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Digitization of Real Time Systems as home

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Abstract: Digitization of Real Time Systems as Home is an Automation System in which we control the home's electrical components digitally. In this project we developed an application as a digital platform for controlling system. And the availability of the system will be ensured by the use of Internet. Our System helps users to access their home appliances easily and safely without any change in existing system in their home. So that without changing the actual components of the home, it's implemented by adding digital interface between user and home. General Home Automation consists of replacement of each component with IoT devices. The availability of the control is limited to small scale area or local control area. Replacement of each component results in increment of investment which is very costly. The connection to the system requires same network to operate. A home automation system controls lighting, temperature, multimedia systems, and appliances. Since these devices and sensors are connected to common infrastructure, they form the Internet of Things. A home automation system links multiple controllable devices to a centralized server.

Keywords: Home automation, IoT, Raspberry Pi, Firebase, Electrical Appliances, Android app.

I. INTRODUCTION

Nowadays, the digitization of appliances we use daily in our home is taking place. The rapid growth of internet is influencing the technology we see around us [2]. The modernization of environment can be achieved by enabling it to get connected with the power of internet. Making the system available online is essential for flexibility, availability and overall control of the system.

The interface should be provided between real-time systems and user of the system. The benefit of the system is more enhanced in the areas in which human contact is not possible. Using the technology for things to automate the work, including less human effort for ease of human being. Daily operations like routines become more effective with less efforts.

In this era of internet, virtual presence of a real-time system makes it more comfortable to operate. The interactive interface also provides voice-based commands which make it more human-friendly [5]. The system is useful in other specialities like banks, hospitals, and educational sector as well which provides authorization for the same [1]. General Home Automation consists of replacement of each component with IoT devices. The availability of the control is limited to small scale area or local control area. Replacement of each component results in increment of investment which is very costly. The connection to the system requires same network to operate. Digitization of Real Time Systems as Home is an Automation System in which we control the home's electrical components digitally. In this project we developed an application as a digital platform for controlling system. And the availability of the system will be ensured by the use of Internet. Our System helps users to access their home appliances easily and safely without any change in existing system in their home. So that without changing the actual components of the home, it's implemented by adding digital interface between user and home. The importance of proposed system is to avoid replacement of each component in system, to make system available to control from everywhere in the world and to avoid the expensive cost of the components to be used.

II. RELATED LITERATURE

Home Automation is being used in various applications like sensors, lightings, heaters, and devices [3]. Internet provides 100% efficiency as it saves time and also helps to manage energy consumption which also saves money as well as provide security to the home [4]. AI powered interface provides better communication between application and its uses. AI with voice commands helps in easing the process. Several home automation systems are capable of automating the functionality of particular devices. It is also expensive in cost to replace existing devices with automated one. The connectivity area and control field is limited to the local network only. The Bluetooth interface have no need of internet connectivity to operate but also has the limitations of less range area for performing operational functions. The structures in which traditional appliances system is established takes more cost for replacement in automation which includes instalment of smart devices and internet connection [5]. Although smart tools had been implemented in past technologies, but due to limited execution of interconnectivity between components resulted in less accessible devices [3]. Several systems are connected remotely through the world wide web helps in protection to the situations like fire accident and inform the user about the place with an alert message [2].

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III. WORKING OF PROPOSED SYSTEM

As the user open the application, one interacts with the virtual representation of digitized home through user interface. Then either user need to register for the first time by going for filling the credentials or if existing user tries to access the application then one is asked the user account credentials i.e. Username and passwords. After filling the credentials, this data is being send to firebase for further authentication. The application also provides features like sign in with google and forget password. This functionality provides authentication, confidentiality and integrity of the data and also security of the user and its automated system.

After successful login user gives input from the components provided in the app. The data or status is send to Google Cloud Firestore for the storage as well as management of data. From Google Cloud Firestore, Raspberry Pi fetch the data and operate on it to enable or disable (ON/ OFF) GPIO pins as per the data. As the components have been switched that status is again being acknowledged to the cloud and resulting appropriate status changed in application as well.

Not only digital interface but also user can interact with system manually by switching the components on or off directly. Even though, after manual switching takes place the components also connected to raspberry pi device sends latest status to the cloud for further manipulation of information.

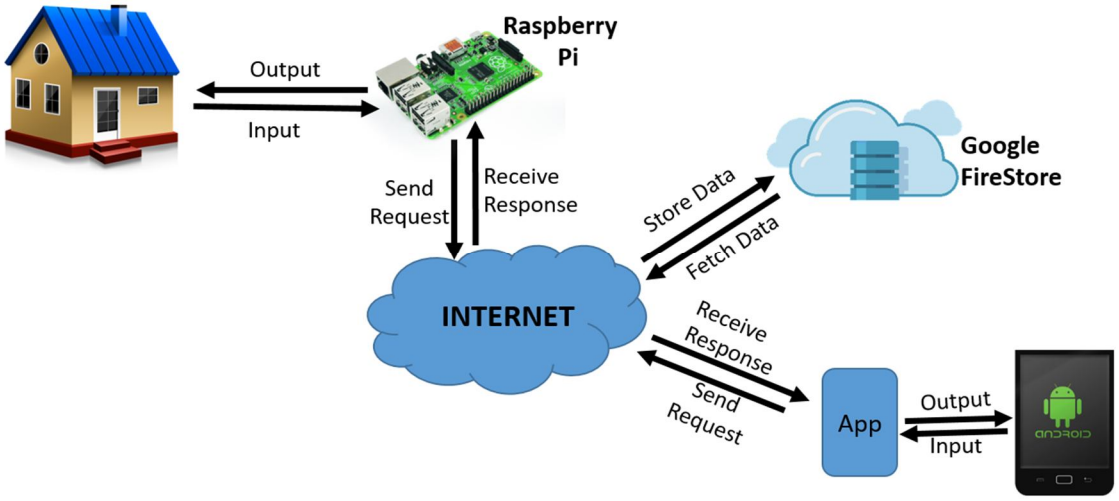


Figure 1: System Architecture

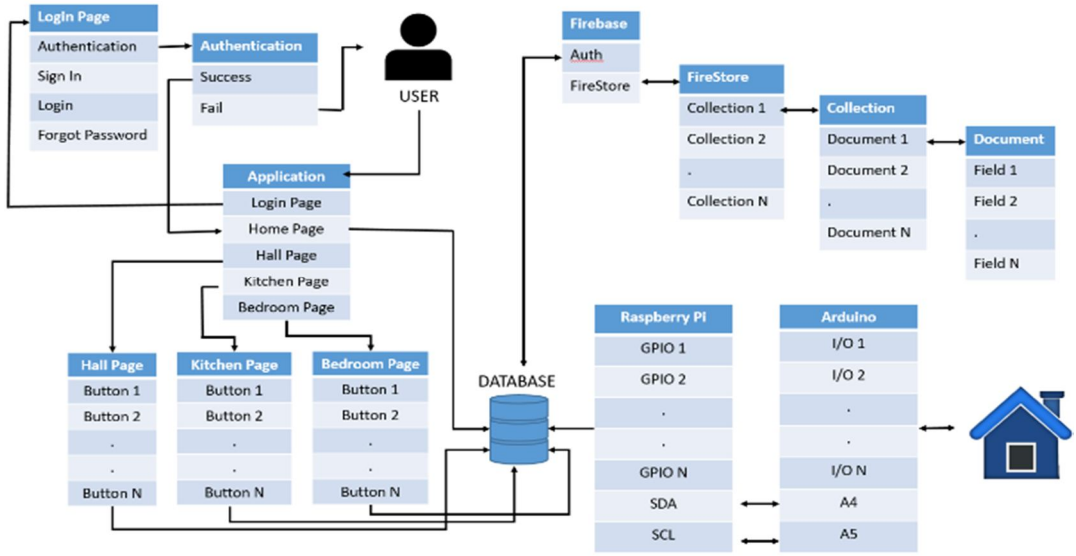


Figure 2: Database Implementation

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IV. HARDWARE DESCRIPTION

A. Raspberry Pi

Raspberry Pi 4 B is the latest embedded platform that has been used which has many in-built features. The platform is well-known due to its low cost and robust performance. It is a called credit-card sized computer that can be plugged into a TV or computer screen and uses standard mouse and keyboard. The latest module has a 64-bit quad-core processor along with 1.4GHz operating frequency and dual-band 2.4GHz. It also offers other key features including Bluetooth (BLE) 4.2, faster Ethernet, PoE capability, and wireless 5 GHz LAN.

B. Relay Boards

Relay boards are computer boards with an array of relays and switches. They have input and output terminals and are designed to control the voltage supply. Relay boards provide independently programmable, real-time control for each of several on board relay channels.

C. Resistors

The resistor is a passive electrical component that creates resistance in the flow of electric current. In almost all electrical networks and electronic circuits they can be found. The resistance is measured in ohms (Ω). An ohm is the resistance that occurs when a current of one ampere (A) passes through a resistor with a one volt (V) drop across its terminals.

V. SOFTWARE DESCRIPTION

A. IDE Python 3.5

An integrated development environment which is abbreviated as IDE is a software application that offers inclusive amenities to the computer programmers for software development. An IDE usually comprising of as a minimum a debugger, source code editor, and build automation tools. Some IDEs, like Eclipse and NetBeans, encompass the essential interpreter, compiler, or both. In this project we have used the tool to configure a RFID authentication module and MySQL database. A various tools including version control system are integrated into the system which can be used to streamline the build of a graphical user interface (GUI)

B. Android Studio

Android Studio provides a unified environment where you can build apps for Android phones, tablets, Android Wear, Android TV, and Android Auto. Structured code modules allow you to divide your project into units of functionality that you can independently build, test, and debug.

VI. ADVANTAGES AND DISADVANTAGES

A. Advantages

1) No need of replacing entire system devices.
2) Saves human effort and money as well.
3) Availability of the system is everywhere.
4) User-friendly Interface.

B. Disadvantages

1) Possible mistakes by Human errors.
2) Physical Damage is possible.

VII. SYSTEM PROTOTYPE AND RESULTS



Figure 3: Inside View of the System

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Figure 4: Outside View of the System

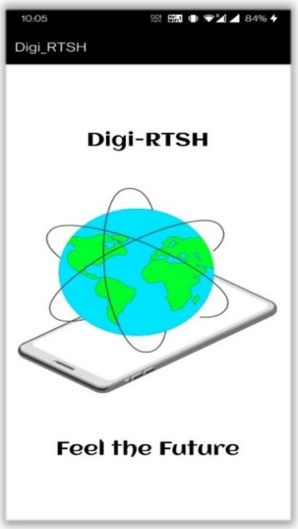


Figure 5: Application Splash Screen Page



Figure 6: Application Login Page



Figure 7: Application Home Page



Figure 8: Application Room Page

VIII. FUTURE SCOPE

The Digitization of Real-Time System as Home includes enabling the operations of devices digitally. Additionally, the system can be implemented in fields like medical, educational, geographical technologies, gaming and many more sectors. The enhancement in functionality and improvement in design of the system may result into modern home environment and also help to grow smart cities and smart societies.

The use of Artificial Intelligence, Machine Learning, Augment Reality, Virtual Reality, etc. technologies and execution of big data with the system also can help to provide overall interconnected and automated digitized real time systems.

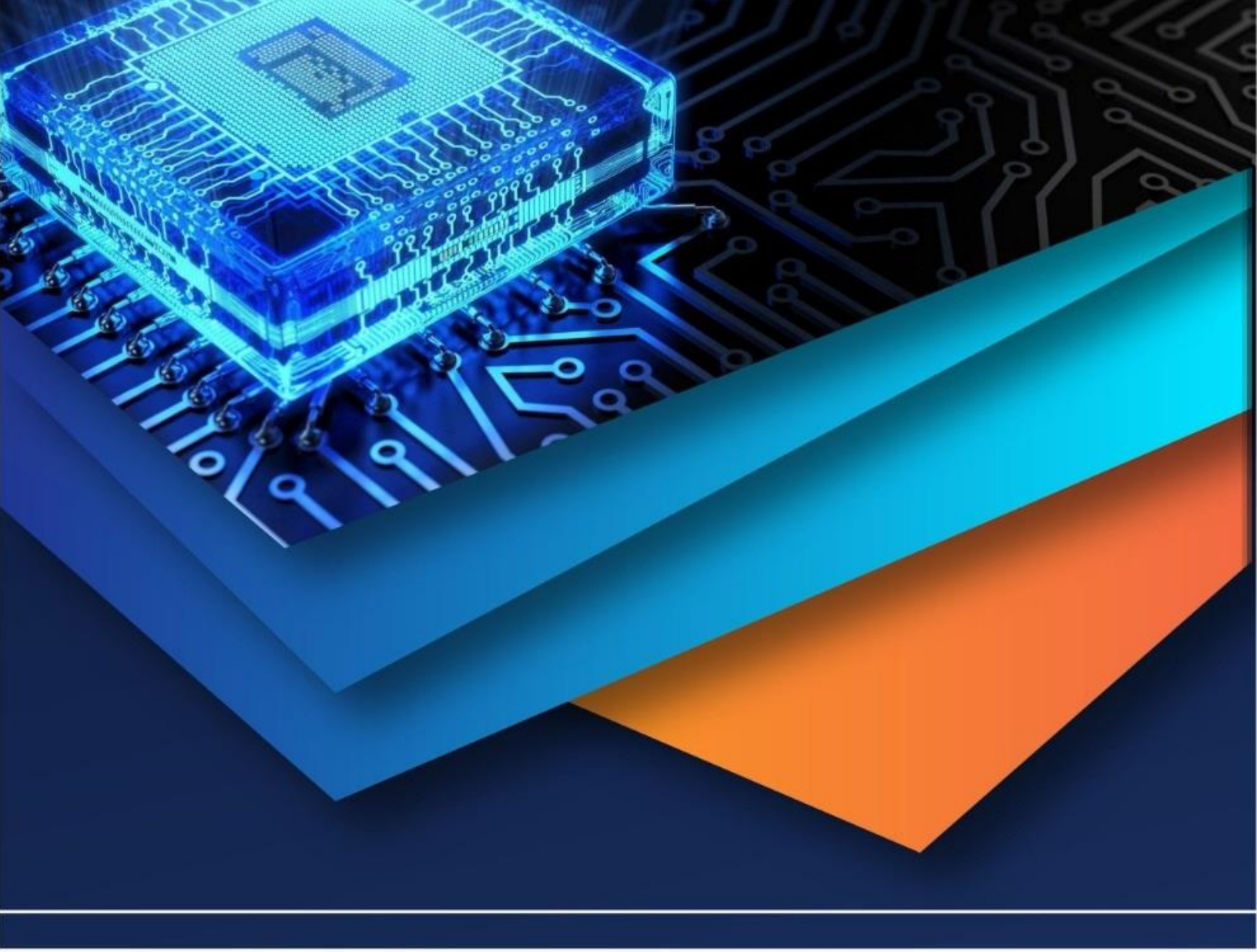
The use of system in rescuing operations also could be implemented for minimizing the efforts, casualties and improving the efficiency of operations and which also results in saving time, money, lives. The further improvements and implementations for the development of whole project as digitization of real-time system could include better future options.

IX. CONCLUSION

The Digitization of Real Time System as Home is an effective and efficient way to implement and enhance the usability, accessibility and overall consistency of the User operations. Due to worldwide availability of the system and flexibility of the operations with the virtual presence of the components in real-time system as home, the consistency and reliability of the system and user experience improved.

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