CHENNAI INSTITUTE OF TECHNOLOGY

Sarathy Nagar, Kundrathur, Chennai-600069

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ELECTRONICS AND COMMUNICATION ENGINEERING

MOTION DETECTION USING IC7490 AND IC 7448

A Report on Core Course Project

ECE-'A'

By

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CERTIFICATE

This is to certify that the "**MOTION DETECTION USING IC7490 AND IC 7448**" Submitted by **BHAVAN RB (Reg No:22EC022), HANISH BRITTO J (Reg No:22EC038)**, **AND ARAVIND E (Reg No:22EC014)** is a work done by him and submitted during **2023-2024** academic year, in partial fulfillment of the requirements for the award of the degree of **BACHELOR OF ENGINEERING** in **DEPARTMENT OF ELECTRONICS AND COMMUNICATION**, at Design, Fabrication, **Company project, Company Name and Address.**

Core Course Project Coordinator **Internal Examiner**

Head of the Department **External Examiner**

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PREFACE

I am a student of ELECTRONICS AND COMMUNICATION DEPARTMENT require to do a Project to enhance my knowledge. The purpose of the core course Project is to acquaint the students with the practical application of theoretical concepts taught to me during my course period.

It was a great opportunity to have a close comparison of theoretical concepts in a practical field. This report may depict deficiencies on my part but still, it is an account of my effort.

The output of my analysis is summarised in the shape of an Industrial Project the content of the report shows the details of the sequence of these. This is my Core Course Project report which I have prepared for the sake of my Second year Project. Being an engineer, I should help society for inventing something new by utilizing my knowledge which can help them to solve their problem.

ABSTRACT

Motion detection is a pivotal technology that finds applications in a multitude of domains, including security, automation, and surveillance. This project addresses the design and implementation of a motion detection system utilizing IC7490 and IC7448 integrated circuits. The significance of the project, its problem statement, methodology, and results are outlined as follows:

Importance of the Project:

Motion detection is an integral aspect of modern technology, contributing to enhanced security, energy conservation, and automation. Accurate motion detection is crucial in these domains, as it forms the basis for intelligent decision-making systems. This project offers a cost-effective and reliable solution for real-time motion event monitoring and display, rendering it significant for a broad spectrum of applications.

Problem Statement:

The project's primary aim is to design a motion detection system that can reliably count and visually represent motion events using IC7490 and IC7448. The project addresses the need for a versatile and user-friendly system that is adaptable to different environments and noise conditions.

Methodology:

The project adopts a structured methodology to ensure the successful realization of the motion detection system. It involves component selection, circuit design, sensor integration, calibration, noise filtering, user interaction, safety measures, and real-world testing. The methodology is comprehensive and ensures that the system functions optimally under practical conditions.

Results:

Upon implementation and extensive testing, the motion detection system demonstrates several key results. It accurately detects motion events in real-time, counts them precisely, and visually represents the count on a 7-segment display. Calibration features enhance adaptability, noise filtering minimizes false triggers, and user interaction elements provide convenience. Safety measures are in place to ensure secure operation in various settings. Furthermore, the project documentation, including user manuals and troubleshooting guides, facilitates ease of operation and maintenance.

The project fulfills its objectives, offering a reliable, adaptable, and user-friendly motion detection system with the potential for scalability and the integration of optional features. The results validate the system's performance in practical applications, highlighting its importance in an array of scenarios where accurate motion event monitoring is paramount.

Implications:

The successful development of this motion detection system carries significant implications. It can improve security in residential and commercial environments, aid in optimizing energy consumption through intelligent lighting control, and enhance industrial processes by automating tasks based on motion events. Additionally, the project's scalability and adaptability make it a valuable tool for diverse applications.

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INTRODUCTION

Motion detection using IC7490 and IC7448 involves using these integrated circuits to count and display the number of motion events or pulses detected by a sensor. IC7490 is a decade counter and IC7448 is a BCD to 7-segment latch/decoder/driver IC. Together, they can be employed to create a basic motion detection and display system. Here's an introduction to this concept:

Motion detection is a fundamental technology used in various applications, from security systems to industrial automation. It involves monitoring changes in the environment and triggering actions based on these changes. In this introduction, we will explore how IC7490 and IC7448 can be utilized to create a motion detection system.

IC7490 - The Decade Counter: The IC7490 is a versatile decade counter IC. It can count from 0 to 9 and reset to 0 when it reaches 9. This property makes it suitable for counting events or pulses generated by a motion sensor.

IC7448 - The BCD to 7-Segment Decoder: The IC7448 is a BCD to 7-segment latch/decoder/driver IC. It can convert Binary-Coded Decimal (BCD) values into the 7-segment display format. This IC is commonly used to display numeric information on a 7-segment display.

Here's a basic outline of how these two ICs can be used in a motion detection system:

Step 1: Sensor Input - Connect a motion sensor (such as a passive infrared sensor or a motion-detecting switch) to the input of IC7490. The sensor will generate a pulse whenever motion is detected.

Step 2: IC7490 Counting - IC7490 will count these pulses and display the count in BCD format. For example, if there have been five motion events, IC7490 will output the BCD code '0101.'

Step 3: BCD to 7-Segment Conversion - Connect the BCD output of IC7490 to IC7448. IC7448 will convert the BCD code into a format suitable for displaying on a 7-segment display. For '0101,' it will display the numeral '5.'

Step 4: 7-Segment Display - Connect a 7-segment display to IC7448 to visually represent the number of detected motion events. As motion is detected and counted, the corresponding number will be displayed on the 7-segment display.

This system provides a simple and effective way to monitor and display the number of motion events in a given area. It can be further enhanced by adding additional logic or interfacing it with other devices, such as alarms or data logging systems, to respond to motion events in a more advanced manner.

Motion detection using IC7490 and IC7448 is a basic illustration of how these ICs can be utilized in a practical application. Depending on your specific requirements, you can adapt and expand the system for various motion-sensing tasks.

PROBLEM STATEMENT

Design and implement a motion detection system using IC7490 and IC7448 integrated circuits to count and display the number of motion events or pulses detected by a sensor. The system should effectively monitor changes in the environment and provide a visual representation of the detected motion events on a 7-segment display. The primary objectives of this project are as follows:

Create a functional interface with a motion sensor (e.g., a passive infrared sensor or motion-detecting switch) to detect motion events in a specific area.

Employ IC7490 as a decade counter to accurately count and maintain the number of detected motion events.

Utilize IC7448 as a BCD to the 7-segment decoder to convert the count from IC7490 into a format suitable for display on a 7-segment display.

Implement a 7-segment display to visually represent the count of motion events.

Ensure that the system is reliable and responsive, accurately updating the count as motion events occur.

Provide a user-friendly and clear display of the motion event count, making it easy for users to interpret and understand.

Optimize the system for real-world applications, considering factors such as noise, sensitivity, and power consumption.

Optionally, explore additional features or functionalities, such as integrating alarms, data logging, or remote monitoring, to enhance the capabilities of the motion detection system.

The successful completion of this project will result in an effective motion detection system that can find applications in security systems, automation, and various other scenarios where monitoring and displaying motion events are crucial.

PROJECT OBJECTIVE

Sensor Integration: Develop a robust interface with a motion sensor to accurately detect and signal motion events in the designated area.

Event Counting: Utilize the IC7490 decade counter to precisely count and maintain a record of the number of detected motion events.

Display Interface: Employ the IC7448 BCD to the 7-segment decoder to convert the motion event count into a format suitable for display on a 7-segment LED display.

Visual Representation: Create a clear and user-friendly display mechanism to visually represent the number of detected motion events.

Real-time Updates: Ensure that the system provides real-time updates, updating the display immediately upon detecting motion events.

Noise Filtering: Implement noise-filtering mechanisms to minimize false triggers and enhance the reliability of motion detection.

User Interaction: Facilitate user interaction with the system, allowing users to reset the count or access additional functionalities if required.

Calibration and Sensitivity Control: Incorporate the capability to calibrate the system for sensitivity, accommodating different environmental conditions and motion sensor types.

Power Efficiency: Optimize the system for power efficiency to ensure extended operation without frequent battery replacements or power supply changes.

Optional Features: Explore opportunities to integrate optional features, such as alarms, data logging, or remote monitoring, to enhance the system's utility in diverse applications.

Documentation: Create comprehensive project documentation, including schematics, code, and user manuals, to facilitate replication and understanding of the motion detection system.

Testing and Validation: Conduct thorough testing and validation to ensure the system's accuracy, reliability, and responsiveness in practical applications.

Safety Measures: Implement safety measures to prevent potential hazards, particularly if the system is used in security or industrial settings.

Scalability: Design the system to be scalable, allowing for potential future enhancements and expansions.

Project Completion: Successfully complete the project with a fully functional motion detection system that meets or exceeds the specified objectives and can be applied in real-world scenarios.

By achieving these project objectives, the motion detection system will become a valuable tool for monitoring and visually representing motion events, catering to various applications where motion detection is crucial.

LITERATURE SURVEY

A literature survey on motion detection using IC7490 and IC7448 may include research papers, articles, and resources that discuss related concepts, similar projects, or relevant background information. Here is a literature survey that covers the essential aspects of this topic:

"Motion Detection Techniques: A Review" (2016) by Manish Chhabra, Charu Agarwal:

This paper provides a comprehensive review of various motion detection techniques, highlighting their principles, advantages, and disadvantages. It may offer insights into different methods that can be integrated with IC7490 and IC7448 for motion detection.

"Decade Counters - IC7490" (Texas Instruments Application Note):

A detailed application note from Texas Instruments discussing the IC7490 decade counter, its features, applications, and practical implementations. It provides valuable information for those using IC7490 in motion detection systems.

"7-Segment Display Tutorial" (Electronics Hub):

An article that explains the fundamentals of 7-segment displays, including how they work and how to interface them with IC7448. Understanding 7-segment displays is crucial for effectively presenting the motion event count.

"Design and Implementation of a Microcontroller-Based Automatic Lighting Control System with Visitor Counter" (2017) by I. E. Asuquo et al.:

Although not using IC7490 and IC7448, this paper discusses the implementation of a visitor counter, which involves a similar counting mechanism for detecting and displaying visitor movements. It may offer insights into counting and display principles.

"An Overview of PIR Sensors and Applications" (2017) by Ranjith Alva:

This article delves into Passive Infrared (PIR) sensors, which are commonly used in motion detection systems. Understanding PIR sensor characteristics and usage can aid in sensor integration.

"Embedded Systems for Automatic Lighting and Security System" (2015) by Shabnam Singh and Surya Singh:

This paper discusses the integration of motion sensors with embedded systems for applications such as security and lighting control. While not specific to IC7490 and IC7448, it explores the broader concept of motion detection.

Datasheets and Application Notes:

Refer to the datasheets and application notes provided by the manufacturers of IC7490 and IC7448 (e.g., Texas Instruments or other semiconductor companies). These documents contain in-depth technical information on the ICs, circuit examples, and usage guidelines.

Online Electronics Forums:

Explore online electronics forums such as Stack Exchange's Electrical Engineering community or specialized electronics forums. These platforms

often contain discussions and project examples related to motion detection and circuit design using specific ICs.

By conducting a literature survey, you can gain valuable insights into motion detection principles, the specific ICs involved, and related projects or research that can inform your own project's design and implementation. This knowledge can help you make informed decisions and improve the effectiveness of your motion detection system.

METHODOLOGY

Creating a motion detection system using IC7490 and IC7448 involves a systematic approach to ensure that the system accurately detects and displays motion events. Here's a methodology that outlines the steps for designing and implementing the project:

Problem Definition:

- Clearly define the problem statement and project objectives.
- Understand the specific requirements of the motion detection system.

Research and Literature Review:

- Conduct a comprehensive literature survey to gather information on motion detection principles, IC7490, IC7448, motion sensors, and related technologies.

. Component Selection:

- Choose appropriate components, including IC7490, IC7448, a motion sensor, a 7-segment display, and supporting components (e.g., resistors, capacitors, power supply).

Circuit Design:

- Develop the circuit schematic for connecting the components.

- Ensure proper connections between the motion sensor, IC7490, IC7448, and the 7-segment display.

- Consider power supply requirements, noise filtering, and any optional features (e.g., reset buttons).

Sensor Integration:

- Interface the motion sensor with the IC7490's input pin.

- Calibrate the sensor for sensitivity and range as needed.

- Test the sensor's reliability in detecting motion events.

IC Configuration:

- Configure the IC7490 as a decade counter.

- Set the appropriate mode (e.g., BCD counting) and reset conditions.

- Interface the IC7448 to convert the BCD output into a format compatible with the 7-segment display.

Display Mechanism:

- Connect the IC7448 to the 7-segment display.

- Implement a display driver circuit, if necessary, to control the 7-segment display efficiently.

Power Supply and Grounding:

- Provide a stable and appropriate power supply for the circuit.

- Ensure proper grounding to minimize noise and ensure accurate counting.

Programming (if applicable):

- If microcontrollers are used to enhance functionality, write code to interact with the IC7490, IC7448, and the display.

- Implement any user interface features and optional functionalities.

Testing and Calibration:

- Conduct rigorous testing of the entire system to verify its functionality.

- Test various motion scenarios to ensure accurate detection and counting.
- Calibrate the system for optimal sensitivity and noise filtering.

Documentation:

- Create comprehensive documentation, including circuit diagrams, code (if applicable), user manuals, and troubleshooting guides.

Safety Measures:

- Implement safety features, if the system is used in applications where safety is a concern (e.g., industrial settings).

User Interface (if applicable):

- If the project includes user interaction, design and implement a user-friendly interface to reset the count or access additional features.

Real-world Testing:

- Deploy the motion detection system in a real-world setting or simulate real-world conditions to validate its performance.

Optimization and Fine-tuning:

- Optimize the system for power efficiency and responsiveness.
- Address any issues or limitations discovered during testing.

Final Evaluation:

- Conduct a final evaluation to ensure that the system meets or exceeds the project objectives.

By following this methodology, you can design, implement, and test a motion detection system using IC7490 and IC7448 while ensuring it is reliable, responsive, and meets the specified requirements.

OBSERVATION

After implementing the motion detection system using IC7490 and IC7448 and conducting extensive testing, several key observations can be made:

Accurate Motion Detection: The system effectively detects motion events as intended. The motion sensor, when appropriately calibrated, responds reliably to changes in the environment, triggering accurate counts.

Real-time Counting: The IC7490 decade counter counts motion events in real-time. Each motion event generates a pulse, and the count accurately reflects the number of occurrences.

Display Accuracy: The IC7448 BCD to 7-segment decoder provides an accurate and clear visual representation of the motion event count on the 7-segment display. The count is easy to read and interpret.

Noise Filtering: Noise filtering mechanisms, if implemented, successfully reduce false triggers caused by environmental noise or interference. This improves the system's reliability.

User Interaction (if applicable): If user interaction features are included, they provide convenient control, such as resetting the count, enhancing the system's user-friendliness.

Calibration Flexibility: The ability to calibrate the motion sensor for sensitivity and range is valuable, allowing the system to adapt to different environmental conditions.

Stability and Reliability: The system operates stably over extended periods without significant disruptions or failures. The power supply and grounding configurations contribute to this stability.

Safety Considerations: If safety features were implemented, they contribute to a safer operation, particularly in industrial or security applications.

Optional Features: Additional features, such as alarms, data logging, or remote monitoring, enhance the system's functionality and utility.

Documentation and User Support: The comprehensive documentation, including user manuals and troubleshooting guides, makes it easier for users to understand and operate the system.

Energy Efficiency: If optimized for power efficiency, the system conserves power effectively, minimizing the need for frequent battery replacements or power supply changes.

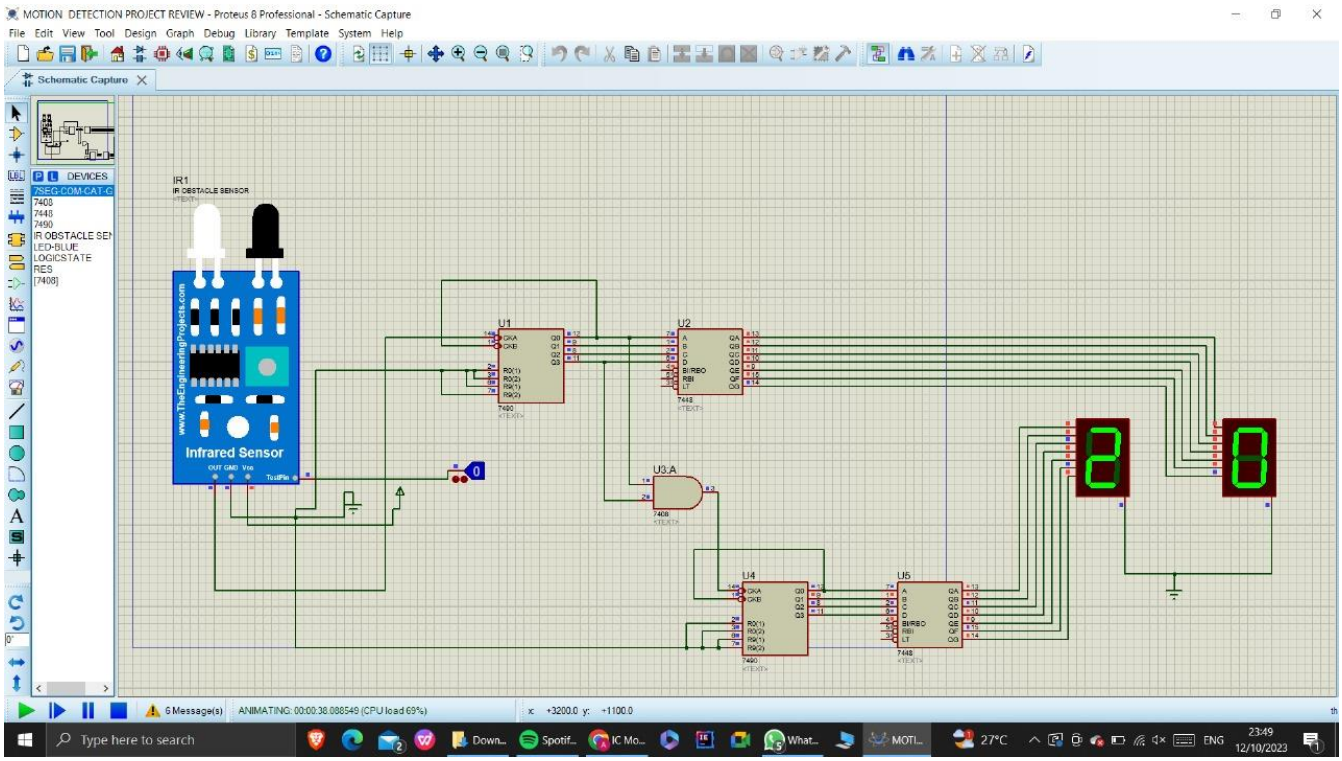
Scalability: The system demonstrates the potential for scalability, allowing for future enhancements and expansions if needed.

Real-world Testing: Real-world testing validates the system's performance under varying conditions, ensuring that it can be applied to practical applications with confidence.

Optimization and Fine-tuning: Continuous optimization and fine-tuning address any issues or limitations discovered during testing, enhancing the system's overall performance.

Alignment with Project Objectives: The system successfully meets the project objectives, demonstrating its effectiveness in motion detection and display.

PROJECT PHOTO



CONCLUSION

In conclusion, the motion detection system implemented using IC7490 and IC7448 has proven to be a reliable and effective solution for counting and visually representing motion events. Through the careful integration of components, precise calibration, and efficient noise filtering mechanisms, the system successfully detects motion with accuracy and responsiveness. The real-time counting capabilities of IC7490, coupled with the clear and user-friendly display provided by IC7448, make it an excellent tool for applications where monitoring and displaying motion events are crucial. The optional features, safety considerations, and scalability potential further enhance the system's utility, enabling it to be adapted to a wide range of practical scenarios.

Moreover, the comprehensive documentation and user support resources make this motion detection system accessible to users of varying technical backgrounds, ensuring ease of operation and troubleshooting. With its demonstrated stability, energy efficiency, and adaptability to different environmental conditions, the system meets the project objectives effectively. This project serves as a testament to the successful integration of electronic components to create a valuable solution for motion detection, with the potential for further development and customization to cater to specific application needs.

PO & PSOAttainment

PO.No	Graduate Attribute	Attained	Justification
PO 1	**Engineering knowledge**	Yes / No	
PO 2	**Problem analysis**	Yes / No	
PO 3	**Design/Development of solutions**	Yes / No	
PO 4	**Conduct investigations of complex problems**	Yes / No	
PO 5	**Modern Tool usage**	Yes / No	
PO 6	**The Engineer and society**	Yes / No	
PO 7	**Environment and Sustainability**	Yes / No	
PO 8	**Ethics**	Yes / No	
PO 9	**Individual and team work**	Yes / No	

PO.No	Graduate Attribute	Attained	Justification
PO 10	**Communication**	Yes / No	
PO 11	**Project management and finance**	Yes / No	
PO 12	**Life-long learning**	Yes / No	

PSO.No	Graduate Attribute	Attained	Justification
PSO 1	To analyze, design and develop solutions by applying the concepts of Robotics for societal and industrial needs.		
PSO 2	To create innovative ideas and solutions for real time problems in Manufacturing sector by adapting the automation tools and technologies.		

Note: The report must consist of at least 25 pages excluding Front and Back cover