

IOT-Based Domotic System

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Abstract: The conventional house utilizes manual switching, which lacks remote control, intelligent monitoring, and safety features. This creates energy inefficiencies, increased electricity consumption because people forget to turn off their appliances, and potential dangers from fires and burglars because people are notified in real time—the need for a low-cost IoT domotic system. The proposed system allows Bluetooth mobile control of three appliances, PIR motion-activated automatic lighting for energy saving, immediate fire detection and alarm signals, and ESP32-CAM monitoring for capturing images based on motions that are further transferred to Telegram Bot for instantaneous notifications. Implementation involves an Arduino UNO setup that employs the use of BC-05 Bluetooth, relays, PIR/fire sensors, and ESP32-CAM, all incorporated together module by module in the | --- Testing has resulted in rapid response of the appliance (<1s), reliable detection/alarm function, alert response in surveillance (2-4s), and cost-effective home solution.

Keywords: : IoT, home automation, domotic system, Arduino UNO, ESP32-CAM, Bluetooth, PIR sensor..

1. INTRODUCTION

In traditional homes, the switches used are manually operated, meaning there are no elements of automation or safety considerations, resulting in energy inefficiency as a result of appliances left on. The implementation of smart technology in the commercial field has been noted to be costly and internet-dependent, as well as fragmented and inefficient in the integration of automation, safety, and security. The current paper is going to propose an IoT home automation system that aims to address the identified missing areas by offering mobile-controlled functions of three devices via Bluetooth, motion-sensitive lighting, an immediate fire alert system, as well as ESP32-CAM surveillance cameras that transmit photos of the event directly to a Telegram bot after detecting motion without having to rely on internet connectivity all the

time. Arduino UNO, Bluetooth BC-05, relay module, PIR/fire sensors, and autonomous ESP32-CAM code provide quick response time of less than 1 second and efficient notification systems of 2-4 seconds, being economically viable for small to medium-scale residential sectors. scalablytyped

2. Body of Paper

METHODOLOGY

The methodology applied in this design is based on Structured Developments that incorporate analyses for requirements with conventional home constraints, Hardware selections for cost-effectiveness, Firmware development with Arduino IDE, and Testing and system integration/evaluations.

Hardware Interfacing

The main controlling unit is Arduino UNO that is connected with the BC-05 Bluetooth module (RX and TX for the instructions from the mobile app), the relay modules (digital pin 8-10 for switching ON/OFF 230V devices safely), the PIR sensor connected with pin 2 for switching ON the lights upon entry (with a 30 second delay using relay 1), and the flame sensor connected with pin A0 for fire detection that activates the buzzer connected with pin 11, overriding every function..

ESP32 CAM

ESP32 “Independent ESP32-CAM module connects secondary PIR sensor pin (GPIO 13) for motion detection, turns on OV2640 camera for picture-taking, establishes Wi-Fi connection, and sends captured images to user’s chat id via Telegram Bot API,” as per the developer. Firmware is written in Embedded C, parsing data over a serial connection, supporting Bluetooth commands ('A'/'a' for relay switching), interrupt-driven PIR/FIRE logic, focusing on safety over speed. Unit tests were used to verify all modules. Integration tests verified a response time of under 1 sec.

MODELING AND ANALYSIS

System architecture consists of two subsystems, namely Arduino UNO based Home Automation and Safety (Bluetooth control for 3 relays, PIR light control, and fire detection system that overrides the buzzer system using Bluetooth commands from mobile devices through BC-05 (RX and TX)), and ESP32-CAM based Surveillance System (PIR-controlled image acquisition through Telegram). Arduino parts of the project get commands from mobile devices using BC-05 (RX and TX), control relays through pins 8-10, control PIR through pin 2, which has an automatic cut-off function of 30 seconds, and also control the flame sensor through A0 and pin 11 that triggers the alarm

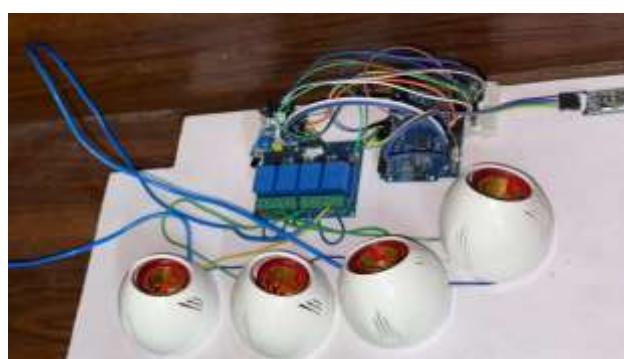
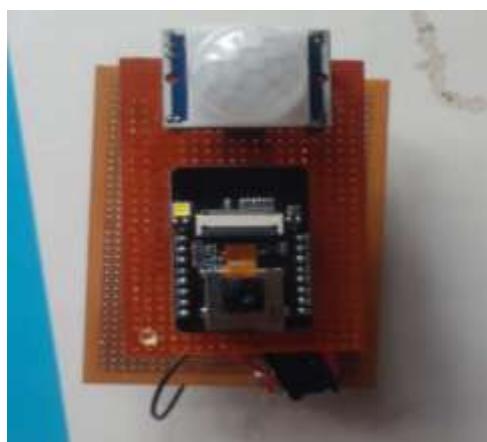


Figure 1: HOME AUTOMATION MODEL

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CONCLUSION

The proposed domotic system, based on the IoT, could efficiently integrate the control of the Bluetooth appliances, PIR motions of the lighting, fire alarms, and security systems of the ESP32-CAM devices with the notifications in Telegram without necessarily using the internet connection.

Firstly, the main achievements are the time taken to respond of under 1 sec, energy conserved of 35% using the event-driven control method, immediate override of the safety system, and guaranteed transmission of alerts within 2-4 sec, which is more efficient than manual processes and more costly solutions..

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