



# Voice to Text Based Noticeboard with Integrated Android Application

<sup>1</sup>Sagar Nimkar, <sup>2</sup>Prof Vijaya Kamble, <sup>3</sup>Aditya Waghmare, <sup>4</sup>Pallavi Meshram, <sup>5</sup>Ashwini tarware

<sup>1</sup>B.E. Student, <sup>2</sup>Professor & Guide, <sup>3</sup>B.E. Student, <sup>4</sup>B.E. Student, <sup>5</sup> B.E. Students

<sup>1</sup>Department of Computer Science & Engineering,

<sup>1</sup>Guru Nanak Institute of Engineering & Technology, Nagpur, India

**Abstract :** The internet has undergone changes over time, transforming numerous fields and impacting countless lives. It has brought significant benefits to humanity, particularly in the area of communication. Thanks to the internet, communication has become faster and more convenient. The purpose of this research is to investigate various methodologies for converting speech to text and text to speech, which will be employed in a voice-based email system that utilizes interactive voice response technology. The study aims to compare different techniques used for these conversions and identify the most efficient one that can be applied to both processes. The review of the literature reveals that the Hidden Markov Model (HMM) is a statistical model that is the most appropriate for both speech-to-text and text-to-speech conversions. Finally, we propose a model that employs HMM and Artificial Neural Network (ANN) methods for speech-to-text conversions, and HMM for text-to-speech conversions. Our team devised an idea of utilizing speech recognition technology to convert spoken language into text and display it on an electronic board. The primary purpose of this display system is to present day-to-day information in real-time or at regular intervals to colleges and universities. Being a wireless system, it can display breaking news or announcements more efficiently than traditional notice boards. The display board is designed to show text generated from speech using a Wi-Fi module that enables communication, and the speech-to-text conversion is facilitated by Python Libraries. Overall, the proposed system is an innovative solution that leverages speech recognition and wireless technology to enhance the communication of information in academic institutions.

**IndexTerms – text-to-speech conversion, HMM, ANN, Notice Board**

## I. INTRODUCTION

This paper aims to propose a design for an interactive voice response-based mailing system that allows users to manage their email accounts through voice commands. The system provides an efficient way for human to human, human to machine, and machine to human communication. To achieve this functionality, the paper will analyse different methods for Speech-To-Text (STT) and Text-To-Speech (TTS) conversion. STT conversion is a process where the system recognizes and translates spoken words and phrases into a readable text format. This process is essential for effective communication between individuals who speak different languages or dialects. Without an STT conversion system, people with different accents or dialects may struggle to understand each other. Therefore, the use of an STT converter can help detect the words spoken by a person with a different accent or dialect and convert them into a text format that can easily recognize by the other person.

Various methods have been proposed and applied to achieve the functionality of STT conversion. Initially, the input speech's significant features are extracted, and then word and sentence matching is performed using acoustic word models and defined syntax and semantics for sentences. This process can be done in parallel and is mutually exclusive. Finally, the selected modelling method is used to perform language modelling.

The proposed interactive voice response-based mailing system will employ the most efficient and accurate STT and TTS conversion methods to ensure seamless communication. Users will be able to manage their email accounts using audio commands only, making the process more convenient and accessible. This system has the potential to revolutionize the way people interact and communicate with each other, particularly in situations where individuals speak different languages or dialects. This paper provides a comprehensive analysis of different methods for STT and TTS conversion and proposes a layout for an interactive voice response-based mailing system that will make email management more efficient and accessible for users.

Everyone desires a comfortable lifestyle and readily available information. People want to stay updated with the latest news and happenings from around the world, whether through the internet, television or other means. Wireless connectivity has become a popular choice among people as it saves time and allows for quick communication with others. To address this, we propose a user-friendly notice board that displays messages contributed by users in a chronological order based on the date and time. The trend of advertising is increasingly becoming digital, with digital screens being employed in big stores, malls, trains and buses to display information such as platform numbers and ticket details. People have grown accustomed to having access to the world through their fingertips, and mobile phones have become a vital tool for communication and control worldwide. This has motivated us to develop a system that can receive spoken messages through cell phones and display them on electronic boards.

## II. PROBLEM STATEMENT:

With the advancements in technology, the traditional wall notice board has become outdated and is plagued with several shortcomings. Firstly, the limited space results in posts overlapping each other, making it difficult to read and comprehend the messages. Secondly, it's often challenging to recall the most recent posts, leading to a lack of information and awareness among individuals. Moreover, there is no way to determine how many people have seen your post, which creates a sense of uncertainty and doubt.

Additionally, the traditional notice board lacks the capability to enable direct communication with the poster. This can lead to confusion and misunderstandings. Checking the notice board frequently for new posts can be tedious and time-consuming, making it an inconvenient method to disseminate information.

Apart from these limitations, the traditional notice board is also not easily accessible, adding to its drawbacks. Therefore, to overcome these shortcomings, we suggest adopting an Online Notice Board system that digitally transforms the traditional notice board and makes it available online.

The Online Notice Board system can help in creating an efficient and user-friendly platform for posting and accessing information. The system can provide ample space for posts without the concern of overlapping, making it easier to read and understand the messages. With the latest post always appearing at the top, there is no need to recall the most recent updates, as they are readily available. Additionally, the system can track the number of views for each post, enabling users to understand the reach and impact of their message. The platform can also allow direct communication with the poster, providing clarity and addressing any concerns. The Online Notice Board system can be accessed from any location and at any time, making it more convenient and accessible for users. With its user-friendly interface and easy accessibility, the system can revolutionize the way information is disseminated, ensuring that important messages reach a wider audience in a timely and efficient manner.

## III. LITERATURE SURVEY:

The topic of creating natural language descriptions from visual input has long been researched in computer vision [1] – [3]. Three types may be found in the literature on picture caption generation. Template-based approaches fall under the first type. Detecting objects, actions, scenes, and characteristics takes precedence in this technique [4]–[7]. The second category of caption generating systems utilizes a transfer-based approach where image retrieval is performed. This involves searching for visually similar images and utilizing the captions associated with these images to generate the caption for the query image [8]. According to the majority

of researchers, neural networks have proven to be advantageous in machine translation and generating image captions through the use of neural language models [10]. However, this has led to an increase in system complexity, as visual feature recognizers are designed using formal languages like And-Or Graphs or logic systems, and then converted using rule-based systems. Mao et al. proposed a multimodal recurrent neural network model as a solution to this issue. [11] and Karpathy et al. is employed for visual description generation [12]. Vinyals, Oriol, and colleagues employed the NIC model (Neural Image Caption) [1].

They utilized an advanced form of RNN called LSTM [1]. Xu et al. recently proposed that visual attention be summarized in the LSTM model for focusing its gaze on diverse objects during the creation of associated phrases [13]. Neural language models are valuable in creating image captions that resemble human-like descriptions. Although the most recent techniques may differ, most of them employ an encoding-decoding architecture that combines caption generation with visual attention to achieve this goal. [13]. The study concentrated on the third type of techniques for generating captions, which involves creating a neural model that produces natural language descriptions for images. To serve as the image encoder, a CNN is utilized. The RNN decoder receives the last hidden layer as input after pre-training for image classification to generate the sentence. The NIC model uses a pre-trained CNN as the encoder for image categorization, and the last layer of the network is utilized as input for the RNN decoder, which is also capable of producing sentences.

#### IV. RESEARCH METHODOLOGY

This system comprises seven primary components, namely a Python program for speech recognition, Node MCU, Wi-Fi Module, LCD Display, Serial connection device, Laptop, Speaker, and Power Supply. The Node MCU, which is a member of the AVR microcontroller family, serves as the system's core. It is responsible for supporting the analog signal's properties and has an integrated Wi-Fi module or source on chip (SOC), unlike other development kits that require a separate Wi-Fi module.

The system allows the user to provide voice commands via the laptop's microphone, which are converted into text using a program. This text is then transmitted to the firebase database using the internet. The Node MCU receives the data from the firebase database and displays it on the LCD display, allowing users to view the information.

##### 4.1 Block Diagram:

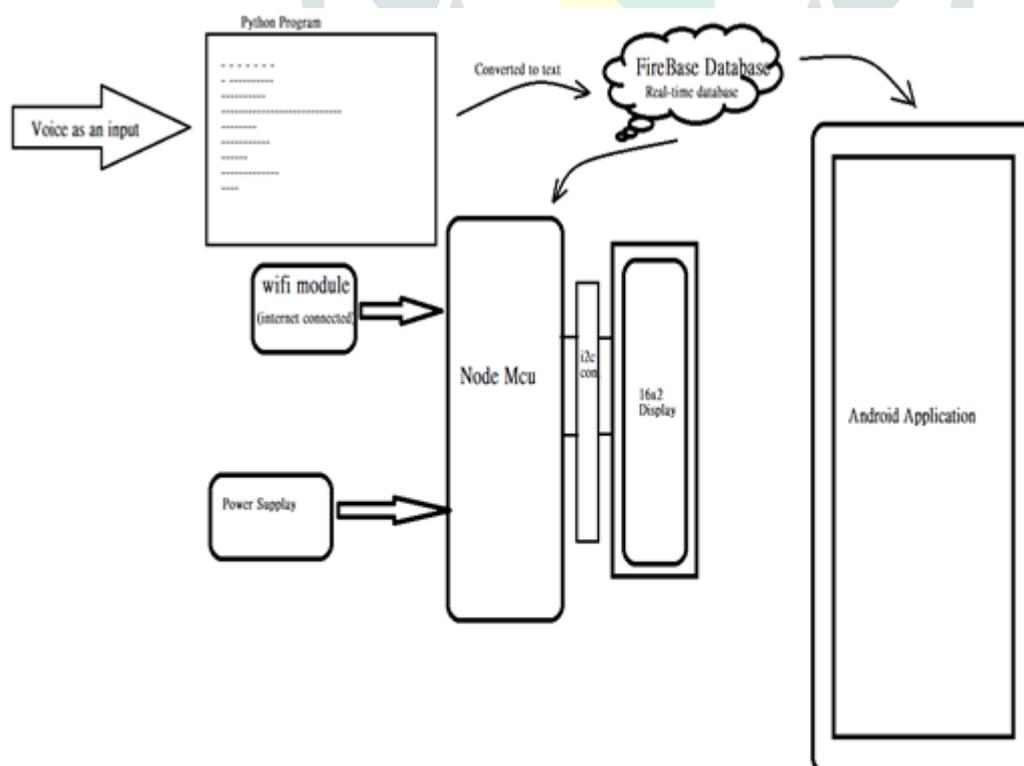


Fig 1.0 Block Diagram Of the System

## 4.2 Working Model:

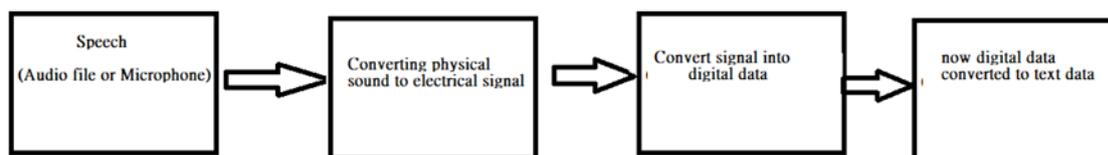


Fig 2.0 Project Working Model

## 4.3 Firebase Database:

Firebase Real-time Database is a cloud-based database that stores data in JSON format and enables real-time data synchronization between connected clients. The database is an efficient tool for building cross-platform applications using iOS and JavaScript SDKs. With Firebase Real-time Database, all customers share a single instance of the database, and each client receives real-time updates with the latest data. The database is a NoSQL database that is designed to store and sync data among multiple users in real-time. It provides developers with real-time control over a JSON object. The Firebase database is built on the Google Cloud Platform and offers a variety of features that make it an attractive option for developers.

One of the primary benefits of Firebase Real-time Database is that it provides real-time data synchronization, which means that any changes made to the database are immediately reflected in all connected clients. This makes it ideal for applications that require real-time updates, such as messaging or collaboration tools. The database also supports offline data synchronization, which means that changes made by a client while offline will be synced with the database when they come back online.

The Firebase Real-time Database API provides developers with a simple and easy-to-use interface for accessing and manipulating data. The API allows developers to read and write data to the database using a variety of data types, including strings, numbers, and objects. It also supports transactions, which ensures that data is updated in a consistent manner, even when multiple clients are making changes to the same data. Firebase Real-time Database also offers a powerful security model that allows developers to control who has access to their data. The database supports authentication using various providers, including email and password, Google, Facebook, Twitter, and GitHub. It also offers fine-grained access control using custom rules, which allow developers to restrict access to specific data based on user authentication and other criteria.

Overall, Firebase Real-time Database is a powerful tool for building real-time applications that require efficient data synchronization and secure access control. Its simple API and flexible data model make it easy for developers to get started, while its robust security features ensure that data is protected from unauthorized access.

## 4.4 Hardware Requirement & Specification:

**4.4.1 NodeMCU:** Node MCU, an open-source firmware based on LUA programming language, was developed for the ESP8266 Wi-Fi chip, which allows exploring the full potential of the ESP8266 chip. With Node MCU being an open-source platform, users have the ability to edit, modify, or even build their own hardware. The ESP8266 Wi-Fi chip is a component of the Node MCU Dev Kit/board. Developed by Espressif Systems, the ESP8266 is a cost-effective TCP/IP Wi-Fi chip. For more information about the ESP8266 Wi-Fi Module, users can consult its documentation. The Node MCU Development Board removes the limitations of the ESP8266 and integrates it with Node MCU firmware to form a standalone device for IoT applications. The Node MCU Development Board v1.0 (Version2), which has a black PCB, is the latest version of the Node

MCU Dev Kit. The Node MCU Dev Kit's board includes analogue (A0) and digital (D0-D8) pins, similar to those on an Arduino board. It supports several serial communication protocols, such as UART, SPI, I2C, among others.

**4.4.2 WiFi Module:** Espressif Systems developed a cost-effective Wi-Fi microchip that integrates a complete TCP/IP stack and microcontroller functionality. The ESP8266 module is a small-sized device that allows microcontrollers to connect to Wi-Fi networks and establish straightforward TCP/IP connections via the use of Hayes-style instructions. The ESP8266 module is a very affordable and user-friendly tool that can be utilized to connect creations to the internet. This module can function as both a station and an access point, enabling it to easily retrieve data and post it to the internet, making the Internet of Things as simple as possible. Moreover, ESP8266 can also fetch data from the internet utilizing APIs, making it an intelligent device that can access any information available on the internet.

**4.4.3 I2C LCD Display:** The LCD screen in question is 16 by 2 and is equipped with an I2C interface. It is capable of displaying up to 162 characters. Arduino-based LCD display projects that rely on microcontrollers often run out of available pin resources quickly, which can make soldering and wire connections challenging. However, this particular 162 LCD panel uses I2C as its communication interface. This means that the LCD display only needs to be connected to four pins: VCC, GND, SDA, and SCL. As a result, at least four digital and analogue pins on the controller can be freed up for other uses.

**4.4.4 Serial Communication:** The LCD screen in question is a 16 by 2 display that features an I2C interface and has the capacity to show up to 16\*2 characters. When working on microcontroller-based Arduino LCD display projects, it is common for the available pin resources to become depleted quickly, and the process of soldering and connecting wires can become quite challenging. However, with the I2C interface on this 16\*2 LCD panel, only a few pins are required to operate it, namely VCC, GND, SDA, and SCL. This means that at least four digital and analogue pins on the controller can be saved for other purposes.

Serial communication is commonly used when parallel communication is not feasible due to cable cost or synchronization issues, and it can be used to transmit data over long distances or at low data transmission rates. The popularity of serial communication can be attributed to the fact that most computers are equipped with one or more serial ports, and no additional hardware is needed to connect an instrument to a computer or two computers to each other other than a cable.

**4.4.5 Arduino IDE:** The Arduino Integrated Development Environment (IDE) is a cross-platform program created in C and C++ that is used to write and upload software programs to boards that are compatible with Arduino. The IDE is a powerful tool that simplifies the process of programming, testing, and debugging the code written for Arduino devices. The Arduino IDE supports the programming languages C and C++, and it follows certain code structure guidelines that help developers write efficient and readable code. The syntax of the Arduino programming language is similar to that of C and C++, making it easy for developers familiar with these languages to get started with Arduino programming.

The IDE provides a user-friendly interface that simplifies the programming process for beginners. The software provides a range of built-in functions and libraries, which help developers to write code for various Arduino projects with ease. It also features an easy-to-use serial monitor, which enables developers to debug their code and analyze the output in real-time. The Arduino IDE is free and open-source software that is available for download from the Arduino website. It is compatible with various operating systems, including Windows, Linux, and macOS, making it accessible to a wide range of developers. The IDE provides a software library from the wiring project, which is a programming framework for microcontrollers. The library provides a range of standard input and output operations that can be used to control the behavior of the Arduino board. The wiring project library simplifies the coding process by providing functions to read and write data to and from the board's input and output pins. In summary, the Arduino IDE is a powerful and user-friendly tool that simplifies the process of programming Arduino-compatible boards. The IDE supports the programming languages C and C++, and it provides a range of built-in functions and libraries that

make programming for Arduino projects easy and efficient. The software is free and open-source, and it is compatible with various operating systems, making it accessible to a wide range of developers.

#### V. APPLICATION OF NOTICEBOARD:

a. An online notice board is a virtual platform where users can post a variety of messages and notifications, such as announcements, advertisements, and information.

b. It is accessible on various digital devices, such as computers, tablets, and mobile phones, making it easy to access and share information.

c. Online notice boards are highly convenient for users who need to stay informed about updates and changes in their community, workplace, or other settings.

d. This platform is especially useful for people who cannot physically be present at a location, such as remote employees, students, or customers.

e. By using an online notice board, organizations and businesses can save time and resources by communicating important information to their audience quickly and efficiently.

f. This initiative can benefit both existing and new users, as it allows them to stay connected and informed about relevant events, activities, and news.

#### VI. RESULTS AND DISCUSSION:

In this experiment, the proposed system was tested to evaluate its performance. The system consists of a Node MCU, a Python program, and an LCD display. The Node MCU, which is powered by a 3.3V power supply, serves as the wireless receiver and communicator between the Python program and the LCD display. To test the system, a user sends a notice through the Python program, which first takes the voice input from the user and then converts it into text using a speech-to-text conversion algorithm. The Node MCU, which has an inbuilt Wi-Fi, receives the converted text notice from the Python program.

The Node MCU then retrieves the data from a database and shows the notice on the LCD display in just a matter of seconds. This entire process allows for the wireless transmission and display of notices on the LCD display in real-time without the need for any physical connections or wires. The use of a speech-to-text conversion algorithm eliminates the need for manual input and makes the system more user-friendly, as users can simply speak their message instead of typing it out. The use of wireless communication also makes the system more versatile, as notices can be displayed from a distance and without the need for any physical connections. Overall, the proposed system shows promise in providing an efficient and user-friendly way to display notices in real-time through the use of wireless communication and speech-to-text conversion. The experiment conducted provides insight into the performance of the system and highlights its potential applications in various settings.

#### VII. CONCLUSION:

Wireless technology has revolutionized the field of communication by improving the efficiency and speed of our connections. Integrating this technology into notice boards can offer several advantages, including easier display of messages with less upkeep. This makes the system suitable for various settings such as colleges, schools, offices, train stations, and even for personal use.

Wireless notice boards can significantly enhance communication by enabling the quick and easy display of messages in real-time. Users can share announcements, news updates, and various other forms of information through digital devices like smartphones, tablets, and computers. The online notice board initiative, therefore, offers a versatile and effective method of communicating important information to a wide audience. This system is suitable for both existing and new users who can access the notice board from anywhere at any time.

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