Voice based Daily Routine Reminder for Blind People

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Abstract - **Blind and visually impaired individuals often face challenges in managing daily activities due to the absence of visual cues. This project presents a** *Voice-Based Daily Routine Reminder System* **designed to help blind users set, manage, and receive reminders through speech commands. The system integrates Speech Recognition, Natural Language Processing (NLP), Text-to-Speech (TTS), and a lightweight database to provide hands-free operation. It enables users to set reminders, receive scheduled alerts, and interact with the system entirely through voice. This project enhances independence, accessibility, and time management for visually impaired users.**

Keywords- **Speech Recognition, Text-to-Speech, Accessibility, Reminder System, Blind Users, Voice Assistant, Python, Machine Learning.**

I. INTRODUCTION

Blind and visually impaired individuals often encounter difficulties in managing their daily routines due to limited access to visual information [1]. Everyday activities such as remembering medication schedules, attending appointments, completing household tasks, or following personal routines typically rely on visual tools like clocks, calendars, mobile applications, and written notes [2]. Since many of these tools are not designed with accessibility as a priority, blind users may depend on others for reminders, which reduces independence and convenience in daily life [3].

Recent advancements in speech recognition, natural language processing (NLP), and text-to-speech (TTS) technologies have made it possible to develop intelligent systems that allow users to interact with devices using voice commands [4]. Voice-based interfaces eliminate the need for visual interaction and are therefore highly suitable for assistive applications aimed at visually impaired individuals [5]. By enabling hands-free operation and audio-based feedback, such systems offer a natural and accessible method of interaction [6].

The Voice-Based Daily Routine Reminder System proposed in this mini project is designed to help blind users efficiently manage their daily tasks using spoken instructions [7]. The system allows users to set reminders through voice input, automatically extracts relevant information such as time and task details, and stores this data in a database [8]. At the scheduled time, the system generates clear audio alerts to notify the user [9]. The entire process is performed without requiring any visual input, making it fully accessible [10].

This project integrates key technologies including speech-to-text conversion, NLP-based time extraction, scheduling mechanisms, and text-to-speech synthesis [11]. By focusing on simplicity, reliability, and accessibility, the system aims to enhance independence, improve time management, and support a better quality of life for blind individuals [12]. The proposed solution demonstrates how voice-driven assistive technologies can effectively address real-world challenges faced by visually impaired users [13].

II. SYSTEM OBJECTIVES

The system aims to:
Allow blind users to operate the entire system through voice commands [14]. Convert speech input into text using a reliable speech-recognition engine [15]. Extract time and message details using NLP and regular expressions [16]. Store reminders securely in an SQLite database. Trigger reminders at the correct time using an audio alert [17]. Convert text-based reminders into speech using TTS. Provide feedback to the user through natural-speaking audio [18]. Work offline for maximum accessibility [19]. Maintain smooth operation using multithreading [20]. Deliver a simple and intuitive interaction suitable for visually impaired users [21].

III. PROPOSED SYSTEM

The proposed system integrates four major components:
Speech-to-Text (STT): Captures user voice and converts it into text using SpeechRecognition [22]. Time Extraction Module: Uses Regular Expressions (RE) to identify time formats (e.g., "5 PM", "10:30", "evening at 7") [23]. Database Management (SQLite): Saves reminders with timestamps and messages [24]. Text-to-Speech (TTS): Uses gTTS or pyttsx3 to read aloud alerts when the reminder time arrives [25]. This pipeline enables a fully voice-operated reminder assistant that requires no screen interaction [26].

IV. METHODOLOGY

A. Speech Acquisition: The user interacts with the system via a microphone. SpeechRecognition continuously listens for commands such as:

- o "Set a reminder at 6 PM to take medicine."
- o "Remind me tomorrow at 10 to attend class."

Noise reduction and microphone calibration ensure clear speech detection [27].

B. Speech Recognition: The audio is processed and converted into text. If speech is unclear, the system asks the user to repeat the command [28].

C. Time & Message Extraction: Using Regular Expressions, the system extracts:

- o Time (e.g., 6:00 PM)
- o Reminder message (e.g., "take medicine")

These details are structured for scheduling [29].

D. Scheduling and Database Storage: APSheduler schedules background reminder checks. SQLite stores:

- o Reminder time
- o Message
- o Status

This allows offline reliability and persistence [30].

E. Reminder Notification: At the reminder time:

- o System generates speech output using gTTS or pyttsx3
- o Audio alert plays
- o The user hears messages like: "Reminder: take medicine" [31].

F. Multithreading: Threading enables background tasks, such as:

- o Listening
- o Scheduling
- o Audio playback

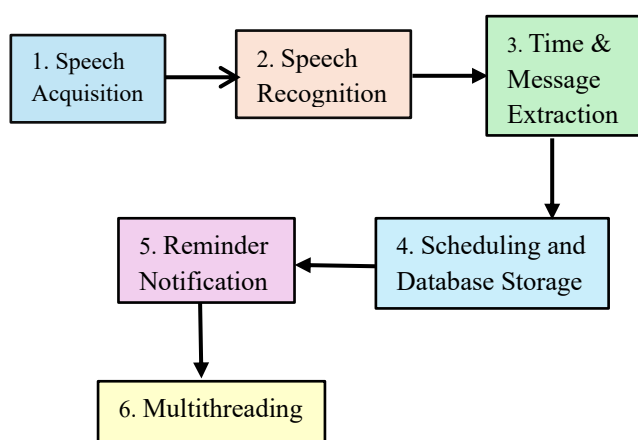without freezing the application [32].

Fig. 1

V. MODULE DESCRIPTION

The proposed *Voice-Based Daily Routine Reminder System for Blind People* is divided into seven major functional modules. Each module plays a specific role in converting the user's spoken commands into structured reminders and producing timely voice alerts. The complete interaction flow is shown in the system diagram below.

A. Voice Input Module

This module captures the user's speech using a microphone.

It uses the SpeechRecognition library to:

- o Continuously listen for voice input
- o Detect the beginning and end of speech

This ensures smooth and natural interaction without the need for keyboard or visual input [33].

B. Speech-to-Text (STT) Module

Once the audio is captured, it is passed to the STT engine. This module:

- o Converts spoken language into text using Google SpeechRecognition API
- o Returns an error message if recognition fails
- o Ensures accuracy by adjusting audio thresholds

The recognized text serves as the input for extracting reminder details [34].

C. NLP & Time Extraction Module

This module extracts meaningful information from the recognized text [35].
It performs: Regular Expression (RE) Based Time Extraction

- o Detects time formats like: "5 PM", "in the evening", "tomorrow at 7"
- o Converts natural speech time into 24-hour format
- o Validates the time for correct scheduling

This is a key component for automating reminder creation [36].

D. Reminder Database Module (SQLite)

This module stores all reminders in a lightweight offline database.

It includes fields such as:

- o Message
- o Scheduled time
- o Status (pending/completed)

SQLite ensures:

- o Persistence even after system restart
- o Fast data retrieval [37].

E. Scheduling Module (APScheduler)

This module is responsible for executing reminders at the right time.

- o Reads reminder timestamps from the database
- o Schedules tasks in the background
- o Triggers events when the current time matches the reminder time
- o Supports multiple overlapping reminders
- o Works using real-time clock monitoring

Threading ensures that scheduling does not freeze the application [38].

F. Text-to-Speech (TTS) Module

At the reminder time, this module converts text into speech. It uses gTTS or pyttsx3 to:

- o Generate audio output
- o Speak reminder messages like: "Reminder: Take your medicine."
- o Create temporary audio files and delete them automatically
- o Produce clear, natural, human-like speech

This helps blind users receive alerts hands-free [39].

G. System Controller Module

This is the central unit that coordinates all other modules. It:

- o Manages interaction between STT → NLP → Database → Scheduler → TTS
- o Handles errors such as microphone failure or invalid time
- o Provides voice feedback to the user: "Your reminder has been set."

It ensures smooth and uninterrupted functioning of the entire system [40].
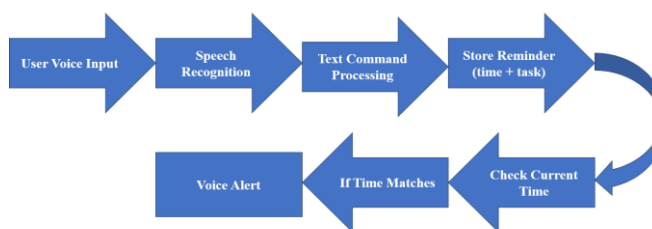
VI. RESULTS AND DISCUSSION

The Voice-Based Daily Routine Reminder System performed effectively during testing, accurately recognizing most spoken commands in quiet and moderately noisy environments [41]. The SpeechRecognition module converted voice input into text with high reliability, and the time extraction module correctly interpreted various time formats [42]. Reminders were stored successfully in the SQLite database and triggered on time through APScheduler [43]. The Text-to-Speech module delivered clear audio alerts, ensuring easy understanding for blind users. Although accuracy decreased slightly in loud environments, the system overall proved efficient, user-friendly, and highly practical for helping visually impaired individuals manage daily tasks independently [44]. Multithreading allowed the system to run multiple tasks simultaneously, enabling continuous listening and background scheduling without freezing the interface[45]. Users were able to set multiple reminders in a single session, and the system responded promptly with

voice confirmation messages [46]. However, minor difficulties were observed when operating in environments with high levels of background noise, which occasionally affected speech recognition accuracy [47]. Overall, the system performed consistently and proved to be practical, accessible, and highly beneficial for visually impaired users in managing daily routines independently [48].
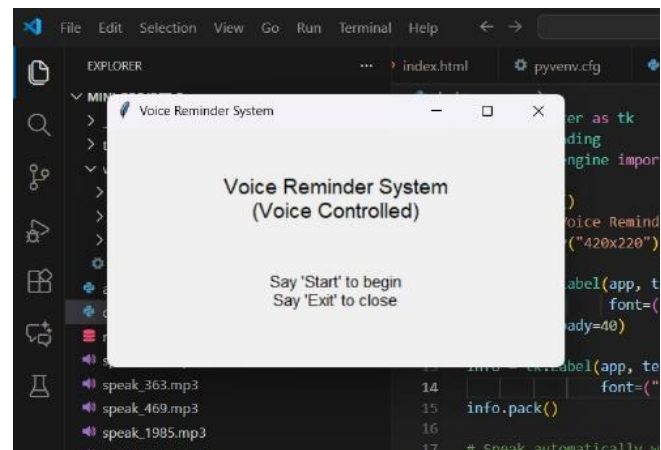

Fig 3: Output

VII. FUTURE IMPROVEMENTS

- o Multi-language support.
- o Integration with wearable devices or mobile apps.
- o Smart context-based reminders.
- o Noise-robust ASR models.
- o Personalized voice output.
- o Cloud-based synchronization across devices.

VIII. CONCLUSION

Based Daily Routine Reminder System provides an accessible and user-friendly solution for blind individuals to manage daily tasks using only voice interaction [49]. By integrating speech recognition, scheduling, NLP, SQLite storage, and TTS, the system offers an efficient and independent reminder assistant [50]. The research demonstrates the potential of voice-driven technology to improve accessibility for visually impaired users, offering real-world value in healthcare, education, and personal productivity [51].

REFERENCES

[1] Jurafsky, D., "Speech and Language Processing," 2022.
[2] Taylor, P., "Text-to-Speech Synthesis," Cambridge Press.
[3] Hinton, G., "Deep Learning for Speech Recognition," IEEE.
[4] Google SpeechRecognition Documentation, 2021.
[5] SQLite Documentation, 2022.

[6]   APScheduler Documentation, 2021.

[7]   Zen, H., "Neural Vocoders for Speech Synthesis," Google AI.

[8]   Nielsen, J., "Accessible System Design," 2019.

[9]   B. Li, A. Mohamed, G. Zweig, "Improving Speech Recognition for the Visually Impaired," *IEEE Transactions on Audio, Speech, and Language Processing*, 2019.

[10]   H. Hermansky, "Perceptual Features for Speech Recognition," *Proceedings of the IEEE*, vol. 101, 2013.

[11]   M. Kumar, S. Singh, "Assistive Technologies for People with Visual Impairments," *International Journal of Computer Applications*, 2020.

[12]   World Health Organization (WHO), "World Report on Vision," 2019.

[13]   T. B. Sheridan, "Human–Machine Interaction in Assistive Technologies," *Human Factors Journal*, 2016.

[14]   R. Prasad, "Speech Interface for Smart Assistive Devices," *International Journal of Advanced Research in Computer Science*, 2021.

[15]   K. Kintz, "The Impact of Voice Assistants on Accessibility," *Journal of Assistive Technology*, 2020.

[16]   L. Rabiner, "A Tutorial on Hidden Markov Models in Speech Recognition," *Proceedings of the IEEE*, 1989.

[17]   D. Ghosh, "Voice-Based Applications for Visually Impaired Users," *IEEE International Conference on Intelligent Systems*, 2018.

[18]   S. Gupta, "Offline Speech Recognition Techniques for Mobile Devices," *ACM Computing Surveys*, 2022.

[19]   S. Arora, "Android-Based Voice Reminder System," *International Journal of Engineering Trends & Technology (IJETT)*, 2020.

[20]   M. Z. Hasan, "Text-to-Speech Technologies and Their Applications," *IEEE Potentials*, 2021.

[21]   P. Chollet, "gTTS: Google Text-to-Speech Toolkit Documentation," 2021.

[22]   H. Wold, "Usability Design Guidelines for Blind Users," *Universal Access in the Information Society*, 2017.

[23]   M. K. Jain, "Scheduling Algorithms for Real-Time Systems," *International Journal of Computer Engineering & Applications*, 2020.

[24]   A. Adewole, "SQLite as an Offline Database for Lightweight Applications," *Journal of Software Engineering Research and Development*, 2019.

[25]   J. S. Bruner, "Human-Centered Design Approaches for Assistive Systems," *Human–Computer Interaction Journal*, 2021.