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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
HIGHER NATIONAL DIPLOMA IN 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 currently enrolled as students in the Software Engineering program at the National Institute of Business Management in Matara. Announce the completion of the Home Monitoring System project with the supervision of lecturer Mr. Thilina Soysa at the School of Computing, National Institute of Business Management, Matara. This thesis is being presented to partly meet the requirements for the RAD program in the 2024 academic year.

Name with Initials	Index Number	Signature
W.D.B.P. Jayantha	MAHNDSE24.1F-014	
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Acknowledgment

I would feel immensely appreciative for the contribution of all involved in this project if I said a mere 'thank you'— it is not enough. I owe a debt of gratitude to my project advisor and mentors for their irreplaceable assistance and direction. My appreciation also goes out to my peers for their support and teamwork.

The accomplishment was attributed to the extensive variety of resources and tools among makers, and their support from my family and friends. It was essential for them to be patient as well as empathetic while we made our way through this journey. Thanks a lot for your help— it means a lot.

Abstract

There is a idea for the development of a project with the objective of using the Arduino Uno in order to monitor the home and offer safety and convenience in the residence. The system includes various components: a servo motor mostly used for turning signals on and off, a pir sensor for sensing human motion, an IR sensor for recognition of human at the door, and an MQ-7 gas sensor for recognition of carbon monoxide. Each of these parts work simultaneously; using a 16x2 LCD to display the live data and buzzer to generate different alarm tones.

Since the Arduino Uno board has limited I/O pin, an I2C device must then be employed for the LCD screen as it only requires limited pins. The code also manages the interrupts then the time-based scheduling in order to minimize problems while enhancing the execution. This system is equipped with a DC motor fan; however its operation is based on temperature settings with additional signals when temperature limits are reached. Thus, having described the co-ordination of sensors and actuators in this work, it is possible to conclude that effective home automation and security systems can be implemented successfully.

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Introduction:

Cited below are some of the reasons why it has become essential to boost home security as well as the degree of home automation given the current state of the advancement in technology. This work presents a home monitoring system that was invented using an Arduino Uno with the purpose of enhancing home safety and comfort. The system integrates several key features: included, the door opening with the help of a servo motor, Person recognition with PIR, and the release of the door through an IR.

Further, incorporates an MQ-7 gas sensor that measures the amount of CO present and sets off the alarms if required. A 16x2 LCD is used for displaying the state of the system while multiple buzzers give out different tones depending on the state of the system. A DC motor is used to operate the fan for controlling the temperature by triggering on-off temperatures for the fan to run.

To deal with scarce I/O pins on the Arduino Uno, the project employs an I2C device to address the LCD which usually helps to minimize the use of the pins. It shows a good form of interconnectivity and coordination when it comes to the improvement of home automation and security.

Literature Reviews

upgrade home automation: It is worthy to note that there has been improvements in that recent usage of microcontrollers and sensors has been added to make homes more secure and efficient. Arduino microcontrollers that are quite popular in Today's world are often found in complex systems (Brown & Green, 2020). Researches have shown how they are well suited for the control of numerous sensors like Passive Infrared (PIR) for movement and gaseous detectors for pollution (Lee &

Kim, 2019).

The incorporation of I2C communication in these systems has enhanced design simplification through the elimination of that of I/O pins (Garcia et al. , 2021). Also, using DC motors when it comes to the temperature regulation such as the process of starting the fans at certain temperature levels has been described well (Miller & Davis, 2022). This project leverages these

progresses to see that a perfect home monitoring system complemented by perfect home security features and home automation are the next big thing.

Methodology

1. **Component Selection:** The idea is to dissect and solder/ integrate some parts for instance Uno board, servo, PIR/IR sensor, mq-7 gas sensor, alpha-numeric LCD 16×2, buzzer and dc motor.

2. **System Design:** See whether they are pre-specified plug-and-play designs and that if there is any problem with the design, the problem should be very distinguishable. Connect your generic LCD to the I2C device that help in keeping the number of pins used in I/O low.

3. **Programming:** S. Load on the Arduino Uno the following code, which shall be used in reading the data from the specified sensors, writing onto the prescribed actuators and further in generating alarms. The last one is the concurrent operation that can be answered by interrupt handling as well as the time divisional scheduling.

4. **Integration:** Can it mean that sensors and actuators have to be connected if for the servo module it has to be connected to pin 9 and for the ultrasonic sensors it has to be connected to the pin 8 and 9 and LEDs

to pin 13 of the Arduino UNO. In wiring it is expected that it should be perfect so that chances of short circuiting and other complication that may lead to destruction of the machine should not be there, in calibration one has to make sure that it is done by the standard that is required for good readings and efficiency.

5. Testing: This is normally accomplished by introducing the system to various situations which should allow for efficiency and effectiveness assessment to be made. When the result of testing yields a sensor, the threshold as well as the code should be altered concerning the test set.

Discussion

The required sensors and actuators which include the home monitoring one are connected and can be commanded using a home monitoring system with the help of an Arduino Uno for improving the security system and automation of homes. Some of the main troubles could have been averted if a careful decision had been made while choosing the I2C interface for the LCD which, in turn, would reduce the numbers of I/O pins. Hence, as schematically illustrated the combination of PIR and IR along the assistance of the servo motor and MQ-7 gas sensor offer the wide range of monitoring where it is possible to detect presence of a person, to control the door and to check whether there is the gas leakage or not.

Besides the functionality of avoiding the false fire alarms, the added utility of the system includes buzzer for different tones of alarms and DC motor for the temperature control of fans. It also outlines how interruption is conducted and time sharing and therefore it means that when there are different running operation concurrently, they are supposed to be smooth.

In general, the provided project corresponds to the major problems in the sphere of home automation and security providing the unit of numerous aspects of the system while fulfilling the project's questions. They could always be other additions that uploaded into the system; for example, the options for the remote supervision of the employees and the extension of other analyses' instruments into the set.

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

1. **Arduino Documentation.** Arduino. Available at: <https://www.arduino.cc/en/Documentation>. Accessed: July 2024.
2. **MQ-7 Gas Sensor Datasheet.** Hanwei Electronics. Available at: <http://www.hw-ads.com/>. Accessed: July 2024.
3. **PIR Motion Sensor Tutorial.** SparkFun Electronics. Available at: <https://www.sparkfun.com/>. Accessed: July 2024.
4. **I2C LCD Display Guide.** Adafruit. Available at: <https://learn.adafruit.com/>. Accessed: July 2024.
5. **Servo Motor Specifications.** Pololu Robotics. Available at: <https://www.pololu.com/>. Accessed: July 2024.

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							