Course Project Documentation

CS101 Project

Voice-controlled bot

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1. Introduction:

It has always been a dream of human being to create machines that behave like humans. Recognizing the speech and responding accordingly is an important part of this dream. With the improvements of the technology and researches on artificial intelligent, this dream comes true relatively.

Speech Recognition is the process of automatically recognizing a certain word spoken by a particular speaker based on individual information included in speech waves. This technique makes it possible to use the speaker's voice to verify his/her identity and provide controlled access to services like voice based biometrics, database access services, voice based dialing, voice mail and remote access to computers. In this project, the algorithms for the speech recognition has been developed and implemented on MATLAB .These algorithms can be used for running devices directly through voice commands.

Problem Statement :

The aim of our project is to build a voice controlled bot which can execute basic commands such as ‘Run’, ‘Stop’, ‘Left’, ’Right’ and ‘Back’. Voice commands will be given to the laptop through microphone (earphones are also fine).

The voice commands given to the laptop will be processed and compared with the stored .wav files. The file which is closest to the given voice command will be recognized as the command file and the corresponding command will be executed by directly sending command through the serial port wirelessly via zigbee.

The bot has been specially programmed in such a way that if it encounters any obstacle in it way, then it does not wait for the user command. If the obstacle comes too close to the bot, it beeps once (as an alarm for the user) and stops.

3. Requirements:

A) Hardware Requirements :

1. FireBird : Requires 1 bot
2. Zigbee : To maintain communication between laptop and the bot
3. Sharp Sensor : To measure the distance between the bot and an object placed in front of the bot.
4 : Microphone : To input voice commands clearly to the laptop.

B) Software Requirements

1. Atmel studio 6.2 : To program instruction onto a given bot
2. Matlab : To recognize the given voice command and send it wirelessly to the bot directly via the serial port using zigbee.
3. XCTU : To send command to the bot using keyboard
4 . AVR Bootloader : To burn the hex file of the program into the bot directly.

4. Implementation:

A) Functionality:

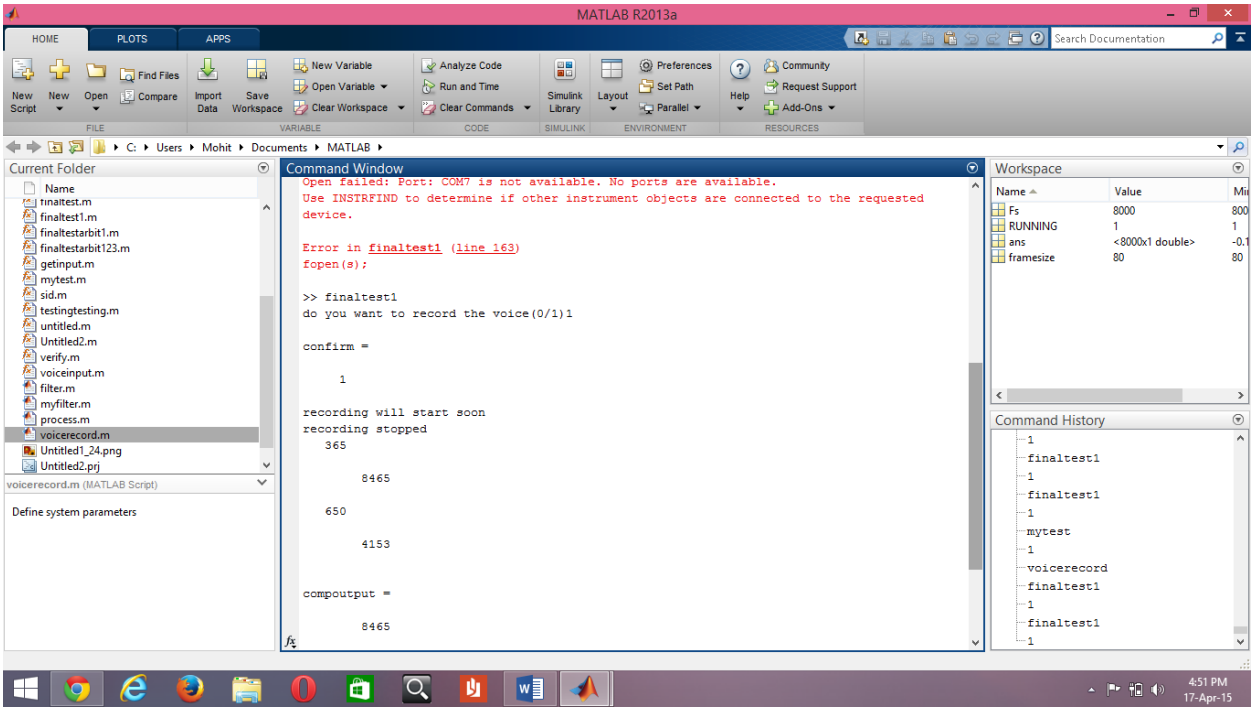
a) Determining voice input : The user is given a fixed time frame of one second to give the command once he presses enter . This ensures that any garbage commands do not affect the functioning of bot . The command is recorded using Matlab and stored in arrays .

b) Comparing input : We have already stored sample voice inputs in Matlab in various arrays . The input array is compared with the already defined arrays for the various commands and the command having array elements closest to given command is returned . The comparison is done by subtracting the value of various array elements of the input array from each of the arrays of sample arrays . The absolute value is taken . The array having maximum number of values having difference below a threshold limit is taken as the input and returned .

c) Sending command to bot : Matlab functions are used to send command detected by comparision to the port COM7 configured for signal transmission .

d) Giving commands to bot : The programming to operate the bot is done in Embedded C language using Atmel Studio .The bot is programmed to follow motion commands as well as detect any obstacle that comes its way during motion . The code is burnt in the bot using AVR Bootloader .

e) Motion of bot : X-bee is used to transmit the signal from port to bot . The bot receives the signal which activates its motors in a particular direction as given in the code .


MATLAB R2013a
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Import Data
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New Variable
Open Variable
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Analyze Code
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Clear Commands
Simulink Library
Layout
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Request Support
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finaltestarbit1.m
finaltestarbit123.m
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mytest.m
sid.m
testingtesting.m
untitled.m
Untitled2.m
verify.m
voiceinput.m
filter.m
myfilter.m
process.m
voicerecord.m
Untitled1_24.png
Untitled2.prj
voicerecord.m (MATLAB Script)
Define system parameters
Command Window
Open failed: Port: COM7 is not available. No ports are available.
Use INSTRFIND to determine if other instrument objects are connected to the requested device.
Error in finaltest1 (line 163)
fopen(s);
>> finaltest1
do you want to record the voice(0/1)1
confirm =
1
recording will start soon
recording stopped
365
8465
650
4153
compoutput =
8465
Workspace
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finaltest1
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6. Discussion of System:

A) What are worked as per plan?

1. **Zigbee Communication:**

Successfully able to communicate with the required bot by using Zigbee and able to take appropriate action at real time.

2. Obstacle Detection:

Integrated the obstacle detection code with the C code for wirelessly controlling the bot (via zigbee). This was executed by breaking the loop of motion by return checking return value from sharp sensors.

3. Voice Processing:

Recognized the given input command from the user as one of the stored .wav files. If the given command wasn't one of the stored commands, the command was ignored using thresholding.

4. Sending data directly through Matlab:

Sent command to the bot wirelessly directly using Matlab. This was done using serial port communication.

(B) Changes made in plan:

According to the SRS, it was planned to integrate MATLAB with XCTU which in turn would send commands to the bot wirelessly via Zigbee.

However, we sent commands directly to the bot through MATLAb via the serial port using in-built functions.

7 . FUTURE WORK :

- Our basic aim while doing this project was to make a bot that can help the handicapped and physically impaired in their day to day activities . The bot is able to do movement according to commands given and by using various hardware parts like gripper , servo motors , etc we can help them in transporting objects and following their other commands as and when required.
- Another application can be in rescue operations in case of calamities like earthquakes when the bot , equipped with a camera can be used as an asset to find people in debris.

8 . CONCLUSION :

Our work has been towards bringing the use of bots in day to day life . A voice controlled environment will make the bot easy and can lead to widespread use . The bot can act like a friend who does as and when ordered . Some applications are in venturing into spaces where humans can not enter which can help in case of earthquakes as well as in spying .

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References

1) Matlab installation :

http://in.mathworks.com/support/install-matlab.html

2) Atmel studio Installation :

http://www.atmel.com/microsite/atmel_studio6/

3) Youtube guide videos :

https://www.youtube.com/watch?v=jUfJFGg4NZI

4) Sample project :

http://www.cs.dartmouth.edu/~dwagn/aiproj/speech.html

5) Voicebox (a helpful toolbox for voice recognition) :

http://www.ee.ic.ac.uk/hp/staff/dmb/voicebox/voicebox.html