VOICE ASSISTANTS FOR LIBRARY AND INFORMATION SYSTEMS

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Abstract. *This article devoted to create voice assistant algorithms for library and information systems. In this article algorithm of library and information systems (LIS), Python libraries, speech-to-text, natural language processing and text-to-speech synthesis, advanced algorithms, bibliographic data management, catalog searches, especially important for visually impaired users, different accents, high-noise environments, and multilingual support are given.*

Keywords. *voice assistant, natural language processing, automated library information systems, catalog search automation, speech recognition, natural language processing, gTTS artificial intelligence.*

In the field of information library systems, the digitization of information is growing rapidly. Accordingly, the volume of data is also increasing. This, in turn, requires more time to search for information than before. Entering information for search is carried out in text form. This poses significant challenges, especially for users with visual impairments, who face barriers in interacting with text-based catalog systems. To solve this problem positively, it is important to introduce voice assistants in information library systems. The integration of voice assistants in information library systems is one of the innovations in the field. Voice assistants translate voice messages into text form and help users search for books by title or author. In addition, they can help find full-text information related to the information in the catalog.

To address these challenges, integrating voice assistants into information library systems is emerging as a transformative solution. Voice assistants enable users to interact with library systems through spoken commands, translating voice queries into text and assisting in searching for books by title, author, or related full-text information from catalogs. By automating these processes, voice assistants enhance accessibility and usability for all users.

The creation and development of specialized voice assistants for information library systems creates new opportunities for users to automate catalog searches and assist with bibliographic management. We can use various Python libraries to create voice assistants. For example,

- when using the SpeechRecognition library, its functions are used to convert speech to text;
- the pyttsx3 library functions allow text to be converted to speech;
- the gTTS library functions are used to support multilingualism [1][2][3].

In general, these tools perform tasks such as speech-to-text, natural language understanding, and text-to-speech, and are used to create advanced solutions. Such capabilities are vital for building intelligent and user-friendly voice assistant systems.

The integration of new capabilities and multifunctional applications in information warehouse systems is growing significantly. The integration of voice assistants is a clear example of this. When creating voice assistants, we will use Python, which, of course, stands out from other programming languages with its wide capabilities. We will be able to use the functions of the SpeechRecognition, pyttsx3, gTTS libraries in it.

One of the main challenges in creating voice assistants is to identify this point and understand natural language. As mentioned above, the functions available in Python libraries help to interpret user commands. In addition, the libraries allow you to convert text data provided by the assistant into speech and provide verbal responses. This process makes interactions more convenient and robust.

In automated information library systems, cataloging and searching data rely on traditional methods. Such methods in the system are considered time-consuming and laborious. If artificial intelligence technologies are implemented in such systems, the efficiency of responding to user requests will increase.

When performing a search, the incoming information is provided in text form. To increase the search capabilities for users, especially those with visual impairments, it is recommended to perform a search query via voice message.

Building a voice assistant for library information systems involves several key steps. Each of them contributes to the functionality and user experience of the system. For example, if we consider the possibility of creating an application for a user, then the user, a student, verbally asks the voice assistant to find all the resources on "machine learning" in the library catalog. The voice assistant processes the request, identifies relevant materials and responds with a list of books, articles and digital resources, simplifying the search process and saving time. The main components and processes are described below:

1. **Input recognition:** The first step is to capture the user's input through voice. Using Python's SpeechRecognition library, the system converts spoken commands into text and passes the input to the post-processing block, preparing it for the next task [1].

2. **Natural Language Processing (NLP):** Once the text is captured, NLP techniques are used to understand the intent of the command. Libraries such as SpaCy or NLTK are used to parse and analyze the text and extract meaningful insights [4][5].

3. **Process**: The algorithm executes commands step by step. At this stage, commands can be executed automatically or with human consent (after pressing a button)..

4. **Feedback generation:** The system responds with text or speech during the feedback process. This increases interactivity with the user. [2][3].

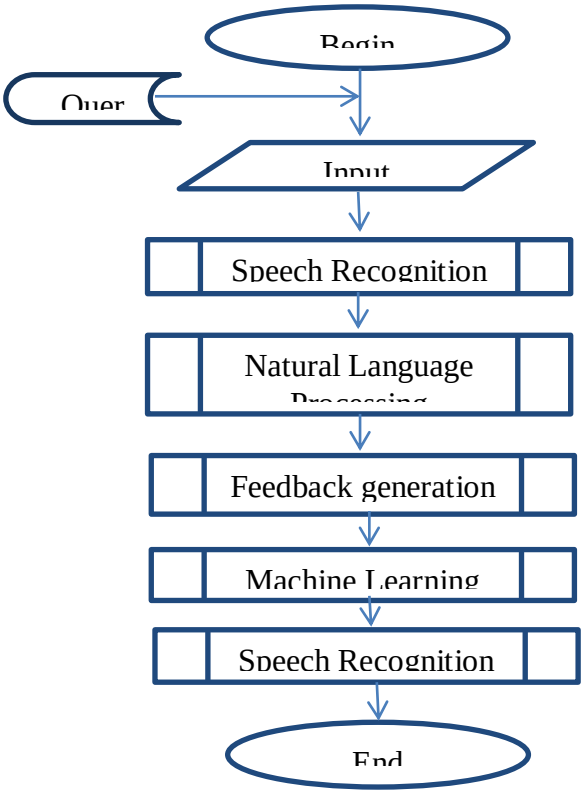

Figure 1. Voice assistant algorithm

5. **Error learning and management:** This process processes erroneous commands, asking the user to provide a more specific request.

6. **Integration process with information library systems:** Voice assistants are integrated with Automated Information Library Systems (AILS). This is a query to a bibliographic database that is made through speech. The result is in the form of speech or text, depending on the user's preference. [9][11].

The following results are obtained in the development of voice assistants for information library systems.

- Users with disabilities (for example, visually impaired) can communicate through voice assistants. This will attract more users to the system.
- Voice assistant integration reduces the time it takes to search for information and provide results.
- Even in noisy environments, speech-to-text conversion accuracy is high and ensures correct interpretation of the query.

Therefore, ongoing evaluations will be necessary to ensure compliance with evolving privacy regulations, particularly those related to the storage and processing of voice data.

Scalability and future improvements: The above considerations have focused on voice assistants that primarily use speech-to-text transcribing and natural language processing to filter out speech noise. Voice assistants can be further extended and enhanced with additional features. Integrating machine learning models to improve system adaptability and personalization is a logical next step.

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