Microprocessors and Microcontrollers Course

Project Proposal Template

Course Code / Name: Microprocessors and Microcontrollers
Semester: [e.g., Spring 2025]
Submission Date: [14/5/2025]

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1. Project Title

HOME OF TOMORROW

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2. Team Members

Name	Student ID
Bishoy Kamel Kamel	25250009
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3. Project Abstract (100–200 words)

This project presents a comprehensive smart home system built using an AVR microcontroller kit. The system integrates environmental and motion sensors (temperature, LDR, IR, ultrasonic) to monitor and automate the home environment. Outputs such as fans, LEDs, buzzers, and motors respond based on real-time sensor data. An LCD screen displays live updates about the system's status. The aim is to increase convenience, safety, and energy efficiency through automation and responsive control.

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4. Problem Statement

Manual control over home devices is inefficient and lacks responsiveness to environmental changes. Smart homes require real-time monitoring and automatic control to improve safety, comfort, and energy efficiency. This project addresses that by building a flexible, sensor-based automation system.

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5. Objectives

- Detect motion in and around the home
- Measure light and adjust lighting or indicators
- Monitor temperature and activate cooling (fan)
- Measure distance to detect presence (e.g., near doors)
- Display system status on LCD
- Trigger buzzer or colored LEDs for alerts or status indicators

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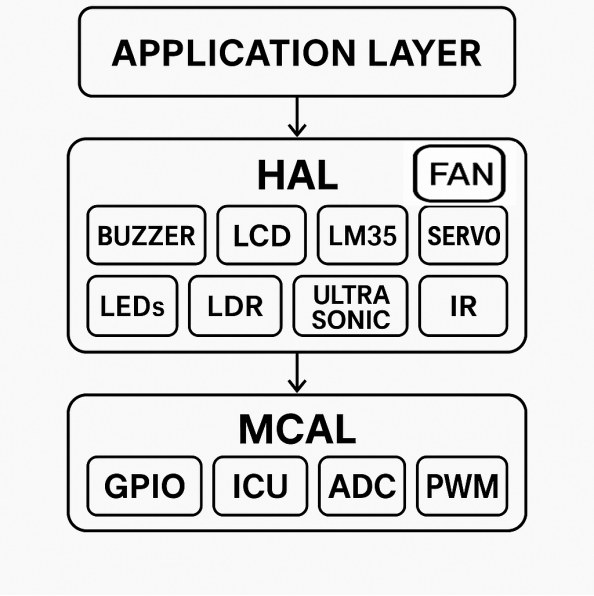
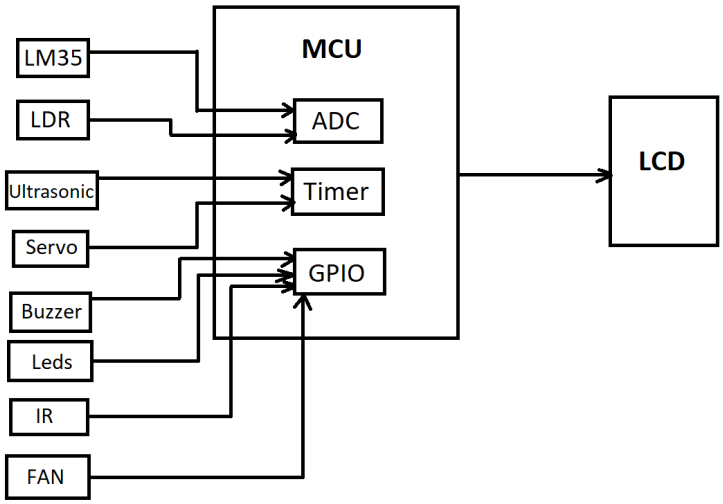
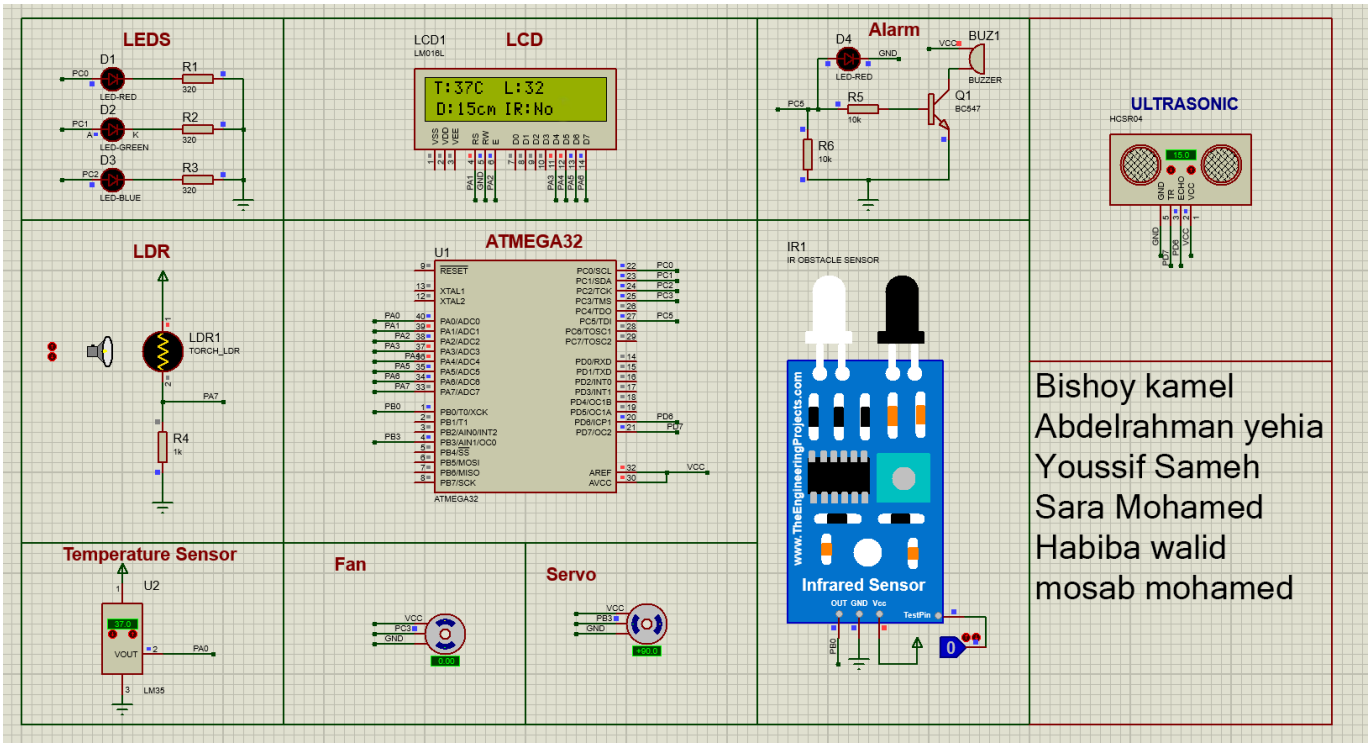
6. Proposed System Overview
Description:
The smart home system continuously monitors sensor data and automatically controls devices. For example, if the temperature exceeds a threshold, the fan turns on. If motion is detected, the system may trigger an alert (buzzer) or activate lighting. Distance sensing can be used to detect someone approaching a door. The entire system is controlled by an ATmega32 microcontroller.

Block Diagram:





Schematic Diagram:



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7. Hardware Components

Component	Specification	Purpose
ATmega32 MCU	AVR 8-bit	Main control unit
LM35	Analog Temp Sensor	Temperature monitoring
LDR	Analog Light Sensor	Detect light intensity
IR Sensor	Digital Motion Sensor	Detect presence or movement
Ultrasonic Sensor	HC-SR04	Distance measurement
LCD 16x2	HD44780	Display real-time status
Servo Motor	Micro Servo	Control smart door
Fan	9V	Temperature-based ventilation
RGB LEDs	Digital Output	Visual status indication
Buzzer	Active Buzzer	Alarm or sound indicator

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8. Microcontroller Details

Type/Model: ATmega32

Features Used:

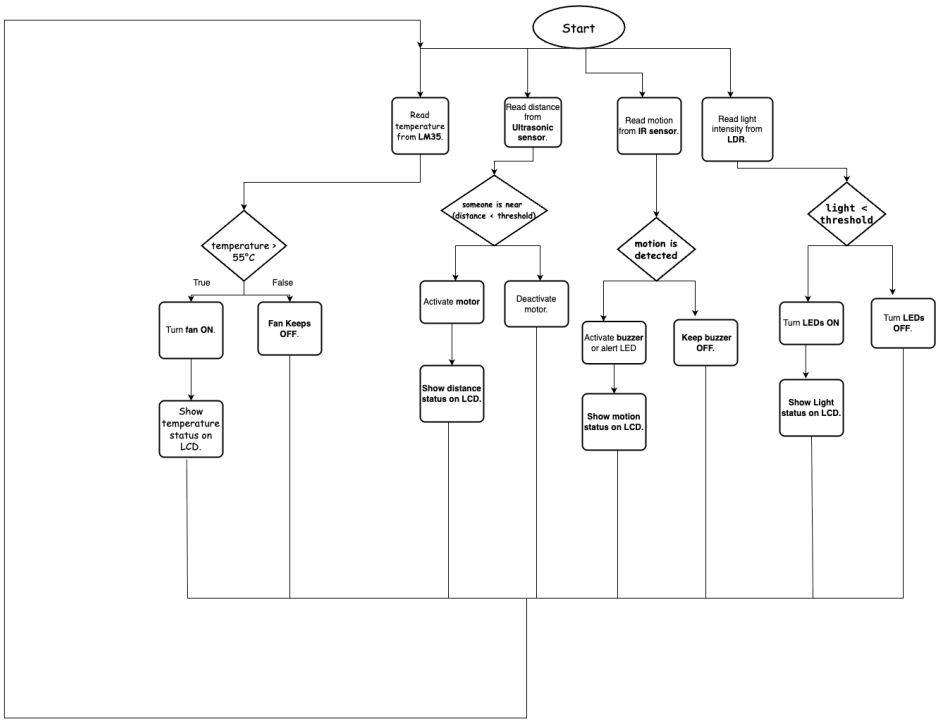
- GPIOs (for all digital I/O)
- ADC (for temperature and LDR)
- PWM (for Servo control)
- Timers (for Ultrasonic timing)
- External Interrupts (for motion sensor)

9. Software Design

Programming Language/IDE: C using Eclipse IDE

- **Code Overview:**
  This smart home system uses sensors (temperature, light, IR, ultrasonic) to automate fan, lights, and garage.
  It turns on the fan and alerts if temperature exceeds 55°C.
  Lights activate in low light using green and blue LEDs.
  Garage door opens/closes based on IR presence detection.
  Red LED and buzzer warn when an object is too close (<10 cm).

- **Flowchart or State Diagram:**



10. Power Supply Requirements

- 5V regulated supply for MCU and logic
- 9V supply for fan.
- Optionally powered by adapter or battery.

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11. Expected Outputs

- LCD shows sensor readings and system status
- LEDs indicate mode (e.g., safe, alert, night)1
- Fan activates on high temperature
- Buzzer triggers on motion detection
- Motor responds to proximity or other events

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12. Timeline & Milestones

Task	Start Date	End Date	Responsible Member
Coding & Drivers	6-05-2025	9-05-2025	Bishoy Kamel
Coding & Proteus	6-05-2025	9-05-2025	Mosab Mohamed
Debuging & Hardware	9-05-2025	12-05-2025	Youssef Sameh
Proteus & Hardware	8-05-2025	12-05-2025	Abdelrahman Yehia
Design & Hardware	9-05-2025	12-05-2025	Sara Mohamed
Design & Proteus	8-05-2025	12-05-2025	Habiba Walid

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13. Challenges and Risks

Challenge/Risk	Description
Sensor Accuracy	Noise or inaccurate readings from sensors may cause false triggering.
Component Interference	Multiple devices operating simultaneously may cause electrical interference.
Timing and Delays	Improper `_delay_ms()` usage may cause missed events or slow response.
No Manual Override	Lack of user control during failures may result in system inaccessibility.

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14. References

1. ATmega32 Datasheet
2. LM35 Temperature Sensor Datasheet
3. HC-SR04 Ultrasonic Sensor Datasheet
4. Proteus Simulation Guides
