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RESEARCH ARTICLE

INNOVATIVE SMART HOME AUTOMATION SYSTEM USING ADVANCED EMBEDDED SYSTEM PLATFORM WITH ARTIFICIAL INTELLIGENCE AND INTERNET OF THINGS

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Abstract

The speedy advancement of electrical, computer, and information technologies has made it possible to build and develop a variety of so-called embedded systems that are employed for awide range of demand and goals, as well as for numerous real-world applications. Such systems are created and put into apply in order to be as closely as possible customized to particular applications and to effectively carry out necessary functions. Additionally, such systems should be as simple to utilize, as compact as possible, as inexpensive as possible, and as energy-efficient as possible. Now a day, automation word is very common in different sectors like industry, garden, restaurant, hospitals and house and so on. Applying sensors and Advanced Embedded System Platforms (AESPs) we can implement Innovative Home Automation Systems (IHAS), such kind of systems append Internet of things (IoT), System on Chip (SoC) and other communications standards on a one board and can be supported with Artificial Intelligence (AI). To present a short review of Innovative Home Automation Systems (IHAS) using Advanced Embedded System Platforms (AESPs) with AI and IoT support. Depending upon the application, implementation of AESP along with AI decrease the cost of IHAS and enhances the system reliability, safety, compactness, energy management and user-friendliness.

Keywords: Artificial Intelligence, Internet of Things, Innovative Home Automation, Advanced Embedded System.

Introduction

The main goal of this paper is to design and implement smart home automation using IoT which can control all the objects that are connected to the internet and with a better security. The system has a great flexibility as it uses wifi technology which is

easy to implement and can be connected to every device. Manage ability is also better as it can easily change the ports or addresses of the devices whenever we want. Using various sensors, we can even make your smart home more efficient and secured. This system is a low cost design with time and energy being saved.

IoT has revolutionize the business strategies, through this enterprise companies built a proprietary system to collect and organize data that is secure and complaint, and uses connected devices to transmit more data to the system. Parcel service companies use sensors on their vehicle to monitor the speed of a car, mileage, and number of stops. IoT has wide range of application, these applications are categorized as follows:

Building and Home Automation:-

Buildings and homes are automated by means of temperature. Lights, AC and Fansare controlled based on room temperature observed. Energy Optimization is one of the prime concern of IoT. Connected Appliances is another application based on IoT, which includes; smart refrigerators, smart vacuum cleaner etc.

Smart Cities:

Residential E – meters is used to improve the efficiency of service and meet residents meet by telling us the amount of electricity consumed and its demand. Smart Street Lights are used to monitor switching, voltage, power, alarm, energy consumption and also set parameters and power line, lamp failure alarm etc. Surveillance cameras used for security purpose, operate in hidden mode, capture live events and save as video file, switching on and off, broadcast video live on internet.

Manufacturing:

IoT plays a vital role in manufacturing, these applications include: Real time inventory, the sale and inventory reports, more efficient manufacturing decisions, increase manufacturing agility, save money, boost sales. Asset Tracking help to control asset location, optimizing asset availability, increase efficiency by minimizing stockout cases.

Wearables:

Entertainment Google glass is one example which uses exiting google apps like Gmail and google. Healthcare some medical instruments when connected to patient's body helps doctor to monitor him/her if he/she is not physically present there; Location and Tracking / Pet Tracking uses micro chips which are placed on person / pet body to track its location easily.

Healthcare:

Hospital Asset tracking smart cabins helps us to track any particular patient data/record and tells the location of different asset placed in smart cabins. Access Control, a smart medical instrument when applied to patient body tells him/her about present condition and recommended him/her about the type of specialist doctor. Ambulance Telemetry, having connection with internet and treat/diagnose patient in a community as well as in the hospital. Predictive Maintenance device connected to patient's body and predict that when and how much medication is needed.

Retail:

Shopping Applications smart screens provide buyers deeper info about the items they are looking at, including up sells. A smart cabin tells us about over stock, out of stock. Supply Chain Management can connect the supplying machine with the internet and control it with our smart phones from anywhere.

Environment:

Water Pollution sensors placed in the water channels, they detect the harmful entities above the safe limit so we can apply remedies. Air Pollution detectors placed at different places to detect the air pollution and alarm at specific air pollution and configuration control.

LITERATURE REVIEW

Effective Home Automation Using Android and Embedded System (2020)

A cost-effective home automation system which is contains combination of Android smart mobile or tablet ora laptop and embedded system which include

Arduino Due Board, Ethernet Shield module and Relay circuit. Also, most researches use an open source or a payed software to be applied under Android media of the smart phones, but here they need interface Android pages are designed and implemented by researcher which reduce the cost of the proposed system effectively.

Home automated system using Bluetooth and an android application (2021)

Once the system is connected, the customer controls the electrical appliances joined to the home-automated system, which can also be controlled using voice prompt with the help of a Google assistant inbuilt with the android smart mobile. The system switches the house appliances ON and OFF utilize the android app, Bluetooth module and voiced prompt. It can also be timed to switch off appliances for a pre-time of 12hours, thus making the application simple and convenient to operate via a smart- phone.

Brain-Computer – Inter face – Based Smart –Home Inter face by Leveraging Motor Imagery Signals (2023)

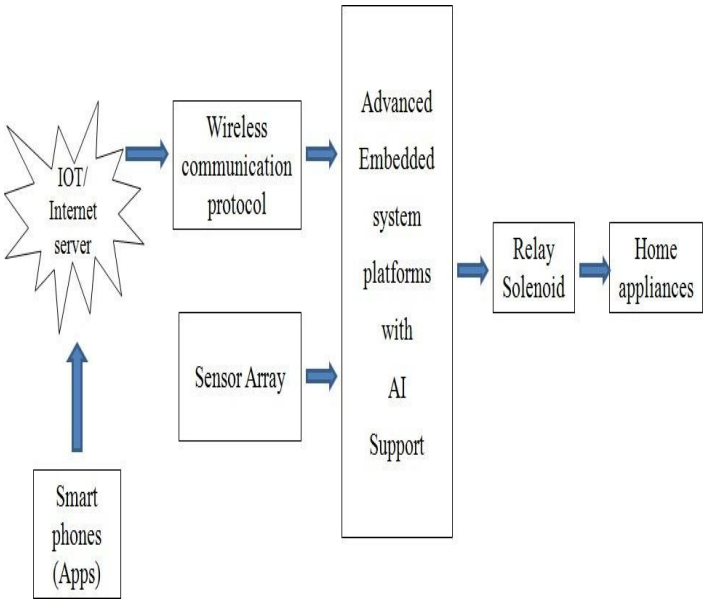
EEG signals were recorded by utilizing the EMOTIV helmet and Open Vibe, a free and open source platform that has been used for EEG signal feature extraction and classification. After being classified, such signals are then changed into control commands, and the open communication protocol for building automation KNX is proposed for the tasks' execution, i.e., the regulation of two switching gadget. The experimental output from the training and testing levels provide evidence of the effectiveness of the customers' intentions classification, which has subsequently been utilized to operate the proposed home automation system, allowing customers to operate two light bulbs.

Embeddedsystem-based Home Automation and Security Surveillance Using Raspberrypi

In this application two main points will be worked out for house automation. First this system based on automatically sends messages to house owner when any other person is pressing the doorbell. The second one is environment sensing inwhichit gather andresearchdata andallows user tocustomizethe settings accordingtothe needs. The entiregadget whichis utilizedfor homeautomationis user friendly. This system utilizes a Cluster of sensors, Raspberry Pi device as server system. The main usage of this present system is that it is a customer-friendly, responsive, safe system which provides a home automation solution to the customers.

PROPOSED SYSTEM

This system consists of Smartphone, Web application, Arduino board, Relay module, Wifi module. The appliances which are connected to Arduino Board using Relaymodule is controlled through Internet.



BLOCKDIAGRAM

Arduino Micro controller

Arduinois a micro controller which is better for performing embedded activities. IoT system can be developed by many different boards but the best and simple board which is easy to use and cost efficient is Arduino. The microcontroller is Arduino mega 2560 which can be connected to maximum of 40 devices at a time. The cost of board is very low as compared to other processors. It is connected to wifi module and relays that are used for controlling current in devices.

Relay

Relay is an electric switch that can be used to control power current for controlling devices. Basically it is used for switching ON/OFF the device or to vary the light brightness. Relays are connected to each device that are used in the system. Other part or end is connected to Arduino board. Relays have a coil which will generate current and allows current to pass and then again disconnect when not in use.

Wi-FiTechnology

Wi-Fi is a wireless technology which is better than any other form of technology for the system. Wi-Fi is connected to the Arduino with the help of Wi-Fi module ESP-8266. Arduino has an IP address which is assigned to the libraries of the Wi-Fi module and assigned at the server side for communication. There is a Wi-Fi router used for creating hotspot through which Arduino can be connected to web server. There is different technology used for internet like GSM or GPRS but the cost will rise and if there is a problem in module then it is hard to detect. Also the cost of Wi-Fi module is much less than other technologies. Fig.2 shows the connection between Arduino and ESP8266- 12.

Sensors

Sensor is an object which corresponds in the environment according to the action performed. Various different sensors are used additionally for security and efficiency of the system. Fire sensor can be used to detect the presence of flame or fire. PIR sensor canused to detect any intrusion. This sensor can be placed at door to detect any unwanted thing. This sensor is used for security purpose. Current sensor can be used which will give the details of the power consumed by each device every time when we need. This will give the efficiency of our system.

Web server

The system which provides services and information to the user is a web server. It stores all the data on web in real time. Website is developed in PHP MySQL. Web server is connected to Arduino where all the request is send and updated in server and sends it to Arduino. We can set at imer after which Arduino checks the servers every ti mean update is made. Connection takes place by wifi which assigns IP address to it. Server performs all the activities in real time. Web server will help to get alert messages when sensors feel or perform any action.

Androidsmart-phone

Android application is developed in Android studio for controlling devices offline. Application will get connected to the same wifi in which Arduino is connected and we can control it when there is no cellular connectivity on cell phone. Android smart phone will therefore help to communicate when we are at home. Disabled or handicapped people can control devices with the help of smart-phone. They can even get updates or alerts when there is any change or actions performed by sensors.

METHODOLOGY

- Firstly, there are some toggle buttons that sends the GPIO states to the data base to manually control the home appliances and window.
- Next, the ESP 8266 will make HTTP Get request to the server through the Arduino IDE.
- Sensor values are evaluated if H1 (PIR Sensor), H2 (Rain Sensor) equals to one and H3 (Piezo Sensor) equals or exceeds high.
- After checking the values, the light gets on and window get close.
- If any of the sensors 'values are low, the lights will remain off.
- When the rain sensordries out, the window opens.

Conclusion

The system can be designed in such a way that it is useful for Home Automation with better security and flexibility. Sensors give more advantages to the scope of the project. It features the most unique e sign with low cost implementation, secure, remotely controlled system that can be access universally. This concept is also quite adaptable; you can quickly control multiple outputs and even connect boards to your server using your web application. The proposed algorithm was practically implemented on Arduinomega for the testing purpose. The result shows that, the algorithm is capable to observe the

motion of a human being, to observe the intrusion by monitoring the line of sight communication between door and senor.

FUTURE WORK

Brain Controlled Interface (BCI) technological advances, disabled people as well as elderly people who have trouble using house hold equipment can get around the restriction. BCI will use non-in vasi veel ectrodes positioned all over the scalp to connect the brain's nerves and electronics. The Neuro vision software is used to connect to and control the Brain sense headsets. The electrodes will gather brain waves, convert them to blink waves, and then turn on the relevant appliances. It enables paralysed and crippled people to perform tasks independently and manage appliances in the automotive, industrial, remote control, and other industries.

References

1. "A P.A.HarshaVardhini, Y.Murali, A.Krishna, "IndustryParameters Monitoringand Controlling system based on Embedded Web server", Vol.6, Issue.2, February2019.
2. Mohan, A. and K, S. 2023. Computational Technologies in Geopolymer Concrete by Partial Replacement of C&D Waste. International Journal of Intelligent Systems and Applications in Engineering, Feb. 2023.
3. P.A.HarshaVardhini, K.Murali Chandra Babu, " Implementation of Low Cost IoT based Home Automation system on Spartan FPGA", Recent Advances in Electronics and communications RAECE- 2K17/Special issue. International Journal of Recent trends in engineering and Research, Dec-2017.
4. Mohan, A., Prabha, G. and V., A. 2023. Multi Sensor System and Automatic Shutters for Bridge-An Approach. International Journal of Intelligent Systems and Applications in Engineering Feb. 2023.
5. P.A.HarshaVardhini,B.Obulesu,"HardwareImplementationofAutomatedHomeSecuritySystemusingSpartan 3 FPGA", National Conference on Recent Innovations in Engineering and Technology (RIET-2017)/International Journal of Trendin Research and Development (IJTRD), December2017.
6. P.A. HarshaVardhini, V.Hanku, "Energy Efficient Implementation of IoT based Home Irrigation System Using RaspberryPi",1st International Conferenceon Advanced Technologies in Engineering Management & Sciences Nov 2017.

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