

PLC based Home Automation System

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Abstract— Programmable Logic Controller (PLC) is utilized extensively for automation of electromechanical processes. In this study, a home automation system is designed using PLC. The proposed control module will consist of software simulation and hardware implementation. The control module provides multiple components fault detection, tolerance and switch on or off in critical areas. The system is easy to build, service, modify and it provides reliable communication of home automation with reduced cost. In this paper, we propose the idea of designing a smart home with optimized energy consumption. The system is programmable to meet demands, adding different home appliances in short time by optimizing the entire hardware assembly and software algorithms. The PLC is easy to understand and the system provides multiple solutions by using a single component. Although new but more efficient than previous systems, the PLC can become the epicenter to many new applications. Once the system is designed and implemented; the only cost is that of maintenance. It is also possible to combine PLC model with other devices such as GSM. Such kind of an application will be extremely beneficial for the aged and disabled people by offering voice control and safety items.

Keywords— Programmable Logic Controller, Fault detection, Software Algorithms, GSM.

I. INTRODUCTION

PLC can help in achieving complete automation e.g. an air conditioning system can be switched on before the owner reaches his home especially in summer. A PLC based security system will detect smoke, excessive electrical power usage, burglar attempts and unauthorized movements in the house and send alert messages. This is the idea behind designing home automation system using PLC and there is no end to its applications. Advanced and more reliable PLCs are now being developed that can maintain a record of household items, record their usage through RFID (Radio Frequency Identification), automatically order replacements etc. Home automation is a key term when we refer a smart home, a home that can detect and distinguish, automatically adjust the lighting as per user's requirement, open doors automatically when combined with proper sensors, switch on the security lights at night and switch them off in morning without any interference in the user's schedule, heat water for bathing and tea making, accessing anywhere in the world via internet, a live video of what is happening in your surroundings [1]. This is possible via one centrally controlled system. Nowadays, it has become essential to have an automated home which can range from remote, set burglar alarm and hi-tech security gates.

II. LITERATURE SURVEY

Various home automation systems have been designed and the system coding depends on number of applications to be controlled. The reason for its tremendous growth has been attributed to various informal research and designs. The types of home automation systems based on their control systems are:

A. Individual Control System-

This type of control system is considered to be the predecessor of modern day control systems. Here each device like heater or air conditioner will have an independent control dedicated to it. Following are the various individual control systems:

- Wired remote controller
- High-spec wired remote controller
- Timer remote controller
- Wireless remote controller
- Simplified remote controller
- Remote sensor

B. Distributed Control System-

A distributed control system is a type of control system. In this, the control systems are distributed throughout the system, but there is a central operator supervisory control. The main feature of this type of system is emergency shut-down. This system can be pre-set or the control parameters of several similar devices can be varied as per requirement. For example, controlling the thermostats of several air conditioners and their ON/OFF timings [3].

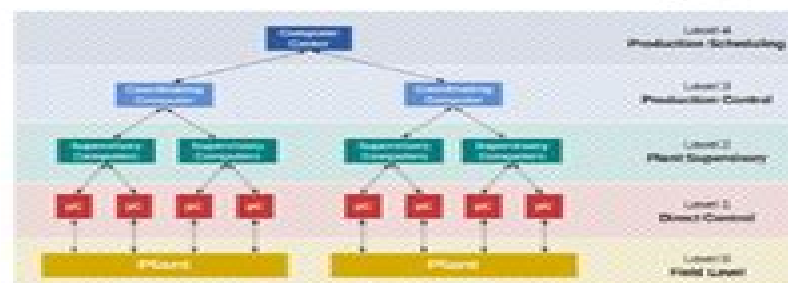


Figure 1: Distributed control system (Source: Wikipedia)

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Power Line Communications Lutz Lampe, Andrea M. Tonello, Theo G. Swart, 2016-04-14 This second edition of *Power Line Communications* will show some adjustments in content including new material on PLC for home and industry PLC for multimedia PLC for smart grid and PLC for vehicles Additional chapters include coverage of Channel Characterization Electromagnetic Compatibility Coupling and Digital Transmission Techniques This book will provide the reader with a wide coverage of the major developments within the field With contributions from some of the most active researchers on PLC the book brings together a wealth of international experts on specific PLC topics [Absolute Beginner's Guide to Home](#)

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(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 **Visible Light**

Communications Zabih Ghassemlooy, Luis Nero Alves, Stanislav Zvanovec, Mohammad-Ali Khalighi, 2017-06-26 Visible Light Communications written by leading researchers provides a comprehensive overview of theory stimulation design implementation and applications The book is divided into two parts the first devoted to the underlying theoretical concepts of the VLC and the second part covers VLC applications Visible Light Communications is an emerging topic with multiple functionalities including data communication indoor localization 5G wireless communication networks security and small cell optimization This concise book will be of valuable interest from beginners to researchers in the field **FiWi Access**

Networks Martin Maier, Navid Ghazisaidi, 2011-12-15 The evolution of broadband access networks toward bimodal fiber

wireless FiWi access networks described in this book may be viewed as the endgame of broadband access After discussing the economic impact of broadband access and current worldwide deployment statistics all the major legacy wireline and wireless broadband access technologies are reviewed State of the art GPON and EPON fiber access networks are described including their migration to next generation systems such as OCDMA and OFDMA PONs The latest developments of wireless access networks are covered including VHT WLAN Gigabit WiMAX LTE and WMN The advantages of FiWi access networks are demonstrated by applying powerful network coding heterogeneous optical and wireless protection hierarchical frame aggregation hybrid routing and QoS continuity techniques across the optical wireless interface The book is an essential reference for anyone working on optical fiber access networks wireless access networks or converged FiWi systems

Intelligent Computing Kohei Arai, 2023-08-19 This book is a collection of extremely well articulated insightful and unique state of the art papers presented at the Computing Conference which took place in London on June 22-23, 2023 A total of 539 papers were received out of which 193 were selected for presenting after double blind peer review The book covers a wide range of scientific topics including IoT Artificial Intelligence Computing Data Science Networking Data security and Privacy etc The conference was successful in reaping the advantages of both online and offline modes The goal of this conference is to give a platform to researchers with fundamental contributions and to be a premier venue for academic and industry practitioners to share new ideas and development experiences We hope that readers find this book interesting and valuable We also expect that the conference and its publications will be a trigger for further related research and technology improvements in this important subject

IMDC-SDSP 2020 Raed Abd-Alhameed, Rana Zubo, Obed Ali, 2020-09-09 IMDC SDSP conference offers an exceptional platform and opportunity for practitioners industry experts technocrats academics information scientists innovators postgraduate students and research scholars to share their experiences for the advancement of knowledge and obtain critical feedback on their work The timing of this conference coincides with the rise of Big Data Artificial Intelligence powered applications Cognitive Communications Green Energy Adaptive Control and Mobile Robotics towards maintaining the Sustainable Development and Smart Planning and management of the future technologies It is aimed at the knowledge generated from the integration of the different data sources related to a number of active real time applications in supporting the smart planning and enhance and sustain a healthy environment The conference also covers the rise of the digital health well being home care and patient centred era for the benefit of patients and healthcare providers in addition to how supporting the development of a platform of smart Dynamic Health Systems and self management

Smart Technologies: Breakthroughs in Research and Practice Management Association, Information Resources, 2017-06-19 Ongoing advancements in modern technology have led to significant developments with smart technologies With the numerous applications available it becomes imperative to conduct research and make further progress in this field Smart Technologies Breakthroughs in Research and Practice provides comprehensive and interdisciplinary

research on the most emerging areas of information science and technology Including innovative studies on image and speech recognition human computer interface and wireless technologies this multi volume book is an ideal source for researchers academicians practitioners and students interested in advanced technological applications and developments

International Conference on Computer Networks and Communication Technologies S. Smys,Robert Bestak,Joy Long-Zong Chen,Ivan Kotuliak,2018-09-17 The book features research papers presented at the International Conference on Computer Networks and Inventive Communication Technologies ICCNCT 2018 offering significant contributions from researchers and practitioners in academia and industry The topics covered include computer networks network protocols and wireless networks data communication technologies and network security Covering the main core and specialized issues in the areas of next generation wireless network design control and management as well as in the areas of protection assurance and trust in information security practices these proceedings are a valuable resource for researchers instructors students scientists engineers managers and industry practitioners

Guide to Computing Fundamentals in Cyber-Physical Systems

Dietmar P.F. Möller,2016-04-14 This book presents an in depth review of the state of the art of cyber physical systems CPS and their applications Relevant case studies are also provided to help the reader to master the interdisciplinary material Features includes self test exercises in each chapter together with a glossary offers a variety of teaching support materials at an associated website including a comprehensive set of slides and lecture videos presents a brief overview of the study of systems and embedded computing systems before defining CPS introduces the concepts of the Internet of Things and ubiquitous or pervasive computing reviews the design challenges of CPS and their impact on systems and software engineering describes the ideas behind Industry 4 0 and the revolutions in digital manufacturing including smart and agile manufacturing as well as cybersecurity in manufacturing considers the social impact of the changes in skills required by the globalized digital work environment of the future

Management and Applications of Complex Systems G. Rzevski,S.

Syngellakis,2019-03-19 Composed of selected research papers this book brings together new developments and processes for managing complexity The included works originate from renowned complexity thinkers well established practitioners and new researchers in the area of complexity and detail issues of common interest

Human Centred Intelligent Systems

Alfred Zimmermann,Robert J. Howlett,Lakhmi C. Jain,2020-05-29 This book highlights new trends and challenges in intelligent systems which play an important part in the digital transformation of many areas of science and practice It includes papers offering a deeper understanding of the human centred perspective on artificial intelligence of intelligent value co creation ethics value oriented digital models transparency and intelligent digital architectures and engineering to support digital services and intelligent systems the transformation of structures in digital businesses and intelligent systems based on human practices as well as the study of interaction and the co adaptation of humans and systems All papers were originally presented at the International KES Conference on Human Centred Intelligent Systems 2020 KES HCIS 2020 held

on June 17 19 2020 in Split Croatia Home Automation and Wiring James Gerhart,1999 Home automation creates the ability to control everyday home systems through one electronic source The home of the 21st century will be fully automated This book sets out to give builders and contractors the information they need to plan and install new systems and repair existing ones

IoT and Analytics for Sensor Networks Padmalaya Nayak,Souvik Pal,Sheng-Lung Peng,2021-09-11 This book includes high quality research papers presented at the 1st International Conference on Wireless Sensor Networks Ubiquitous Computing and Applications ICWSNUCA 2021 which is held at Gokaraju Rangaraju Institute of Engineering and Technology Hyderabad India during 26 27 February 2021 This volume focuses on the applications use cases architectures deployments and recent advances of wireless sensor networks as well as ubiquitous computing Different research topics are illustrated in this book like wireless sensor networks for the Internet of Things IoT applications for eHealth smart cities architectures for WSNs and IoT WSNs hardware and new devices low power wireless technologies wireless ad hoc sensor networks routing and data transfer in WSNs multicast communication in WSNs security management in WSNs and in IoT systems and power consumption optimization in WSNs

Proceedings of the 2nd International Conference on Intelligent Technologies and Engineering Systems (ICITES2013) Jengnan Juang,Cheng-Yi Chen,Cheng-Fu Yang,2014-04-18 This book includes the original peer reviewed research papers from the conference Proceedings of the 2nd International Conference on Intelligent Technologies and Engineering Systems ICITES2013 which took place on December 12 14 2013 at Cheng Shiu University in Kaohsiung Taiwan Topics covered include laser technology wireless and mobile networking lean and agile manufacturing speech processing microwave dielectrics intelligent circuits and systems 3D graphics communications and structure dynamics and control

Broadband Powerline Communications Halid Hrasnica,Abdelfatteh Haidine,Ralf Lehnert,2005-01-14 Broadband Powerline Communications Network Design covers the applications of broadband PLC systems in low voltage supply networks a promising candidate for the realization of cost effective solutions for last mile communications networks There are many activities surrounding the development and application of PLC technology in the access area particularly because of strong interest of new network providers after the deregulation of telecommunications market Nowadays there are no existing standards for broadband PLC networks which use a frequency range up to 30 MHz This book includes relevant and timely information regarding broadband PLC systems and especially PLC access networks and contributions to the design aspects of broadband PLC access systems and their network components This book Offers explanations on how broadband PLC networks are realized what the important characteristics for the transmission on electrical power grids are and which implementation solutions have been recently considered for the realization of broadband PLC systems Considers various system realizations disturbance scenarios and their impact the transmission in PLC networks electro magnetic compatibility applied modulation schemes coding and error handling methods Pays particular attention to the specifics of the PLC MAC layer and its protocols as well as the modelling and performance evaluation of

broadband PLC networks **Transforming Tomorrow: Innovative Solutions and Global Trends in Electrical and Electronics Engineering** Namit Gupta, Anjali Gupta, Naresh Purohit, Shiraz Husain, 2025-06-03 The International Conference on Transforming Tomorrow Innovative Solutions and Global Trends in Electrical and Electronics Engineering Pragyata 2025 is scheduled to be held on May 5-6, 2025 at Shri Vaishnav Vidyapeeth Vishwavidyalaya Indore Madhya Pradesh India. This prestigious event aims to provide a dynamic platform for researchers, academicians, industry professionals, and students to exchange knowledge, showcase cutting-edge innovations, and discuss global trends shaping the future of Electrical and Electronics Engineering. Pragyata 2025 will feature sessions and presentations on key emerging areas including Robotics, Renewable Energy, Smart Grids, Mechatronics, 5G Communications, Artificial Intelligence, and the Internet of Things (IoT). The conference is designed to foster meaningful dialogue, cross-disciplinary collaboration, and engagement with leading experts from academia and industry. In line with its theme of Transforming Tomorrow, the conference emphasizes clarity, innovation, and sustainable development. It will serve as a catalyst for forward-looking discussions and solutions that address modern engineering challenges and contribute to building a smarter, greener, and more connected world. With a commitment to being Concise, Clear, and Cohesive, Pragyata 2025 is set to become a significant academic and professional milestone in advancing technological progress and inspiring future innovation across the Electrical and Electronics Engineering spectrum.

Intelligent Computing and Information and Communication Subhash Bhalla, Vikrant Bhateja, Anjali A. Chandavale, Anil S. Hiwale, Suresh Chandra Satapathy, 2018-01-19 The volume presents high quality research papers presented at Second International Conference on Information and Communication Technology for Intelligent Systems ICICC 2017. The conference was held during 2-4 August 2017, Pune, India, and organized communally by Dr. Vishwanath Karad, MIT World Peace University, Pune, India, at MIT College of Engineering, Pune, and supported by All India Council for Technical Education (AICTE) and Council of Scientific and Industrial Research (CSIR). The volume contains research papers focused on ICT for intelligent computation, communications, and audio and video data processing. **Recent Advances in Signals and Systems** Omid Ansary, Meng Lin, B. R. Shivakumar, 2024-11-19 This book comprises select peer-reviewed papers from the International Conference on VLSI Signal Processing, Power Electronics, IoT Communication, and Embedded Systems (VSPICE 2023). The book provides insights into various aspects of electronics and communication engineering as a holistic approach. The various topics covered in this book include VLSI, embedded systems, signal processing, communication, power electronics, and the Internet of Things. The contents mainly focus on the most recent innovations, trends, concerns, and practical challenges and their solutions. This book is useful for academicians, professionals, and researchers in the area of electronics and communications and electrical engineering. *Energy Conservation for IoT Devices* Mamta Mittal, Sudeep Tanwar, Basant Agarwal, Lalit Mohan Goyal, 2019-05-21 This book addresses the Internet of Things (IoT), an essential topic in the technology, industry, policy, and engineering circles and one that has become headline news in both the specialty press and the popular media. The book

focuses on energy efficiency concerns in IoT and the requirements related to Industry 4.0. It is the first ever how-to guide on frequently overlooked practical, methodological, and moral questions in any nation's journey to reducing energy consumption in IoT devices. The book discusses several examples of energy-efficient IoT, ranging from simple devices like indoor temperature sensors to more complex sensors, e.g., electrical power measuring devices, actuators, e.g., HVAC room controllers, motors, and devices, e.g., industrial circuit breakers, PLC for home building or industrial automation. It provides a detailed approach to conserving energy in IoT devices and comparative case studies on performance evaluation metrics, state of the art approaches, and IoT legislation.

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