnana Swathika, K. Karthikeyan, Sanjeevikumar Padmanaban, 2023-08-11 Smart cities emanate from a smart renewable energy aided power grid The smart grid technologies offer an array of benefits like reliability availability and resiliency Smart grids phenomenally contribute to facilitating cities reaching those sustainability goals over time Digital technologies such as the Internet of Things IoT automation artificial intelligence AI and machine learning ML significantly contribute to the two way communication between utilities and customers in smart cities Five salient features of this book are as follows Smart grid to the smart customer Intelligent computing for smart grid applications Novel designs of IoT systems such as smart healthcare smart transportation smart home smart agriculture smart manufacturing smart grid smart education smart government smart traffic management systems Innovations in using IoT and AI in improving resilience of smart energy infrastructure Challenges and future research directions of smart city applications ICAE 2022 Prasaja Wikanta, Alena Uperati, Abdurahman Dwijotomo, 2023-06-28 This is proceeding for the 5th International Conference on Applied Engineering ICAE 2022 held online in Batam Indonesia on 5 October 2022 ICAE is an annual conference organized by Politeknik Negeri Batam This year ICAE was structured in 3 tracks namely Electronics Informatics and Mechanicals ICAE received 64 papers in various topics including Control Systems and Mechanical Engineering Applied Mechanics and Control Systems Computational Mechanics and Microelectronic Circuits and Systems Micro Electro Mechanical System RFID and Electronics Design Electronics materials Sensor Networks Fuzzy Systems AI and Expert Systems Virtual Reality Augmented Reality Architecture and Topology Geo Information GIS and Remote Sensing Multimedia Content IoT Semiconductor technology IoT Devices and other related fields All submission were peer reviewed with at least 3 reviewers provided for each paper A total of 37 selected which is around 58% acceptance rate We express gratitude to all who contributed to the success of ICAE 2022 We acknowledge the invaluable assistance of the track chairs and the track program committee members It required the significant efforts of many people to make this virtual conference possible especially in this time of COVID 19 pandemic We thank the Organizing Committee members along with the numerous reviewers for their assistance with the reviews of the submitted manuscripts These reviewers serve to bring a broad set of perspectives to the research arena We especially thank the authors who have provided the submitted manuscripts The quality of these papers is a tribute to the authors and also to the reviewers who have guided any necessary improvement Last but not least we are greatly indebted to the three keynote speakers Prof Yusep Rosmansyah S T M Sc Ph D from Information Technology Research Division KKI School of Electrical Engineering and Informatics STEI Institut Teknologi Bandung ITB Indonesia Dr Hj Mohammad Nabil Almunawar Associate Professor School of Business and Economics Universiti Brunei Darussalam Ashwani Singh PhD Global R for delivering the keynote speeches in this conference We hope this ICAE proceeding will have impact to the research community in the longer

term **Microcomputer Applications** ,1990 **Science Abstracts** ,1995 *Information and Automation* Luo Qi,2011-04-15 This book constitutes the refereed proceedings of the International Symposium on Information and Automation ISIA 2010 held in Guangzhou China in November 2010 The 110 revised full papers presented were carefully reviewed and selected from numerous submissions The symposium provides a forum for researchers educators engineers and government officials to present and discuss their latest research results and exchange views on the future research directions in the general areas of Information and Automation Electrical & Electronics Abstracts ,1997 **Proceedings of the 21st International Conference on Power Industry Computer Applications** IEEE Power Engineering Society,ABB Asea Brown Boveri Ltd,1999 IEEE Catalog Number 99CH36351 verso of T p Conference Proceedings ,1999 Index to IEEE Publications Institute of Electrical and Electronics Engineers,1998 Issues for 1973 cover the entire IEEE technical literature Microcontroller-Based Temperature Monitoring and Control Dogan Ibrahim,2002-10-08 Provides practical guidance and essential theory making it ideal for engineers facing a design challenge or students devising a project Includes real world design guides for implementing a microcontroller based control systems Requires only basic mathematical and engineering background as the use of microcontrollers is introduced from first principles Engineers involved in the use of microcontrollers in measurement and control systems will find this book an essential practical guide providing design principles and application case studies backed up with sufficient control theory and electronics to develop their own systems It will also prove invaluable for students and experimenters seeking real world project work involving the use of a microcontroller Unlike the many introductory books on microcontrollers Dogan Ibrahim has used his engineering experience to write a book based on real world applications A basic mathematical and engineering background is assumed but the use of microcontrollers is introduced from first principles Microcontroller Based Temperature Monitoring and Control is an essential and practical guide for all engineers involved in the use of microcontrollers in measurement and control systems The book provides design principles and application case studies backed up with sufficient control theory and electronics to develop your own systems It will also prove invaluable for students and experimenters seeking real world project work involving the use of a microcontroller Techniques for the application of microcontroller based control systems are backed up with the basic theory and mathematics used in these designs and various digital control techniques are discussed with reference to digital sample theory The first part of the book covers temperature sensors and their use in measurement and includes the latest non invasive and digital sensor types The second part covers sampling procedures control systems and the application of digital control algorithms using a microcontroller The final chapter describes a complete microcontroller based temperature control system including a full software listing for the programming of the controller *Conference Proceedings* IEEE Power Engineering Society. General Meeting,2003 *Electrical World* ,1994 **Fourth International Conference on Advances in Power System Control, Operation & Management, 11-13 November 1997** ,1997

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
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