



Sensors Application Using PIC16F877A Microcontroller

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Abstract: In the 21st century, sensors have become common and part of everyday life. Such as touch-sensitive cell phones, computer monitors, elevator buttons, lamps that automatically dim or brighten, and even cars that park themselves. In addition, there are many applications of sensors that are hidden but control many facets of modern life such as in cars, airplanes, medical imaging, satellite communications and navigation. This research effort examines three sensor types, their data, and how to integrate it with a single microcontroller to accomplish simple tasks – dimming a light, sounding an alarm and showing a temperature rise. Three sensor types were used in this effort. First, an ultrasonic sensor was used to measure the distance from an object. A temperature sensor was used for monitoring temperature change from a human touch. Third, a Light Depending Resistor (LDR) sensor was used to detect different levels of light in a room. The goal of this research was to make a smart device that can be used to solve simple problems. Further applications could be applied to perform tasks such as controlling the temperature of a room or controlling the level of water in a meter. Also, robotics could be improved by providing information about distance to an object. Many applications can be enhanced based on this research.

Keywords: Sensors, Microcontroller, Ultrasonic Sensor, Temperature Sensor, Light Sensor, Robot, Distance Measurement

1. Introduction

In the modern world of the 21st century, sensors are so abundant and widespread that they are commonly taken for granted. Sensors and microcontrollers have been integrated for specific applications such as touch-sensitive cell phones, computer monitors, elevator buttons and lamps which dim or brighten by touching the base. There are also innumerable applications for sensors of which most people are never aware. Applications include cars, machines, aerospace, medicine, manufacturing and so on [1].

Simply put, a sensor is a device for detecting and signaling a changing condition [2]. A sensor (also called detector) is a converter that measures a physical quantity and converts it into a signal which can be read by an observer or by an (today mostly electronic) instrument [3-6]. For example, a mercury-in-glass thermometer responds to the ambient temperature by expansion and contraction of the mercury liquid. This can be read on a calibrated glass tube. A thermocouple converts temperature to an output voltage which can be read by a voltmeter. For accuracy, most sensors

are calibrated against known standards [6-8].

The sensitivity of a sensor indicates how much the sensor's output changes when the measured quantity changes. For instance, if the mercury in a thermometer moves 1 cm when the temperature changes by 1°C, the sensitivity is 1 cm/°C (it is basically the slope $\frac{\Delta L}{\Delta T}$ assuming a linear characteristic). Sensors that measure very small changes must have very high sensitivities [2, 4].

The sensors themselves may also have an impact on what they are measuring. For instance, a room temperature thermometer inserted into a hot cup of liquid will have a cooling effect on the liquid while the liquid heats the thermometer. For this reason, sensors should be designed to have as small an effect as possible on the environment which it is placed. One way to achieve this is to make the sensor small, the smaller the better. This miniaturization often improves the sensor response and may introduce other advantages as well. Technological progress allows more and more sensors to be manufactured on a microscopic scale as micro sensors using Micro Electro Mechanical Systems (MEMS) technology. In most cases, a micro sensor reaches a

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Peng, Rohit Sharma, Gwanggil Jeon**

Sensors Application Using Pic16f877a Microcontroller:

Designing Embedded Systems with PIC Microcontrollers Tim Wilmshurst, 2006-10-24 Embedded Systems with PIC Microcontrollers Principles and Applications is a hands on introduction to the principles and practice of embedded system design using the PIC microcontroller Packed with helpful examples and illustrations the book provides an in depth treatment of microcontroller design as well as programming in both assembly language and C along with advanced topics such as techniques of connectivity and networking and real time operating systems In this one book students get all they need to know to be highly proficient at embedded systems design This text combines embedded systems principles with applications using the 16F84A 16F873A and the 18F242 PIC microcontrollers Students learn how to apply the principles using a multitude of sample designs and design ideas including a robot in the form of an autonomous guide vehicle Coverage between software and hardware is fully balanced with full presentation given to microcontroller design and software programming using both assembler and C The book is accompanied by a companion website containing copies of all programs and software tools used in the text and a student version of the C compiler This textbook will be ideal for introductory courses and lab based courses on embedded systems microprocessors using the PIC microcontroller as well as more advanced courses which use the 18F series and teach C programming in an embedded environment Engineers in industry and informed hobbyists will also find this book a valuable resource when designing and implementing both simple and sophisticated embedded systems using the PIC microcontroller Gain the knowledge and skills required for developing today's embedded systems through use of the PIC microcontroller Explore in detail the 16F84A 16F873A and 18F242 microcontrollers as examples of the wider PIC family Learn how to program in Assembler and C Work through sample designs and design ideas including a robot in the form of an autonomous guided vehicle Accompanied by a CD ROM containing copies of all programs and software tools used in the text and a student version of the C compiler **Sensor Applications, Experimentation, and Logistics** Nikos

Komninos, 2010-03-02 This book constitutes the thoroughly refereed post conference proceedings of the First International Conference SENSAPPEAL 2009 held in Athens Greece in September 2009 The 12 revised full papers were carefully reviewed and selected from 24 submissions The papers cover various topics such as WSN for fire hazard detection and monitoring WSN for precision horticulture a nephelometric turbidity system for monitoring residential drinking water quality deployment of a wireless ultrasonic sensor array for psychological monitoring WISEBED an open large scale wireless sensor network testbed SmartEN a Marie Curie research framework for WSN in smart management of the human environment embedded web server for the AVR butterfly enabling immediate access to wireless sensor node readings as well as TinySPOTComm facilitating communication over IEEE 802.15.4 between Sun SPOTs and TinyOS based motes **Advanced PIC Microcontroller Projects in C** Dogan Ibrahim, 2011-08-30 This book is ideal for the engineer technician hobbyist and student who have knowledge of the basic principles of PIC microcontrollers and want to develop more advanced applications

using the 18F series The architecture of the PIC 18FXXX series as well as typical oscillator reset memory and input output circuits is completely detailed After giving an introduction to programming in C the book describes the project development cycle in full giving details of the process of editing compilation error handling programming and the use of specific development tools The bulk of the book gives full details of tried and tested hands on projects such as the I2C BUS USB BUS CAN BUS SPI BUS and real time operating systems A clear introduction to the PIC 18FXXX microcontroller s architecture 20 projects including developing wireless and sensor network applications using I2C BUS USB BUS CAN BUS and the SPI BUS which give the block and circuit diagram program description in PDL program listing and program description Numerous examples of using developmental tools simulators in circuit debuggers especially ICD2 and emulators PIC Microcontrollers Martin P. Bates,2004-06-09 The use of microcontroller based solutions to everyday design problems in electronics is the most important development in the field since the introduction of the microprocessor itself The PIC family is established as the number one microcontroller at an introductory level Assuming no prior knowledge of microprocessors Martin Bates provides a comprehensive introduction to microprocessor systems and applications covering all the basic principles of microelectronics Using the latest Windows development software MPLAB the author goes on to introduce microelectronic systems through the most popular PIC devices currently used for project work both in schools and colleges as well as undergraduate university courses Students of introductory level microelectronics including microprocessor microcontroller systems courses introductory embedded systems design and control electronics will find this highly illustrated text covers all their requirements for working with the PIC Part A covers the essential principles concentrating on a systems approach The PIC itself is covered in Part B step by step leading to demonstration programmes using labels subroutines timer and interrupts Part C then shows how applications may be developed using the latest Windows software and some hardware prototyping methods The new edition is suitable for a range of students and PIC enthusiasts from beginner to first and second year undergraduate level In the UK the book is of specific relevance to AVCE as well as BTEC National and Higher National programmes in electronic engineering A comprehensive introductory text in microelectronic systems written round the leading chip for project work Uses the latest Windows development software MPLAB and the most popular types of PIC for accessible and low cost practical work Focuses on the 16F84 as the starting point for introducing the basic architecture of the PIC but also covers newer chips in the 16F8X range and 8 pin mini PICs *Interfacing PIC Microcontrollers* Martin P. Bates,2013-09-18 Interfacing PIC Microcontrollers 2nd Edition is a great introductory text for those starting out in this field and as a source reference for more experienced engineers Martin Bates has drawn upon 20 years of experience of teaching microprocessor systems to produce a book containing an excellent balance of theory and practice with numerous working examples throughout It provides comprehensive coverage of basic microcontroller system interfacing using the latest interactive software Proteus VSM which allows real time simulation of microcontroller based

designs and supports the development of new applications from initial concept to final testing and deployment Comprehensive introduction to interfacing 8 bit PIC microcontrollers Designs updated for current software versions MPLAB v8 Proteus VSM v8 Additional applications in wireless communications intelligent sensors and more *Role of Higher Education Institutions in Achieving Sustainable Development Goals* Sri Sairam College of Engineering,2022-08-01 Contains papers related to Role of Higher Education Institutions in Achieving Sustainable Development Goals *Programming 8-bit PIC Microcontrollers in C* Martin P. Bates,2008-08-22 Microcontrollers are present in many new and existing electronic products and the PIC microcontroller is a leading processor in the embedded applications market Students and development engineers need to be able to design new products using microcontrollers and this book explains from first principles how to use the universal development language C to create new PIC based systems as well as the associated hardware interfacing principles The book includes many source code listings circuit schematics and hardware block diagrams It describes the internal hardware of 8 bit PIC microcontroller outlines the development systems available to write and test C programs and shows how to use CCS C to create PIC firmware In addition simple interfacing principles are explained a demonstration program for the PIC mechatronics development board provided and some typical applications outlined Focuses on the C programming language which is by far the most popular for microcontrollers MCUs Features Proteus VSMg the most complete microcontroller simulator on the market along with CCS PCM C compiler both are highly compatible with Microchip tools Extensive downloadable content including fully worked examples **Intelligent Systems and Computer Technology** D. Jude Hemanth,S. Malathi,2020-12-15 Recent developments in soft computation techniques have paved the way for handling huge volumes of data thereby bringing about significant changes and technological advancements This book presents the proceedings of the 3rd International Conference on Emerging Current Trends in Computing Next Generation Soft Computing is a platform for scientists researchers practitioners and academics to present and discuss their most recent innovations trends and concerns as well as the practical challenges encountered in the field The second section Evolutionary Networking and Communications focuses on various aspects of 5G communications systems and networking including cloud and virtualization solutions management technologies and vertical application areas It brings together the latest technologies from all over the world and also provides an excellent international forum for the sharing of knowledge and results from theory methodology and applications in networking and communications The book will be of interest to all those working in the fields of intelligent systems and computer technology **Universal Threats in Expert Applications and Solutions** Vijay Singh Rathore,Joao Manuel R. S. Tavares,B. Surendiran,Anil Yadav,2024-08-03 This book presents high quality peer reviewed papers from 3rd International Conference on Universal Threats in Expert Applications and Solutions UNI TEAS 2024 jointly being organized by IES University Bhopal and Shree KKarni Universe College Jaipur in association with CSI Jaipur Chapter and Jaipur ACM Professional Chapter during January 6 9 2024 The book is a collection of innovative ideas

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Modeling and Simulation of Environmental Systems Satya Prakash Maurya,Akhilesh Kumar Yadav,Ramesh Singh,2022-08-24 This book presents an overview of modeling and simulation of environmental systems via diverse research problems and pertinent case studies It is divided into four parts covering sustainable water resources modeling air pollution modeling Internet of Things IoT based applications in environmental systems and future algorithms and conceptual frameworks in environmental systems Each of the chapters demonstrate how the models indicators and ecological processes could be applied directly in the environmental sub disciplines It includes range of concepts and case studies focusing on a holistic management approach at the global level for environmental practitioners Features Covers computational approaches as applied to problems of air and water pollution domain Delivers generic methods of modeling with spatio temporal analyses using soft computation and programming paradigms Includes theoretical aspects of environmental processes with their complexity and programmable mathematical approaches Adopts a realistic approach involving formulas algorithms and techniques to establish mathematical models computations Provides a pathway for real time implementation of complex modeling problem formulations including case studies This book is aimed at researchers professionals and graduate students in Environmental Engineering Computational Engineering Computer Science Modeling Simulation Environmental Management Environmental Modeling and Operations Research

Problem Solving for Wireless Sensor Networks Ana-Belén García-Hernando,José-Fernán Martínez-Ortega,Juan-Manuel López-Navarro,Aggeliki Prayati,Luis Redondo-López,2012-02-02 Problem Solving for Wireless Sensor Networks delivers a comprehensive review of the state of the art in the most important technological issues related to Wireless Sensor Networks WSN It covers topics such as hardware platforms radio technologies software technologies including middleware and network and deployment aspects This book discusses the main open issues inside each of these categories and identifies innovations considered most interesting for future research Features Hardware Platforms in WSN Software Technologies in SWN Network Aspects and Deployment in WSN Standards and Safety Regulation for WSN European Projects Related to WSN WSN Application Scenarios at both utility and technical levels Complete cutting edge and resulting from the work of many recognized researchers Problem Solving for Wireless Sensor Networks is an invaluable reference for graduates and researchers as well as practitioners

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Emerging Trends in Expert Applications and Security Vijay Singh Rathore, Vincenzo Piuri, Rosalina Babo, Marta Campos Ferreira, 2023-06-29 The book covers current developments in the field of computer system security using cryptographic algorithms and other security schemes for system as well as cloud The proceedings compile the selected research papers presented at ICE TEAS 2023 Conference held at Jaipur Engineering College and Research Centre Jaipur India during February 17 19 2023 The book focuses on expert applications and artificial intelligence information and application security advanced computing multimedia applications in forensics security and intelligence and advances in web

technologies implementation and security issues *International Conference on Intelligent Computing and Applications*
Subhransu Sekhar Dash,Swagatam Das,Bijaya Ketan Panigrahi,2017-12-28 The book is a collection of best papers presented in International Conference on Intelligent Computing and Applications ICICA 2016 organized by Department of Computer Engineering D Y Patil College of Engineering Pune India during 20 22 December 2016 The book presents original work information techniques and applications in the field of computational intelligence power and computing technology This volume also talks about image language processing computer vision and pattern recognition machine learning data mining and computational life sciences management of data including Big Data and analytics distributed and mobile systems including grid and cloud infrastructure **PIC in Practice** D. W. Smith,2002-01-01 The book can be used at a variety of levels While the carefully graded practicals make it ideal for colleges and schools many university students and professionals are also newcomers to PIC so this book will provide a painless introduction for more advanced readers In addition electronics hobbyists will find this book to be an exciting introduction to the world of microcontrollers A practical guide for all newcomers to the PIC microcontroller Discover microelectronics by building PIC circuits Based on Manchester Metropolitan University s highly successful short courses on the PIC **Micro-Electronics and Telecommunication Engineering**
Devendra Kumar Sharma,Sheng-Lung Peng,Rohit Sharma,Gwanggil Jeon,2023-06-01 The book presents high quality papers from the Sixth International Conference on Microelectronics and Telecommunication Engineering ICMETE 2022 It discusses the latest technological trends and advances in major research areas such as microelectronics wireless communications optical communication signal processing image processing big data cloud computing artificial intelligence and sensor network applications This book includes the contributions of national and international scientists researchers and engineers from both academia and the industry The contents of this book are useful to researchers professionals and students alike

Intelligence of Things: Technologies and Applications Nhu-Ngoc Dao,Tran Ngoc Thinh,Ngoc Thanh Nguyen,2023-10-19 This book aims to provide state of the art knowledge in the field of Intelligence of Things to both academic and industrial readers In particular undergraduate graduate and researchers may find valuable information to drive their future research This book is considered a reference for numerous courses such as Artificial Intelligence Internet of Things Intelligent Systems and Mobile Networks In the industrial area this book provides information on recent studies in applying AI to IoT developments which help to align and shorten R D processes to introduce new classes of intelligent IoT products This book provides a technical reference for interdisciplinary studies which utilize machine learning and IoT as tools in their fields such as constructional management smart agriculture Earth sciences and geo spatial analysis intelligent business and digital transformation in education **Fieldbus Systems and Their Applications 2005** Miguel Leon Chavez,2006-11-23 The FeT series Fieldbus Systems and their Applications Conferences started in 1995 in Vienna Austria Since FeT 2001 in Nancy France the conference became an IFAC International Federation of Automatic Control sponsored

event These proceedings focus on 13 sessions covering fieldbus based systems services protocols and profiles system integration with heterogeneous networks management real time safety dependability and security distributed embedded systems wireless networking for field applications education and emerging trends Two keynote speeches from experts outside Europe are featured The first one entitled Bandwidth Allocation Scheme in Fieldbuses by Prof Seung Ho Hanyang University Korea The second by Prof I F Akyildiz Georgia Institute of Technology USA Key Technologies for Wireless Networking in the Next Decade Featuring 36 high quality papers from 13 countries Keynote speech reflecting the current interest of wireless communications for industrial applications FeT 2005 was supported by a International Program Committee of around 40 members from 15 countries 6 from Europe Wireless Sensor Networks K. G. Langendoen, 2007-01-12 This book constitutes the refereed proceedings of the 4th European Workshop on Wireless Sensor Networks EWSN 2007 held in Delft The Netherlands in January 2007 The 22 revised full papers presented were carefully reviewed and selected from 164 submissions The papers are organized in topical sections on networking tracking algorithms applications and support medium access control os and tools as well as localization

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