Implementation of text to speech on web-based broadcasting radio service applications

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Abstract: Radio broadcasting is a source of information for the public. In delivering information, the broadcaster must read the text of the news before it is transmitted through a radio transmitter. Implementing a text-to-speech conversion can help solve this problem. The purpose of this study is to develop a Broadcasting Service Application by implementing text to speech on a Web-Based Radio Broadcasting service application that can convert data/information in text form into information in the form of voice. This paper does not discuss text-to-speech conversion techniques but emphasizes how to apply text-to-speech conversion techniques in web-based broadcasting service applications, especially news and music data management. This application utilizes web hosting services and Google voice services to convert text data into voice. The method used is Analyzing the application system of Broadcasting Radio services, Application of Text to speech (TTS), which functions to convert text into sound before being transmitted to broadcasting stations and to test the response of the conversion results and data management to the quality of the design. The process carried out in this system, namely retrieval of text data from the news database, converting text data into sound, adjusting the volume of music and sound information, and updating the status of the text data that has been broadcast. Based on application testing carried out with the Black Box Testing Method, all functional applications have been running well and are now successfully operationalized.

Keywords: broadcasting, data management web, music playlist, text to speech

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Introduction

News in the form of text in Indonesian must be read aloud every time a broadcast is made. This reading job requires manpower and 24 hours of service time to optimize information to the public. A support service that can assist in converting news in the form of text into sound is needed. For this reason, it can be realized by a computer-based application that can receive data in the form of text, convert text into sound and manage to broadcast both news and entertainment in the form of music/songs.

A research entitled Retrieval of Mandarin Broadcast News Using Spoken Queries has been done and reported that voice data is stored in a database, news broadcasting is done by taking from a database that stores voice data [1]. On the other hand, the use of text-to-speech converters has developed with applications in various fields, such as the use of reading text on a computer display, reading electronic mail, reading story scripts. But the use of a text to speech converter has not been applied to broadcast radio news in real-time in text format from the database.

Some research on the application of the text to voice has been carried out [2]-[6]. This study discusses the conversion from text to speech and vice versa from speech to text (speech recognition). Text-to-speech conversion has been widely developed both from conversion technology, phonemes, and variations from various languages in the world. But the application of the text to speech conversion has not yet been implemented in broadcasting especially Indonesian-language radio broadcasting.

This application is expected to overcome problems in delivering information and entertainment services in the broadcasting world 24 hours a day.

Methodology

The waterfall model takes the fundamental process activities of specification, development, validation, and evolution [7]. The model can be represented as separate process phases such as requirements specification, system and software design, implementation, unit testing, integration, system testing, operation, and maintenance. The planning stages in this research are:

1. Data collection
   The necessary data collection is carried out by conducting literature/literature studies and interviews. Literature study which includes literature concerning text to speech (TTS) and radio broadcasting management. In this step, we study the application structure of web-based radio broadcasting services such as data formats, algorithms, and existing music management.

2. System Design Analysis
   Analysis of the system design in the form of a design for the development of Radio Broadcasting Support Applications with the application of the text to speech (TTS). The purpose of implementing the text-to-voice conversion is intended to facilitate the management and management of information. The analysis was carried out on the insertion of coding which functions to change the format of the text into a voice which is done repeatedly. analysis was also carried out on the length of the converted text to the iteration time.

3. Database Creation
   Based on the database design that has been outlined in the system design that has been made, identification of the entities involved is carried out. Each - each entity has an attribute that describes the entity itself. The identified entities will be used to support application development and implementation of text to voice conversion.

4. Interface Creation
   The interface design is a user interface design that will be used by application users to interact with the system to be built. This interface will be implemented into a Radio Broadcasting Support Application. The interface is designed specifically for the use of the Indonesian language because implementation is planned for radio broadcasting in Indonesia.

5. Program code generation
   After the database and interface creation stages are complete, proceed with the program code generation stage. The program code to build this web-based system uses a web editor and requires XAMPP software as a local web server.

6. Testing
   At this stage, testing is carried out on a web-based application system that has been created by uploading it to a web server connected to the internet network. Testing is carried out to ensure the system built is running as expected. If an error occurs, then repairs are made to the system.

7. Evaluation
   At this stage, an evaluation of the system is carried out on the success of the service support system that has been developed.

Results and Discussions

Information processing architecture can be seen in Figure 1 [8]. Text data from newsagents/reporters are sent and stored in the database. Development application includes data/news retrieval in the form of text from the database, conversion of text data into speech, management of song and information settings, and news updates that have been converted to the database.
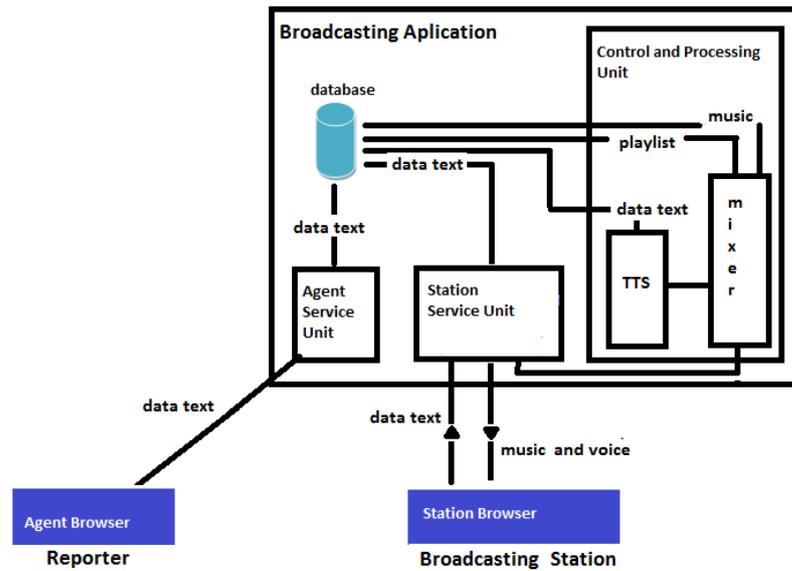
Figure 1. Information processing architecture

1. Retrieval of data/news in the form of text from the database based on the news that enters the database from field agents/reporters who work to find news in the community. The data taken are the name of the agent and news according to the status of the data that has not been converted.
2. Conversion of text data into voice is done by using facilities from Google to obtain voice using an Indonesian voice translator.
3. The sound produced by the translator is then superimposed on the music. When the sound is played, the music volume is set to decrease with a scale of 15% of normal sound so that information/news is heard clearly but there is still music. After the information/news is played, the music sound is set to normal again (100%). The resulting sound is then forwarded to the radio broadcasting transmitter.
4. The converted data/news is synced back to the database with the status converted so that it is not read again as a news queue.

The process will repeat itself from data/news retrieval to the synchronization stage and will run automatically every ten seconds to anticipate news queues that accumulate. Figure 2 describes the sequence of processes carried out in the application of the text-to-speech conversion method and settings with music.
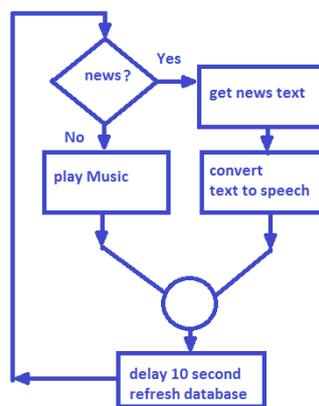

Figure 2. Chart of the TTS implementation process

The implementation of the design into coding for looping can be seen in the following program list [8],[9]. The loop is set to 10000 ms via the setInterval function.

```
setInterval(myLoop, 10000);
function myLoop(){
   myMusik_VolUnInterupt();
   myDBRefresh();
   if ((news !='') & (news!=news)){
        myTTS();
      };
};
```

Update data in the database is placed in a function named myDB_status, which functions to change the status of the news if the news text data has been converted to sound. News that has updated its status will not be read as a news queue.

```
function myDB_status(){
      $.ajax({
            type: 'POST',
            url: "update.php",
            data: {id:this['id']},
            dataType:'json',
            success: function() {}
         });
      };
```

The function used to convert text data into voice can be seen in the following coding list [10].

```
function myTTS (){ tts=news+". "+agent+" ,report";
   myMusik_VolInterupt();
   responsiveVoice.speak(
         tts,
         "Indonesian Female",
           {
             pitches: 1,
             rates: 1,
             volumes: 1,
           }
      );
   news=news; news='';
   myDB_status();
  };
```

It can be seen that the converted text is a combination of news text, followed by the name of the agent/reporter and ending with the word 'report'. When the news in the form of sound is played, the music volume is changed to 15% of normal sound. This setting is placed in a function named myMusik_VolInterupt();

Interface Display

The interface display of the Broadcasting Radio Service Support Application with the application of the Web-based text-to-voice conversion method that has been developed in this study can be seen in Figure 3. Some texts and news on the interface use Indonesian text because the interface is designed specifically for the application of radio broadcasting in Indonesia. The choice of translator also converts to Indonesian.
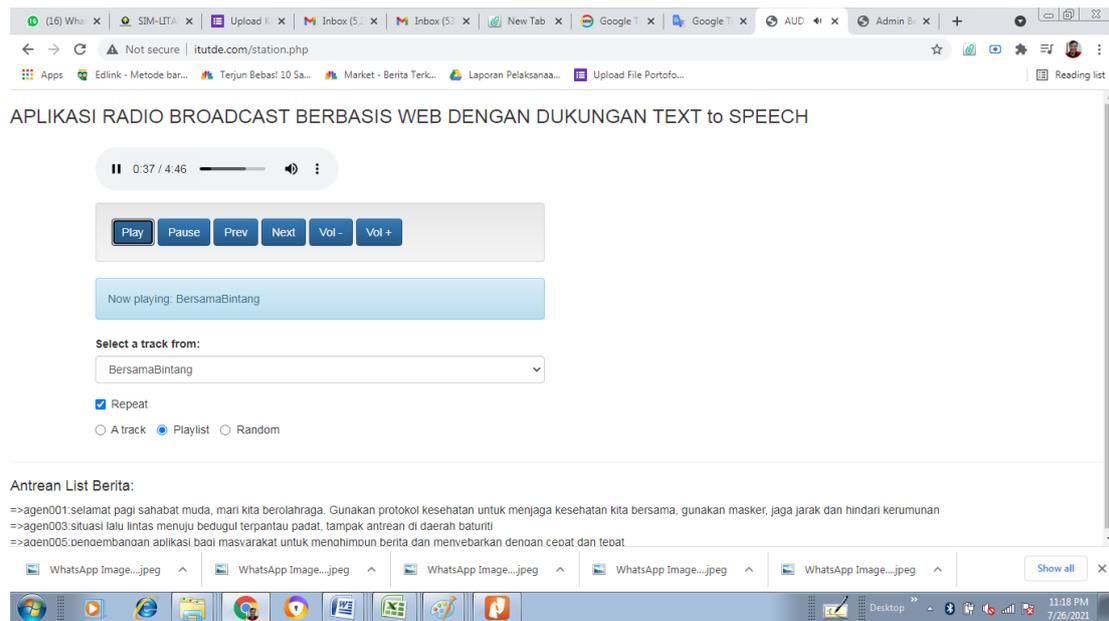
Figure 3. Broadcasting station application page

On the Broadcasting Station application page is an operator service page that displays the broadcast music list settings and news queue information. On this page, you can arrange music that is sorted by music data stored in the database. This music arrangement is like a playlist in general.

The news queue is retrieved from the news database with unconverted status. This news queue is converted, broadcast, and synchronized in turn according to the order of the table.

Application Testing

Functional testing of Text to Voice Data conversion

Application testing is carried out to determine the performance after the application of the text to voice conversion method on the Web-based Broadcasting Radio Service Support Application that has been developed. Application testing using the Black Box Testing method focuses on the functional specifications of the software.

Application testing is done with simulation data by inputting news data from newsagents/ field reporters. The news was sent 10 times from 5 different agents. The length of the news is set to a maximum of 15 words. This input stage is done to observe the response of the application to convert the latest news that enters the system. In this test, it is expected to obtain a response from text to voice conversion.

The summary of the application test results is shown in Table 1. Black Box Testing focuses on the functional specifications of converting text to speech in software. Based on the results of system testing, functionally the application has been running well.

Functional Testing of Data Management and Synchronization

Application testing is carried out to determine the performance of music and news settings that are broadcast, as well as synchronization of the status of the news queue in the database. Testing the application uses a test method similar to the stage 1 test, but with varying text length simulations (variation between 10 to 20 words). Determination of 10 to 20 words adjusted to set the repetition of database retrieval of 10 seconds. An average of 15 words is obtained by analogy, each word consists of 5 to 15 letters, so that an average of 10 letters per word is obtained 150 letters for one news. In this test, it is expected to get the synchronization setting time to the database.

Table 1. Functional testing of TTS conversion and Data Update.

class	item	result
Application Running	Operator function	Valid
	Show music options and settings	Valid
Music Management	Choose music	Valid
	Set music playback	Valid
Sending News	Display news in text form	Valid
Conversion Function	Convert text data to voice	Valid
Update Data Function	The system automatically changes the news status after text data were converted	Valid

Application testing focuses on the functional specifications of synchronizing music management with news in the form of sound and synchronizing news status updates in the database. Based on the results of system testing using the Black Box Testing method, functionally the application has been running well.

Conclusion

The development that has been carried out on the application to support radio broadcasting services is in the form of converting text data in the form of news from a database (news with an average word length of 15 words and the iterative process of retrieving news from the database every 10 seconds), music and news management, synchronizing news queue status. This application was developed with the hope of reducing the burden on operators and broadcasters in disseminating information to the public.

This application for supporting radio broadcasting services has also been tested and shows that the functionality of the application has been running well.

Furthermore, this application can be developed for internet-based voice information services at campus locations, factories, and emergency services for motorists and others.

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