Development of Low-Latency and Real-Time Automatic Speech Recognition System

[1]Dr. K. Prasanthi Jasmine, [2]Ch. Mohana Krishna, [3]M. Saketh, [4]M. Sairam

[1]Professor, [2]Student, [3]Student, [4]Student
[1]Electronics and Communication Engineering,
[1]ALIET, Vijayawada,

I.ABSTRACT: In the context of advancing modernization, automation has emerged as a pivotal enabler, particularly evident in the realm of home automation. This technology empowers individuals to seamlessly control various electrical appliances such as fans, televisions, and lighting systems. With the pervasive influence of modern technology shaping contemporary lifestyles, the concept of home automation has gained significant traction. This paper delves into the intricacies of smart home appliance control leveraging the ubiquitous Android smartphones. Through the integration of an Arduino microcontroller, Bluetooth module, and Android device, the project endeavors to establish an affordable, intuitive, and adaptable system. By harnessing the capabilities of these technologies, the aim is to provide users with enhanced convenience and efficiency in managing their domestic environments. This endeavor underscores the convergence of cutting-edge hardware and software solutions to cater to the evolving needs of modern living.

Keywords: Arduino, Bluetooth, DHT11 sensor
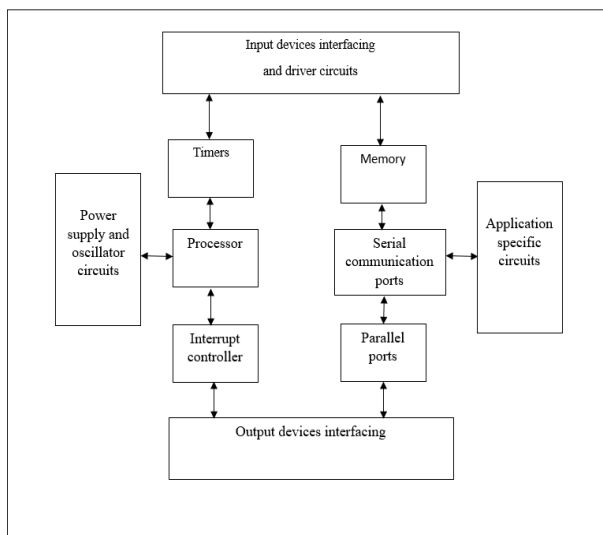
II.INTRODUCTION:

Nowadays, we have remote controls for our television sets and other electronic systems, which have made our lives real easy. Have you ever wondered about home automation which would give the facility of controlling tube lights, fans and other electrical appliances at home using a remote control? Off-course, yes! But, are the available options cost-effective? If the answer is No, we have found a solution to it. We have come up with a new system called Arduino based home automation using Bluetooth. This system is super-cost effective and can give the user, the ability to control any electronic device without even spending for a remote control. This project helps the user to control all the electronic devices using his/her smartphone. Time is a very valuable thing. Everybody wants to save time as much as they can. New technologies are being introduced to save our time.
 To save people's time we are introducing Home
Automation system using Bluetooth. With the help of this system, you can control your home appliances from your mobile phone. You can turn on/off your home appliances within the range of Bluetooth**.**

III.EMBEDDED SYSTEM IMPLEMENTATION :

In the realm of modernization, automation has become increasingly integral, with home automation systems exemplifying this convergence of technology and convenience. These systems, comprising both hardware and software components, facilitate the seamless control of various electrical appliances, ranging from fans to televisions and lighting systems. A defining characteristic of embedded systems is their ability to deliver outputs within stipulated timeframes, enhancing precision and efficiency. From commonplace devices like microwaves and calculators to sophisticated applications such as TV remote controls and home security systems, embedded systems have permeated numerous facets of daily life.

Embedded systems typically encompass hardware and software components, each playing a crucial role in system functionality. The hardware aspect comprises essential elements like microprocessors or microcontrollers, input/output interfaces, user interfaces, memory, and display units. These components form the foundation upon which the embedded system operates, providing the necessary computational and operational capabilities. Microprocessors and microcontrollers serve as the core processing units, facilitating the execution of tasks and interactions with external peripherals.

Distinguishing between microprocessors and microcontrollers, the former represents a central processing unit (CPU) integrated onto a single chip, allowing for the attachment of required amounts of ROM, RAM, and I/O ports. Conversely, microcontrollers encapsulate an entire computing system within a single chip, featuring fixed amounts of on-chip ROM, RAM, and I/O ports. While microprocessors offer flexibility and expansibility at the cost of higher expenses and larger physical footprints, microcontrollers offer cost-effectiveness and compactness, catering to specific-purpose applications.

IV.ARDUINO UNO FOR BEGINNERS:

The Arduino Uno is a microcontroller board designed for beginners, educators, and hobbyists to create interactive electronics projects. Its affordability, ease of use, and open-source nature make it a popular choice. The board features an Atmega328 microcontroller, the brain that processes code and controls connected devices. It also has 14 digital and 6 analog I/O pins for interacting with external components like sensors and actuators. The Arduino Uno communicates with a computer via USB for programming and data transfer, and can be powered by USB cable, external battery, or AC adapter.

Software development for the Arduino Uno is done using the Arduino IDE, a free, cross-platform application. The IDE simplifies programming with functions and libraries, even though C and C++ are the supported languages. This user-friendly environment makes Arduino accessible to those new to coding.

The Arduino Uno's versatility extends to a wide range of applications. From building and controlling robots with sensors and motors to collecting and storing data for analysis, the possibilities are vast. It can be used for home automation tasks like controlling lights and thermostats, or for creating

interactive art installations with light displays and sound effects. Even in scientific research, the Arduino Uno proves valuable for prototyping and testing experiments with sensors and actuators.

Microcontroller	ATmega328P – 8.bit AVR family microcontroller
Operating Voltage	5V
Recommended Input Voltage	7-12V
Input Voltage Limits	6-20V
Analog Input Pins	6 (A0 – A5)
Digital I/O Pins	14 (Out of which 6 provide PWM output)
DC Current on I/O Pins	40 mA
DC Current on 3.3V Pin	50 mA
Flash Memory	32 KB (0.5 KB is used for Bootloader)
SRAM	2 KB
EEPROM	1 KB
Frequency (Clock Speed)	16 MHz

There are several advantages to using Arduino Uno. Compared to other development platforms, it's a cost-effective way to enter the world of electronics. The online community and wealth of resources offered by the Arduino platform make learning easy for beginners. Additionally, the open-source nature allows for customization to fit specific project needs. Finally, the large and active Arduino community provides ongoing support, tutorials, and project inspiration, ensuring a successful learning journey.
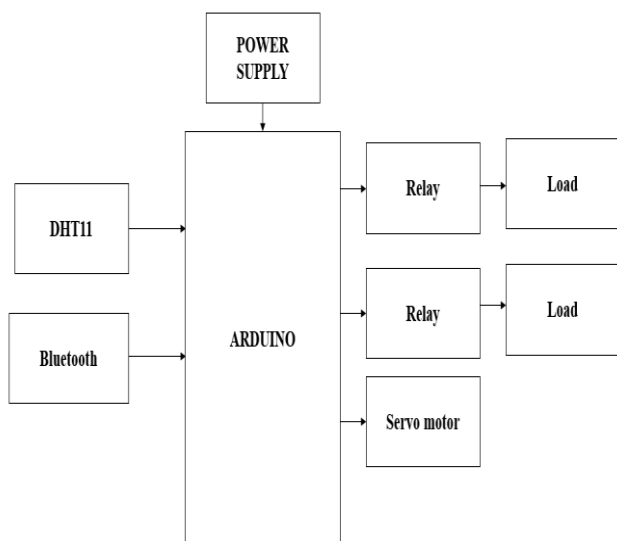
V.CODE FOR THE ASR MODEL :

Code

VI.ADVANTAGES AND APPLICATIONS:

ADVANTAGES :

Arduino boards offer numerous advantages that make them an ideal choice for both beginners and experienced users. Firstly, they are cost-effective, making them accessible to a wide range of users. Additionally, the Arduino Software (IDE) is cross-platform, compatible with Windows, Macintosh OSX, and Linux operating systems, providing flexibility in development environments. The programming environment is simple and user-friendly, suitable for beginners while still offering advanced capabilities for experienced users. Both the software and hardware are open source and extensible, allowing for customization and improvements by the community. Arduino boards are versatile, capable of reading various inputs and generating outputs, making them suitable for a wide range of applications. They also boast a large and active community, providing ample support and resources for users. Furthermore, Arduino boards are easily integrated with other hardware and software, enhancing their compatibility and usability. Finally, they are widely available for purchase online and in stores, ensuring accessibility to users worldwide. With its simplified version of the C/C++

programming language, Arduino offers a powerful yet approachable platform for electronics projects and prototyping.

APPLICATIONS :

Arduino boards offer numerous advantages, making them suitable for a wide range of applications. They are commonly used in robotics projects for motor control and sensor interfacing, as well as in home automation systems for controlling lights, appliances, and security. Arduino boards are also popular for creating Internet of Things (IoT) devices, wearable technology such as smartwatches, and data logging systems for collecting and analyzing sensor data. Additionally, they find applications in environmental monitoring, art installations, educational tools, agriculture automation, and security systems.

One notable application of Arduino boards is in real-time automation and low-latency speech recognition systems. These systems can be used in various scenarios, including call centers for transcribing customer interactions, live transcription services for virtual meetings, and accessibility tools for individuals with disabilities. The advantages of using Arduino boards for such systems include remote control of home appliances, assistance for disabled persons, independence from internet connectivity, immediate feedback, high accuracy in speech recognition, and seamless user interactions. Overall, Arduino boards offer a versatile platform for innovation and development across diverse fields and industries.

VII.CONCLUSION:

The home automation system was successfully operated from a wireless mobile device after it was experimentally shown to work by attaching sample appliances to it. We learnt numerous skills during this project, including soldering, wiring the circuit, and using other tools, and we were able to work together as a team. The Bluetooth client has been successfully tested on a variety of mobile phones from various manufacturers, demonstrating its mobility and compatibility. As a result, a low-cost home automation system was built, implemented, and tested successfully.

The successful implementation of the home automation system, initially demonstrated through the operation of sample appliances via wireless mobile devices, has yielded valuable technical and collaborative experiences. The project involved hands-on training in soldering, circuit wiring, and the utilization of various tools. Furthermore, it fostered teamwork and collaboration among the project participants.The Bluetooth client underwent rigorous testing on diverse mobile phone models from multiple manufacturers, showcasing its portability and compatibility. These tests confirmed the system's ability to be controlled and monitored remotely using a variety of mobile devices.

Ultimately, the project culminated in the development, implementation, and successful testing of a cost-effective home automation system. This system empowers users with the convenience of controlling and monitoring their home appliances remotely, enhancing comfort, energy efficiency, and security. The project's success demonstrates the feasibility and practicality of home automation solutions, particularly in the context of limited budgets.

VIII.RESULT :

In this study, an Arduino-based home automation system is developed to enable remote control of household appliances. The system utilizes a Software Serial interface for communication, allowing users to send commands to control lights, fans, and a servo motor-controlled door. Commands are received in multiple languages, including English, Telugu, and Hindi, providing linguistic versatility. The system integrates a DHT11 sensor to monitor temperature and humidity, providing environmental feedback. Each command triggers specific actions, such as toggling appliance states or adjusting the door position. Through a combination of hardware and software components, the system demonstrates an efficient and accessible approach to home automation, catering to diverse linguistic and environmental needs.

IX.ACKNOWEDGEMENT:

REFERENCES

[1] The official Bluetooth website from Bluetooth SIG: http://www.bluetooth.com

[2] Neng- Shiang Liang; Li-Chen Fu; Chao-Lin Wu. "An integrated, flexible, and Internet-based control architecture for home automation system in the internet era". Proceedings ICRA `02. IEEE International Conference on Robotics and Automation, Vol. 2, pp.1101-1106, 2012

[3] K. Mandula, R. Parupalli, C. A. S. Murty, E. Magesh and R. Lunagariya, "Mobile based home automation using Internet of Things(IoT)," 2015 International Conference on Control, Instrumentation, Communication and Computational Technologies (ICcrCCT), Kumaracoil, 2015, pp. 340-343.

[4] D. Chowdhry, R. Paranjape and P. Laforge, "Smart home automation system for intrusion detection," 2015 IEEE 14th Canadian Workshop on information Theory (CWIT), St. John's, NL, 2015, pp. 75-78.

[5] N. Skeledzija, J. C. Edin, V. Bachler, H. N. Vucemilo, H. Dzapo , "Smart home automation system for energy efficient housing", 37th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO), 2014, pp. 166-171.

[6] R. K. Kodali, V. Jain, S. Bose and L. Boppana, "loT based smart security and home automation system," 2016 Tnternational Conference on Computing, Communication and Automation (ICCCA), Noida, 2016, pp. 1286-1289.

[7] R. Piyare and M. Tazil, "Bluetooth based home automation system using cell phone," 2011 IEEE 15th

Tnternational Symposium on Consumer Electronics (ISCE), Singapore, 2011, pp. 192-195.

[8] B. Ghazal and K. AI-Khatib, "Smart home automation system for elderly, and handicapped people using XBee," international Journal of Smart Home, vol. 9, no. 4, pp. 203-210, Apr. 2015.

BIOGRAPHIES

Dr.K.Prasanthi Jasmine
M.E, Ph.D Department of ECE, Andhra Loyola Institute of Engineering and Technology, Andhra Pradesh, India

Ch. Mohana Krishna
Student of ECE Department , Andhra Loyola Institute of Engineering and Technology, Andhra Pradesh, India

M.Saketh
Student of ECE Department , Andhra Loyola Institute of Engineering and Technology, Andhra Pradesh, India

M.Sairam
Student of ECE Department , Andhra Loyola Institute of Engineering and Technology, Andhra Pradesh, India