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IOT BASED SMART HOME AUTOMATION SYSTEM A REVIEW AND PROPOSED FRAMEWORK

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ABSTRACT

The fast expansion of Internet of Things (IoT) tech has really boosted the need for smart, and automated home systems. Usual ways to manage home appliance stuff often ask for manual input, which can feel annoying sometimes, also causes energy wastage, and it reduces efficiency. In this paper, we suggest an IoT Based Home Automation System, built to automate and manage household devices using Arduino UNO together with Bluetooth communication The design mainly emphasizes wireless appliance control. In other words , the home devices are connected using the HC-05 Bluetooth module, and an Android mobile application is used to drive the commands. LEDs are included to act as smart lighting in the house, and a servo motor is added so the door can be controlled automatically. Overall, the system is meant to be simple, budget-friendly , and fairly easy for users to handle. Besides that, it improves comfort and energy efficiency because it supports appliance control without wires. Unlike classic manual systems, this proposed approach lets users manage appliances remotely while staying inside the Bluetooth communication coverage. That leads to better operational efficiency, and less manual effort. The proposed IoT Based Home Automation System is intended to deal with these issues by developing a straightforward, low-cost, and user- focused smart home automation setup using Arduino UNO and HC-05 Bluetooth technology.

KEYWORDS: IoT, Home Automation, Arduino UNO, HC-05 Bluetooth Module, Smart Home, Android Application, Servo Motor, Wireless Communication, Smart Lighting, Home Security.

I. INTRODUCTION

Home automation systems have become one of the most important applications of Internet of Things (IoT) technology, like honestly this is pretty much everywhere now. Smart home systems allow users to control and monitor household appliances through wireless communication tech such as Bluetooth and Wi-Fi. These systems boost convenience, improve security, and support energy efficiency in modern homes. LEDs are used to represent the household lights, while a servo motor is used to handle automatic door movement, sort of like that. In the past, traditional home appliance control systems relied mostly on manual operation , and that can create inconvenience , not to mention unnecessary power draw. Smart automation systems fix this by letting people do wireless appliance control using smartphones, plus embedded systems. These days modern home automation solutions blend microcontrollers with mobile applications, to deliver a more efficient and smarter setup. And with the advancement of IoT technology it has also become possible to automate household appliances using low cost, easy-to-use hardware parts. Arduino UNO Hard Parameter Sharing Network.

II. BACKGROUND

Traditional home appliance control systems leaned pretty heavily on manual operation, and on wired communication methods too. In practice these setups were annoying to maintain , not very flexible, and they would often end up wasting power for no real reason. When you manually operated lights, doors, or other electrical appliances you basically needed continuous human effort, and the whole thing couldn't really offer true automation support. Then along came IoT and wireless communication technologies, and yeah, they changed the whole home automation landscape. The early automation systems often used Bluetooth style communication, plus microcontroller driven appliance control mechanisms. In that stage they could still do some helpful things, like wireless switching and remote operation from a smartphone, nothing fancy but it worked. More recently, embedded systems and IoT technologies have improved smart home automation in a noticeable way. Microcontrollers such as Arduino UNO offer a more adaptable and low-cost approach for building automation projects. Meanwhile wireless communication modules like HC-05 Bluetooth help keep communication steady between smartphones and electronic devices

III. PROBLEM STATEMENT

Current home automation systems are a bit fragmented, like each gadget sort of runs on its own rather than being tied into one main platform. so management becomes awkward, energy use can creep up, security coordination stays pretty weak, and daily convenience for people goes down. Most of the proposed solutions also miss adaptive learning, and the communication between devices isn't really smooth. There's a clear requirement for an intelligent, affordable , and scalable setup that gives centralized control, improves energy efficiency, and makes sure the home stays secure and comfortable to live in.

IV. LITERATURE REVIEW

Recent studies in smart home automation kinda keep circling around how to blend Internet of Things, (IoT) bits with wireless communication approaches in order to raise convenience , security , and energy efficiency inside homes. A lot of researchers built different automation setups, usually combining Arduino with Bluetooth, Wi-Fi, and mobile applications, mainly to manage home devices from a distance. Bluetooth based home automation systems are often chosen because they are low in cost, easy to set up, and they use relatively low power. For example, some works proposed solutions that use an Arduino UNO board alongside an HC-05 Bluetooth module. With that setup, lights , fans , and other electronic appliances can be governed from Android smartphones. In practice, these solutions keep wireless communication inside a fairly limited operational range. So, they tend to fit small-scale smart home scenarios, better than bigger installations. Alongside remote control, smart security and door automation have also turned into major themes. Multiple studies introduced automatic door operation using servo motors, motion sensors, plus wireless communication mechanisms, all intended to boost home security and also improve user comfort. Meanwhile, AI driven automation systems can observe user patterns, then do more intelligent, step-by-step decisions for how appliances should be control

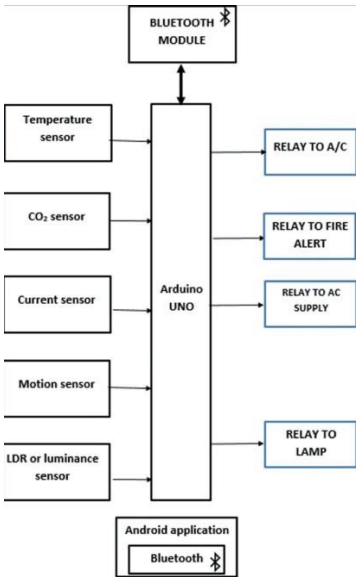
V. METHODOLOGY

The proposed IoT Based Home Automation System is simple and structured methodology of wireless appliance control and automation. The process starts when the user gives commands through an Android mobile application that is connected via Bluetooth communication. The HC- 05 Bluetooth module receives wireless signals and sends them to the Arduino UNO microcontroller.

The commands are received by the Arduino UNO and the required operations such as

switching ON/OFF of LEDs and also the servo motor operation for automatic door control are executed. The system uses LEDs to represent the household lighting systems and servo motor to automate the door opening and closing operations. The system operation in total consists of command transmission, Bluetooth communication, signal processing and appliance control. The methodology guarantees reliable wireless communication, ease of operation, low power consumption.

VI. SYSTEM ARCHITECTURE



The diagram represents a Smart Home Automation System based on an Arduino UNO microcontroller. In this system, different sensors are connected to the Arduino to monitor environmental conditions and automatically control home appliances. The temperature sensor measures room temperature and sends data to the Arduino. If the temperature increases beyond a set limit, the Arduino activates the relay connected to the air conditioner (A/C). The CO_2 sensor detects harmful gas levels or smoke and triggers the fire alert system during abnormal conditions.

A current sensor is used to monitor electrical power consumption and detect overload conditions in the AC supply. The motion sensor identifies human movement, which helps in security monitoring and automatic appliance control. The LDR or luminance sensor measures light intensity and controls lamps automatically depending on daylight availability.

The Bluetooth module enables wireless communication between the Arduino UNO and an Android application. Using the mobile application, users can monitor sensor data and control

devices remotely through Bluetooth connectivity. Relays act as switches between the Arduino and electrical appliances such as lamps, AC supply, and fire alarms. Overall, the system improves energy efficiency, safety, comfort, and convenience in modern smart homes.

VII. FUTURE SCOPE

The system enables users to activate its advanced IoT and automation systems which enhance its operational performance. Users can now control their appliances from any location through internet connectivity because the system includes Wi-Fi-based remote monitoring systems as its primary enhancement. The system requires motion sensors to activate automatic lighting systems which will achieve two main goals: better energy efficiency and improved smart automation system performance. Smoke and gas detection systems can also be added to improve home safety and security. Automation systems become more advanced through Artificial Intelligence (AI) and Machine Learning (ML) technologies which analyze user behavior to create automated appliance control systems that follow regular usage patterns. The system supports expansion through ESP8266 and ESP32 Wi-Fi modules which enable advanced IoT functionality together with remote access capabilities.

VIII. CONCLUSION

The IoT Based Home Automation System successfully demonstrates the automation of household appliances using Arduino UNO and HC-05 Bluetooth technology. The proposed system provides a simple, low cost and user friendly solution for smart home automation.

The project improves energy efficiency and comfort and home security through wireless communication and automation technologies. The Android application can control the lights and door mechanisms easily by Bluetooth communication The smart home automation system improves convenience, security, and energy efficiency by connecting devices through IoT technology. It enables remote monitoring and control, making daily life smarter, safer, and more comfortable for users.

IX. REFERENCE

1. D. Pavithra and R. Balakrishnan, “IoT based monitoring and control system for home automation,” Proc. IEEE Global Conference on Communication Technologies, 2015.
2. R. Piyare and M. Tazil, “Bluetooth based home automation system using cell

phone," IEEE 15th International Symposium on Consumer Electronics, 2011.

3. N. Sriskanthan and F. Tan, "Bluetooth based home automation system," Microprocessors and Microsystems, vol. 26, no. 6, pp. 281–289, 2002.
4. S. Kumar and S. R. Lee, "Android based smart home system with control via Bluetooth and internet connectivity," International Journal of Smart Home, vol. 8, no. 4, pp. 15–26, 2014.
5. A. Alheraish, "Design and implementation of home automation system," IEEE Transactions on Consumer Electronics, vol. 50, no. 4, pp. 1087– 1092, 2004.
6. A. R. Delgado, R. Picking, and V. Grout, "Remote-controlled home automation systems with different network technologies," Proc. 6th International Network Conference, 2006.
7. V. Vujovic and M. Maksimovic, "Raspberry Pi as a wireless sensor node: Performances and constraints," Information and Communication Technology Forum, 2014.
8. A. ElShafee and K. A. Hamed, "Design and implementation of a WiFi based home automation system," World Academy of Science, Engineering and Technology, vol. 68, pp. 2177–2180, 2012.
9. N. Dickey, D. Banks, and S. Sukittanon, "Home automation using cloud network and mobile devices," IEEE SoutheastCon, 2012.
10. P. Palensky and D. Dietrich, "Demand side management: Demand response, intelligent energy systems, and smart loads," IEEE Transactions on Industrial Informatics, vol. 7, no. 3, pp. 381–388, 2011.
11. J. Byun and S. Park, "Development of a selfadapting intelligent system for building energy saving and context-aware smart home," IEEE Transactions on Consumer Electronics, vol. 57, no. 1, pp. 90–98, 2011.
12. S. Sendra, J. Lloret, M. Garcia, and J. F. Toledo, "Power saving and energy optimization techniques for wireless sensor networks," Journal Communications, vol. 6, no. 6, pp. 439–459, 2011.
13. of H. Ardam and I. Coskun, "A remote controller for home and office appliances by telephone," IEEE Transactions on Consumer Electronics, vol. 44, no. 4, pp. 1291–1297, 1998.
14. M. A. Mazidi, J. G. Mazidi, and R. D. McKinlay, The 8051 Microcontroller and Embedded Systems, Pearson Education, 2006.
15. K. Gill, S.-H. Yang, F. Yao, and X. Lu, "A ZigBee-based home automation system,"

IEEE Transactions on Consumer Electronics, vol. 55, no. 2, pp. 422–430, 2009.

16. S. Sharma, "Home automation system using IoT," International Research Journal of Engineering and Technology (IRJET), vol. 5, no. 3, pp. 2435–2
17. M. Chan, D. Estève, C. Escriba, and E. Campo, "A review of smart homes—Present state and future challenges," Computer Methods and Programs in Biomedicine, vol. 91, no. 1, pp. 55– 81, 2008.
18. C. Gomez and J. Paradells, "Wireless home automation networks: A survey of architectures and technologies," IEEE Communications Magazine, vol. 48, no. 6, pp. 92–101, 2010.
19. P. Suresh, J. Daniel, V. Parthasarathy, and R. Aswathy, "A state of the art review on the Internet of Things (IoT) history, technology and fields of deployment," International Conference on Science Engineering and Management Research, 2014.
20. R. Khan, S. U. Khan, R. Zaheer, and S. Khan, "Future Internet: The Internet of Things architecture, possible applications and key challenges," International Conference on Frontiers of Information Technologypp,257,260,2012