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Department:	School of Computing	
Submission Due on:	2024.07.23	
Type of Coursework:	Group	
Title of the Coursework:	Home Monitoring System	

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NATIONAL INSTITUTE OF BUSINESS MANAGEMENT
DIPLOMA IN SOFTWARE ENGINEERING/DIPLOMA IN NETWORK ENGINEERING
COURSEWORK ONE

SOFTWARE ENGINEERING

HOME MONITORING SYSTEM

SUBMITTED BY

Name with Initials	Index Number
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Date of Submission: ……2024.07.23……...

DECLARATION

We are students at Software Engineering National Institute of Business Management, Matara. Declare that Home Monitoring System has been successfully completed under the guidance of lecturer Mr. Tilina Soysa School of Computing, National Institute of Business Management, Matara. This dissertation work is submitted in partial fulfillment of the requirements for the RAD course work during the academic year 2024

Name with Initials	Index Number	Signature
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I.H.S. Punsara	**MAHNDSE24.1F-011**	
S.R.W. Kumara	**MAHNDSE24.1F-002**	
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This project was made possible by the extensive resources and tools available in the maker community, as well as the support from my family and friends. Their patience and understanding have been instrumental throughout this journey. Thank you all for your support and contributions.

Abstract

This project develops a home monitoring system using an Arduino Uno to enhance residential security and automation. The system integrates various components, including a servo motor for door control, a PIR sensor for person detection, an IR sensor for door activation, and an MQ-7 gas sensor for carbon monoxide detection. A 16x2 LCD displays real-time data, while buzzers provide distinct alarm signals.

To address the Arduino Uno's limited I/O pins, an I2C device is utilized for the LCD, optimizing pin usage. Efficient code with interrupt handling and time-based scheduling ensures seamless operation. The system also includes a DC motor-operated fan that activates based on temperature thresholds, with additional alarms for critical heat levels. This project demonstrates effective integration of sensors and actuators, offering practical solutions for home automation and security.

TABLE OF CONTENT

Introduction:

As technology advances, enhancing home security and automation has become increasingly important. This project introduces a home monitoring system developed using an Arduino Uno, aimed at improving residential safety and convenience. The system integrates several key features: automated door control with a servo motor, person detection with a PIR sensor, and door activation via an IR sensor.

Additionally, it includes an MQ-7 gas sensor to detect carbon monoxide and triggers alarms as needed. The 16x2 LCD provides real-time system status, and multiple buzzers issue different alerts for various conditions. A DC motor operates a fan that activates based on temperature thresholds, helping to maintain a comfortable environment.

To overcome the Arduino Uno's limited I/O pins, the project utilizes an I2C device for the LCD, effectively managing pin usage. This project demonstrates a practical and integrated approach to enhancing home automation and security.

Literature Reviews

Recent advancements in home automation have integrated microcontrollers and sensors to enhance security and efficiency. Arduino microcontrollers, known for their versatility, are frequently used in modern systems (Brown & Green, 2020). Studies have demonstrated their effectiveness in managing various sensors, such as PIR sensors for motion detection and gas sensors for environmental monitoring (Lee & Kim, 2019).

The use of I2C communication in these systems has streamlined design by reducing I/O pin requirements (Garcia et al., 2021). Additionally, employing DC motors for temperature control, like activating fans based on temperature thresholds, has been shown to effectively maintain optimal conditions (Miller & Davis, 2022). This project leverages these

advancements to create a comprehensive home monitoring system, combining proven technologies to improve home security and automation.

Methodology

1. Component Selection: Choose and integrate key components including an Arduino Uno, servo motor, PIR sensor, IR sensor, MQ-7 gas sensor, 16x2 LCD, buzzers, and a DC motor.
2. System Design: Develop a modular design to facilitate integration and troubleshooting. Use an I2C device to connect the LCD, reducing the number of I/O pins required.
3. Programming: Write and upload code to the Arduino Uno for sensor data acquisition, actuator control, and alarm management. Implement interrupt handling and time-based scheduling to manage concurrent operations effectively.
4. Integration: Connect the sensors and actuators to the Arduino Uno. Ensure proper wiring and calibration for accurate readings and reliable performance.
5. Testing: Conduct thorough testing of the system under various conditions to ensure functionality and reliability. Adjust sensor thresholds and code as necessary based on test results.
6. Optimization: Fine-tune the system to enhance performance, including optimizing power usage and minimizing environmental interference.
7. Documentation: Document the design, code, and troubleshooting steps to support future modifications and improvements.

Discussion

The home monitoring system effectively integrates various sensors and actuators to enhance home security and automation using an Arduino Uno. By employing an I2C device for the LCD, we managed to overcome the limitations of limited I/O pins, allowing for more efficient use of resources. The combination of PIR and IR sensors with the servo motor and MQ-7 gas sensor provides comprehensive monitoring capabilities, including person detection, door control, and gas leak detection.

The use of buzzers for distinct alarms and a DC motor for temperature-based fan control adds practical functionality to the system. The code implementation, which includes interrupt handling and time-based scheduling, ensures that concurrent operations are managed smoothly.

Overall, the project demonstrates a successful integration of various components into a cohesive system, addressing key challenges in home automation and security. Future improvements could involve adding remote monitoring capabilities and advanced analytics to further enhance the system's functionality.

Future Implementations

1. **Remote Monitoring**: Integrate IoT capabilities for remote access and control via a smartphone app.
2. **Advanced Analytics**: Implement data analytics to provide insights and predictive maintenance.
3. **Voice Control**: Add voice command functionality using platforms like Alexa or Google Assistant.
4. **Enhanced Security**: Incorporate facial recognition or fingerprint sensors for improved security.
5. **Energy Management**: Develop smart energy management features to optimize power usage based on real-time data.

Reference

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Gantt Chart

	June				July		
Task	1	2	3	4	1	2	4
Make proposal	■						
Proposal Submission	■						
Make presentation	■	■					
presentation addressing		■					
Make video clip			■	■	■		
Present video clip					■		
Create final report					■	■	
Present final report							■
Final Presentation and VIVA							■