An application to control media player with voice commands

Ses komutları ile media player kontrolü için bir uygulama

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Ses Komutları ile Media Player Kontrolü İçin Bir Uygulama

 Araştırma Makalesi / Research Article

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ÖZ


Anahtar Kelimeler: Ses tanıma, media player kontrolü, engelli birey.

An Application to Control Media Player with Voice Commands

ABSTRACT

Using technology today is of great importance in terms of making people's lives easier. It has become very easy to run some applications with technology. In this study, an application that provides media player control with voice commands was developed. This application was developed to address the needs of people who cannot listen to music on their own due to any disability. The application was implemented in C# programming language. In order to manage the media player with voice commands, voice recognition libraries were first used. In the developed application, operations with keyboard and mouse can be done with voice commands. Voice commands can be sent with the wireless headset from anywhere in the shooting area.

Keywords: Voice recognition, media player control, disabled individual.

1. INTRODUCTION

Today, it is nearly not possible for people to live and carry out some operations without technology. People have developed and used technology every day for their own benefit. Today, it is very easy to control any application with software. Nowadays, many applications can be controlled with software so that people can live more comfortably. People can see examples of such practices in every aspect of their lives.

To facilitate the social life of people in studies in this field in the literature: Different voice recognition algorithms and command sets were used on MATLAB [1]. With different voice recognition algorithms, “On TV”, “Off TV”, “Volume Up”, “Volume Down” and “Channel One” command sets were tried separately for male and female users [2]. It has been tried by establishing different algorithms on a phone simulation. The results obtained were found to vary according to the way the voice is spoken [3]. Over 80% success was achieved in voice recognition on the letters “a”, “e” and “i” [4]. In a different study, separate tests were performed on male and female users with different algorithms [5].

Using artificial intelligence techniques, a voice recognition system independent of text and speaker was developed on the Turkish language [6]. The syllable-based Turkish word recognition system was developed using different voice recognition algorithms [7, 8]. In the simulation environment performed on MATLAB, the successful recognition rate for 10 people was found to be 99% [9]. They performed music and speech recognition [10]. Successful results were obtained in the study which performed 40 commands [11]. It was controlled by voice commands of a remote controlled car [12]. It has been tried to determine the English pronunciation of the numbers 0-9 [13].

In this study; an application was developed to control the media player to listen to music over the computer. The application was implemented using the SpeechRecognitionEngine Class in the System.Speech library in the C# .Net Framework. If there is a match in voice commands, the operations that can be done with mouse and keyboard are executed.

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2. MATERIAL and METHOD

The application was programmed in C# programming language. This section describes how the voice recognition process is performed.

2.1. Voice Recognition Process

First stage; the voice recorded in the system. Once the voice is recorded, it can go through various processes and be processed. The following Figure 1 shows a general voice recognition process.

![Figure 1. Voice recognition process.](image1)

The voice is digitized to perform these operations. The voice is first filtered and then sampled for digitization. Figure 2 shows an example of digitization function.

![Figure 2. Example of digitization function.](image2)

Where \(x(t)\) is the analog signal, \(x(nT)\) is the digitized signal. In the digitizing stage, the filter shown in Figure 2 refers to the analog filter analog filtering and sampling are performed during the recording of the voice.

In order to use digital signal processing techniques, the analog signal must be represented as a series of numbers \([14]\). It utilizes the analysis and separation of voice signals to detect voice after sampling.

The voice wave that forms the sound has two important features. These properties are amplitude and frequency \([15]\). Frequency, while determining the soundness and quiver characteristics of voice; amplitude determines the intensity of the voice and the energy it carries. Equation 1 is given for the Total Amplitude (TG) calculation.

\[
TG = \sum_{t=1}^{n} x(t)
\]

(1)

In this equation \(x(t)\); amplitude at time \(t\); In other words, it expresses the energy carried by the voice wave at the moment \(t\). If the sum of the total amplitude value calculated by this method is above a certain value, then the meaning of sound, that is, speech, is started.

Filters are used for two purposes in the processing of voice. These are the separation of the voice signal and the correction of the voice signal. Digital filters are FIR (Finite Impulse Response) filter and IIR (Infinite Impulse Response) filter. In FIR filters, the input signal forms the output \(y_n\), which is the weighted sum of the current and previous inputs versus \(x_n\). The mathematical expression of this filter is given by Equation 2.

\[
y_n = b_0 x_n + b_1 x_{n-1} + b_2 x_{n-2} + \cdots + b_q x_{n-q}
\]

(2)

In this equation \(y_n\) is the result of the filter output. In IIR filters, the input signal constitutes the output \(y_n\), which represents the weighted sum of the previous outputs, together with the weighted sums of the current and previous inputs versus \(x_n\). In this model, together with the \(x_n\) input, the weighted sum of the previous \(p\) outputs gives the filter output \(y_n\). After digitizing the voice, the voice is encoded and the voice recognition process is completed. The following libraries should first be added to the system for voice recognition.

```csharp
using System.Diagnostics;
private SpeechLib.SpSharedRecoContext objRecoContext = null;
private SpeechLib.ISpeechRecoGrammar grammar = null;
private SpeechLib.ISpeechGrammarRule menuRule = null;
```

The design of the application consists of certain stages. From the recognition of voice commands to the execution of the media player, a number of operations are carried out. The flow diagram of the developed application is as in figure 3.
Firstly, we need to add the media player component to our application as shown in Figure 2.

The general form design view of the application to be managed by voice commands is shown in Figure 5. We can activate or deactivate this application at any time.

We need to include the following library in our system first.

```csharp
using System.Speech.Recognition;
```

Voice detection can be performed with the methods in the “System.Speech” library in the .Net Framework. The following code blocks are used in the system for feedback after voice recognition.

```csharp
SpeechSynthesizer Speech = new SpeechSynthesizer();
PromptBuilder Builder = new PromptBuilder();
SpeechRecognitionEngine Recognition = new SpeechRecognitionEngine();
```

First, the “player” command is given to start the application. This starts the application.

```csharp
if (avuclu.Text == "player")
{
    var mediaPlayer = "C:\Program Files\Windows Media Player\wmplayer.exe";
    System.Diagnostics.Process.Start(mediaPlayer);
}
```

The code block required to activate or deactivate the application is as follows.
The definitions and their use for controlling the media player with voice commands are shown in Table 1 below.

### Table 1. Commands and functions.

<table>
<thead>
<tr>
<th>Voice command</th>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Player</td>
<td>Open the media player</td>
</tr>
<tr>
<td>Open</td>
<td>Add mp3 list to media player</td>
</tr>
<tr>
<td>Active</td>
<td>Media player active</td>
</tr>
<tr>
<td>Passive</td>
<td>Media player passive</td>
</tr>
<tr>
<td>Play</td>
<td>Mp3 Play</td>
</tr>
<tr>
<td>Pause</td>
<td>Mp3 Pause</td>
</tr>
<tr>
<td>Next</td>
<td>Mp3 Next in list</td>
</tr>
<tr>
<td>Previous</td>
<td>Mp3 previous in list</td>
</tr>
<tr>
<td>Stop</td>
<td>Mp3 Stop</td>
</tr>
</tbody>
</table>

After verification of the required definitions and voice command, the data transmission process is executed with the following code block.

```csharp
avuclu.Text = Result.PhraseInfo.GetText(0, -1, true); // activate
objRecoContext = null; // deactivate

if (recog.Text == "play")
{
    axWindowsMediaPlayer1.Ctlcontrols.play();
    SpeechSynth.Speak("play");
}
if (avuclu.Text == "pause")
{
    axWindowsMediaPlayer1.Ctlcontrols.pause();
    SpeechSynth.Speak("pause");
}
if (avuclu.Text == " next")
{
    axWindowsMediaPlayer1.Ctlcontrols.next();
    SpeechSynth.Speak("next");
}
if (avuclu.Text == "previous")
{
    axWindowsMediaPlayer1.Ctlcontrols.previous();
    SpeechSynth.Speak("previous");
}
if (avuclu.Text == "stop")
{
    axWindowsMediaPlayer1.Ctlcontrols.stop();
    SpeechSynth.Speak("stop");
}
```

3. CONCLUSION

As the pronunciation of the voice command becomes more difficult and the number of letters in it increases, the level of accurate voice recognition decreases. 100% accurate recognition can be achieved by using short words and words with full pronunciation when making voice definitions. With misrecognition, the voice command performs the function linked to the nearest voice command. No action can be taken with inability to identify. In this study, test procedures were performed with 20 people. In some word tests, more than one test was performed over the same person's voice. The following in Table 2 shows the results of the experimental studies.

### Table 2. Experimental results.

<table>
<thead>
<tr>
<th>Words</th>
<th>Number of trials</th>
<th>Accurate recognition</th>
<th>False recognition</th>
<th>Error rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Player</td>
<td>20</td>
<td>18</td>
<td>2</td>
<td>%10</td>
</tr>
<tr>
<td>Open</td>
<td>20</td>
<td>14</td>
<td>6</td>
<td>%30</td>
</tr>
<tr>
<td>Active</td>
<td>15</td>
<td>14</td>
<td>1</td>
<td>%6,66</td>
</tr>
<tr>
<td>Passive</td>
<td>15</td>
<td>14</td>
<td>2</td>
<td>%13,33</td>
</tr>
<tr>
<td>Play</td>
<td>10</td>
<td>10</td>
<td>0</td>
<td>%0</td>
</tr>
<tr>
<td>Pause</td>
<td>12</td>
<td>10</td>
<td>1</td>
<td>%16,66</td>
</tr>
<tr>
<td>Next</td>
<td>20</td>
<td>10</td>
<td>0</td>
<td>%0</td>
</tr>
<tr>
<td>Previous</td>
<td>25</td>
<td>18</td>
<td>5</td>
<td>%28</td>
</tr>
<tr>
<td>Stop</td>
<td>25</td>
<td>23</td>
<td>1</td>
<td>%8</td>
</tr>
</tbody>
</table>

As can be seen from the results, it was more difficult to identify words with a high number of words and difficult to pronounce. The application has a coding that can do everything we do about daily media player with voice commands. It is thought that the application will be useful for people who cannot use the computer for any reason (bedridden, elderly, disabled, etc.). Specially developed to facilitate the lives of the visually impaired. With the application you can meet your daily music listening needs without being connected to anyone.

In this study, media player control was provided to listen to music by remote voice commands. Voice commands can be sent from any point with a wireless or wired headset. Media player was managed with voice commands without using mouse and keyboard. In addition, this study will enable people with disabilities, elderly or bedridden patients to meet their listening needs. The application developed in C# using the Speech.dll library was tested with different voice commands.

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