Indian Institute of Technology, Guwahati

Department of Computer Science and Engineering

Project report

On

"Speech based Control Panel"

Based on

Speech recognition system

Course: CS566 Speech Processing

Submitted to

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Submitted by:

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Introduction:

We created a speech based voice assistant named "**SWAP**" which can open the following applications through the voice commands.

Applications listed:

1. Browser
2. Face book
3. Photos
4. Paint
5. Excel
6. Word
7. Notepad
8. Music

Proposed methodology:

Basic requirements to develop this project are as follows:

- Windows OS
- Microsoft Visual Studio 2010
- C++ 11 integrated with VS2010
- Recording Module

With the availability of above software, we further proceed in modelling the logic. The prerequisites of this project are

- Basic i/o operations on file
- Pre-processing of speech data
- Feature extraction
- Modelling of extracted feature
- Enhancing mode

Model Used for system development:

Hidden Markov Model:

When we cannot observe the state themselves but only the result of some probability function (observation) of the states we utilize HMM.

Elements:

1. Number of states (N considered to be 5)
2. Number of Observation symbols (M considered to be 32)
3. A, B and π matrices

Recordings:

- 20 utterances of each word are considered for the training and models are created.
- The recordings are done using cool edit software with sampling rate 16000 and 16bit mono channel.
- For live recordings, executable file "Recording_Module.exe" is used.
  Usage: Recording_Module.exe 3 input_file.wav input_file.txt

Codebook:

Cepstral coefficients of the frames considered in the training recordings are taken into the universe file for the generation of the codebook. A 32*12 size codebook is generated from the universe created using the LBG method.

Training Model:

The training was done with 20 utterances of each word. The frame limit was set to 150 at max. The average of model was done for three iterations, taking model generated at previous iteration as base. The threshold value of 10 to the power of -30 (difference in P* in consecutive iteration) was used to train the model for particular observation sequence.

Steps for training:

1. Pre-recorded utterances of words are used to generate the observation sequences.
2. The obtained observation sequences are used to train the models for different words.
3. The trained models are then used for testing to determine accuracy of the system.

Functionalities SWAP can perform:

Live Training:

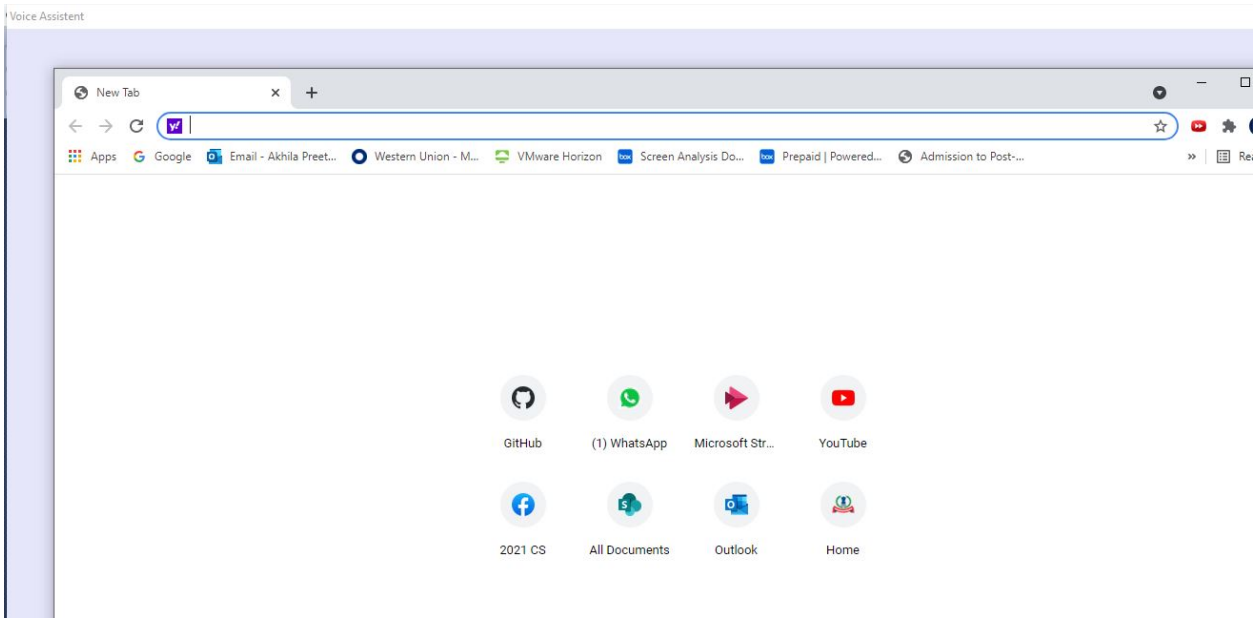
- For a new user we have included a module to train on user's voice.
- The user is prompted to utter the same word for 10 times.
- Data stored in the folder "live_recordings\\"
- New model is created for the word.
- Use the generated model for testing on the new user's voice.

Live Testing:

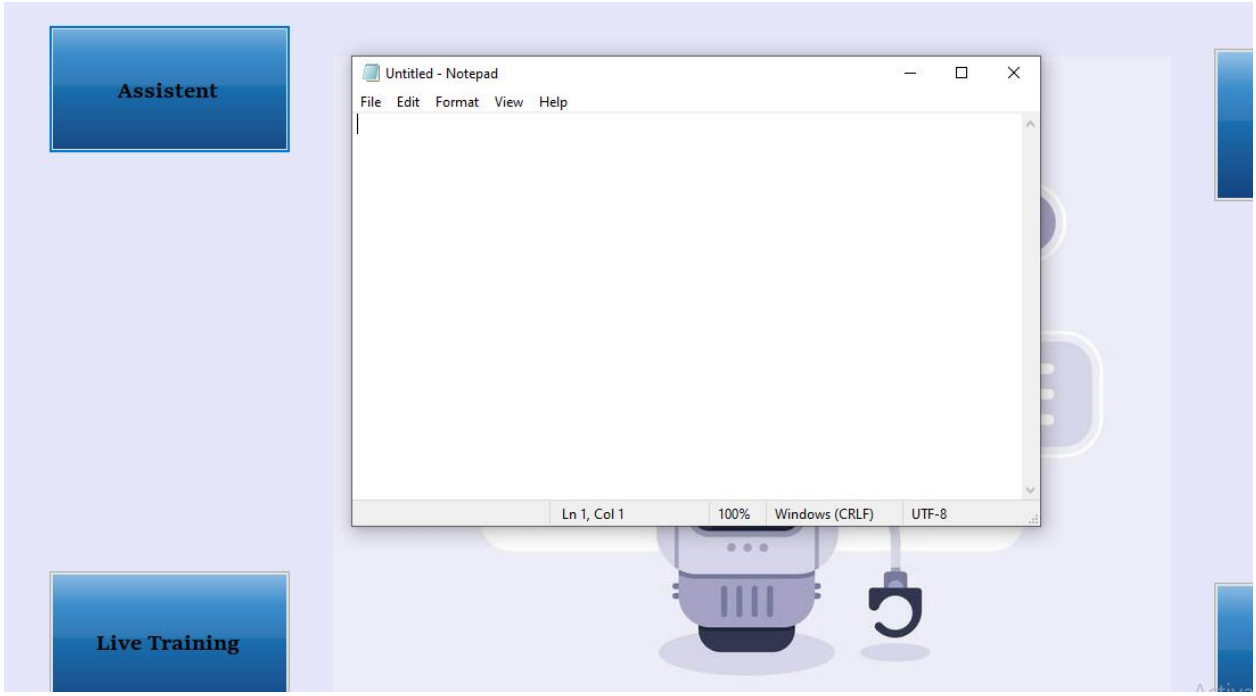
- SWAP prompts the user for the command (Application to be opened) .
- Through HMM models already trained, SWAP recognizes the command.
- SWAP opens the corresponding application.

User prompts and corresponding action by SWAP :

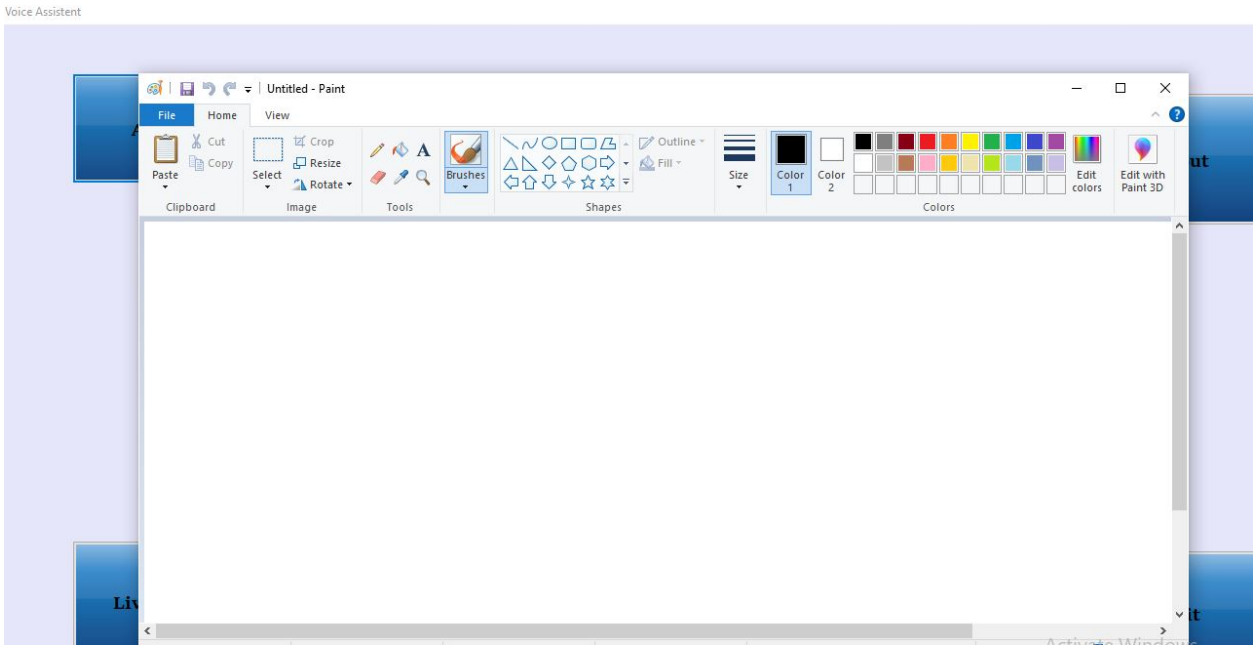
- **Browser**



- **Notepad**



- **Paint**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Home
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Crop
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Rotate
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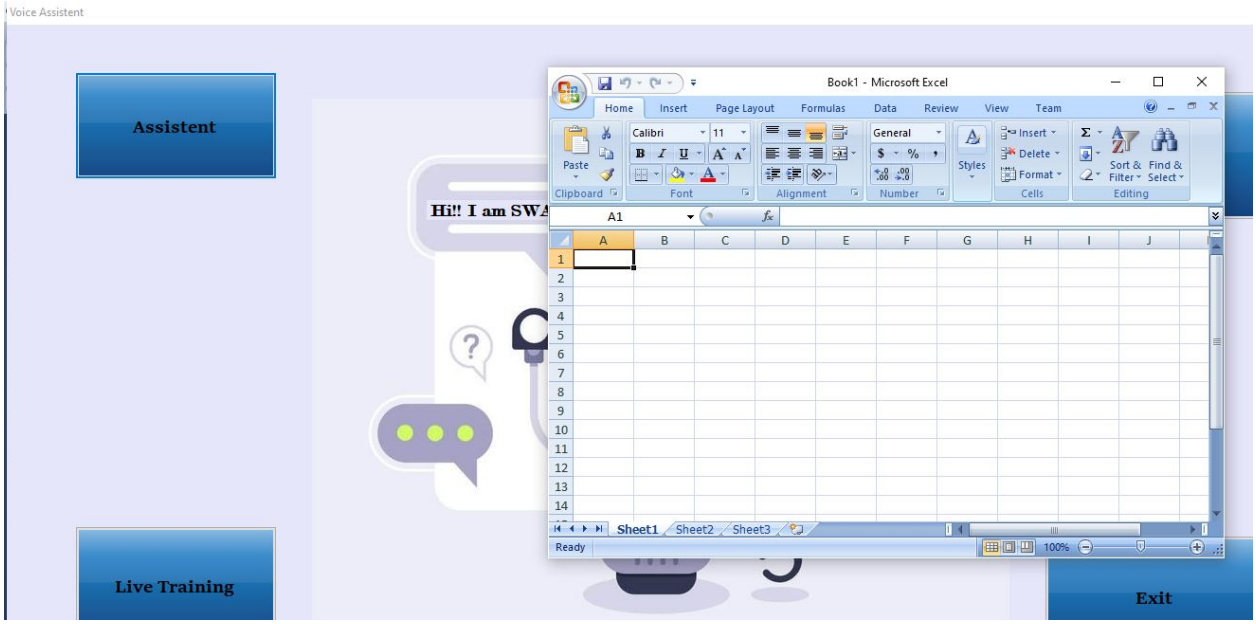
Edit with Paint 3D
Clipboard
Image
Tools
Shapes
Colors

- **Excel**


Voice Assistent
Assistent
Hi!! I am SWA
Live Training
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General
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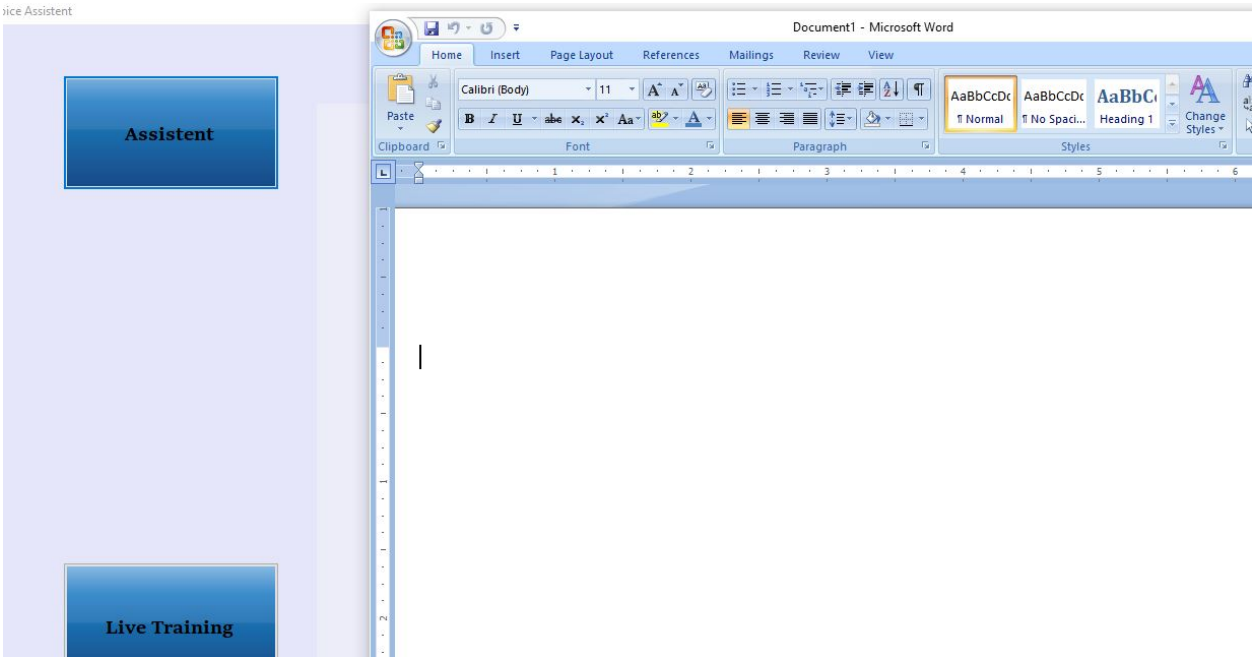
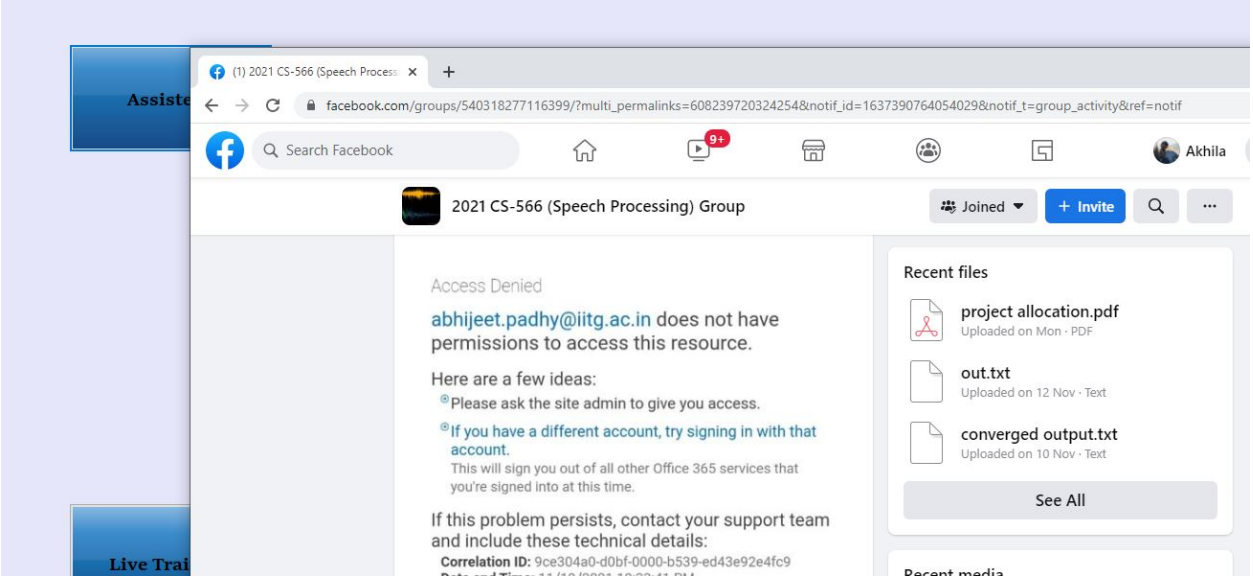
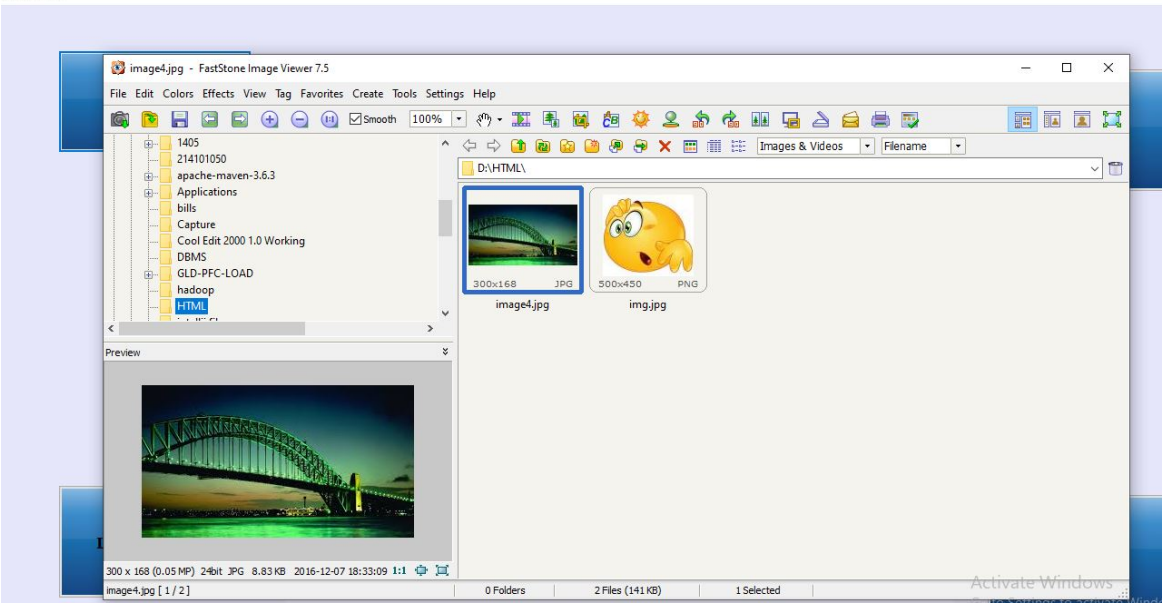
- **Word**



- **Face book**



- **Photos**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