

NATURAL LANGUAGE USER INTERFACE SYSTEM

A

PROJECT REPORT

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In fulfillment for the award of the degree

Of

BACHELOR OF ENGINEERING

in

Computer Engineering



**Government Engineering College, At-Katpur, Patan
Gujarat Technological University, Ahmedabad
2019-2020**

GOVERNMENT ENGINEERING COLLEGE, PATAN



CERTIFICATE

Date: / /

This is to certify that the project entitled “**NATURAL LANGUAGE USER INTERFACE SYSTEM**” has been carried out by,

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ABSTRACT

Natural language interface is a user interface that allows people to interact using a human language, such as English, as opposed to a computer language such as command line interface, or graphical user interface. Natural language interfaces may be designed for understanding either written or spoken text. It is a type of computer human interface where linguistic phenomena such as verbs, phrases and clauses act as UI controls for accessing a device. This application may help for blind people and various type of voice recognition security system.

CHAPTER-1 INTRODUCTION

SR (SPEECH RECOGNITION)

Definition:

- Speech recognition is the ability of a machine or program to identify words and phrases in spoken language and convert them to a machine-readable format.
- Rudimentary speech recognition software has a limited vocabulary of words and phrases, and it may only identify these if they are spoken very clearly.
- A common type of speech recognition is "speech-to-text" or "dictation" software, such as Dragon Naturally Speaking, which outputs text as you speak. While you can buy speech recognition programs, modern versions of the Macintosh and Windows operating systems include a built-in dictation feature. This capability allows you to record text as well as perform basic system commands.
- Many speech recognition systems only support English; some speech recognition software supports multiple languages. This requires a unique dictionary for each language and extra algorithms to understand and process different accents. Some dictation systems, such as Dragon Naturally Speaking, can be trained to understand your voice and will adapt over time to understand you more accurately.



Figure 1.1 Speech Recognition

1.1 PROJECT SUMMARY

- Natural-language user interface is a type of computer human interface where linguistic phenomena such as verbs, phrases and clauses act as UI controls for accessing a device.
- The primary goal of this project is to recognize and indentify the given voice command.
- Our voice command will be interpreted to its corresponding task on the backend.
- As per our voice command the computer will automatically perform the given task.

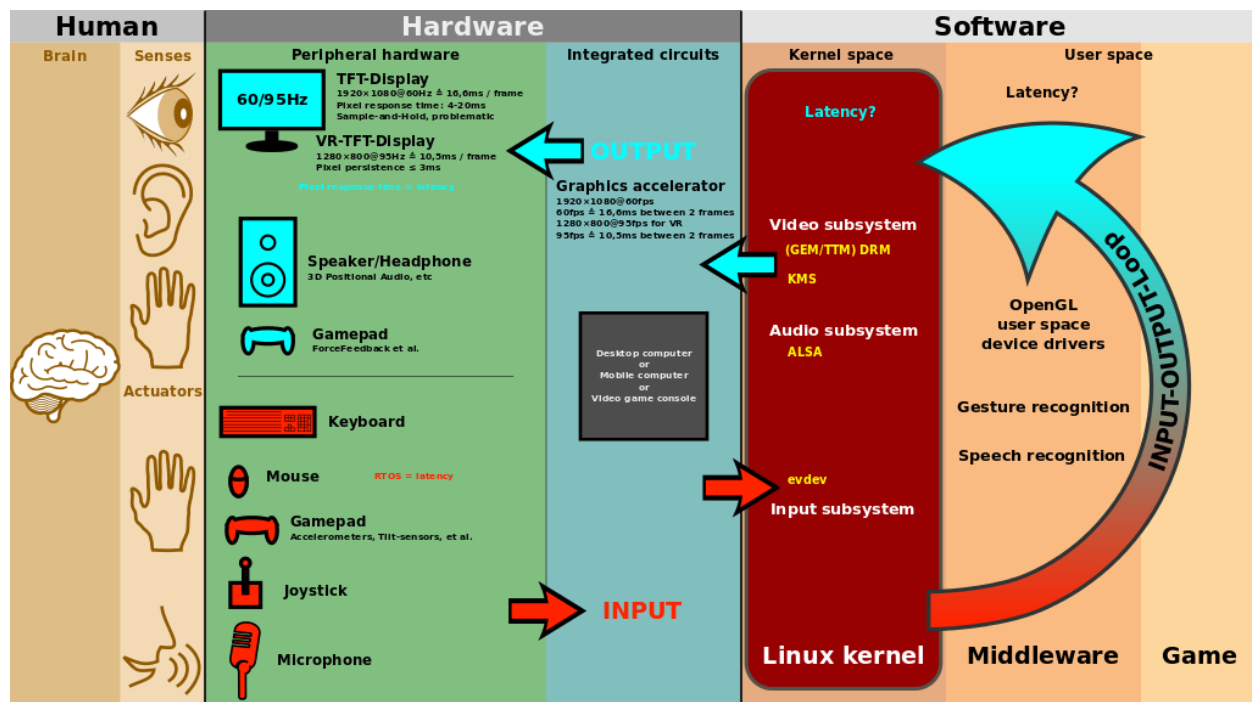


Figure 1.2 Project lifecycle

1.2 AIM & Objectives

- Natural-language user interface is a type of computer human interface where linguistic phenomena such as verbs, phrases and clauses act as UI controls for accessing a device.
- Voice Recognition: - The primary goal of this project is to recognize and identify the given voice command.
- Command Identification: - Our voice command will be interpreted to its corresponding task on the backend.
- Perform the task accordingly: - As per our voice command the computer will automatically perform the given task.

1.3 Problem Specification

- Gmail: - Using Web-Browser automation techniques we will provide automation to Gmail on web browser meaning the entire task that are performed by clicking with mouse and with the help of keyboard will be performed by your speech corresponding to that task.
- Microsoft PowerPoint Presentation: - Similar to Gmail we will be also able to access Microsoft PowerPoint Presentation with the help of desktop application automation techniques with the voice commands.

1.4 Scope of Project

- Our Project could be applied to the following web application and desktop application: -
 1. Gmail
 2. PowerPoint Presentation
 3. Social media
 4. Game
 5. Speech to Text application

1.5 Plan of Work

- Firstly, we need to go through different research papers and different resources to see if any such project is done in the past or not.
- We had the dilemma which design should we use - user interface of webpage, a Chabot or a backend running process without any interface.
- Then after we need to develop a sample program file of our project using libraries like Google Text to Speech (gTTS), speech recognition and pyTTS.
- Since there are two libraries for text to speech: (a) Google Text to Speech (gTTS), (b) pyTTS. gTTS requires high speed internet for errorless text to speech. And pyTTS is offline so it is little less effective. So, we needed to carefully check all the pros and cons of both methods to choose the appropriate one.
- We had two ways that a user can give input to the system 1) text input and 2) voice input which is both accepted as valid input and we had to design that accordingly.
- We had developed a program to automate web browser and 3-4 web applications such as Wikipedia, Whatsapp web, Youtube using linguistic

phenomenon such as verb, phrase or clause on selenium using python language.

- It would be better if user gives clear and detailed document for better and optimized result.
- We had to learn to implement machine learning and deep learning on voice commands to make effective voice command implementation on different platforms.
- The challenging task is to interpret complex voice commands using machine learning algorithm.
- The main support we needed in this task was to get guidance on how to improve accuracy of the input taken in voice form.

1.6 TECHNOLOGIES AND TOOLS:

- Python
- Google Text To Speech (gTTS) Library: gTTS is a module and command line utility to save spoken text to mp3. It uses the Google Text to Speech (TTS) API.
- Python Text To Speech (PyTTS) Library: Python Text To Speech | pyttsx module. pyttsx is a cross-platform text to speech library which is platform independent. The major advantage of using this library for text-to-speech conversion is that it works offline.
- Selenium: Selenium Python bindings provide a convenient API to access ... When I say automation; it means it automates test scripts written in Selenium.
- Open CV: Using as a library of image processing.
- Microphone

Chapter: 2 SYSTEM REQUIREMENTS

2.1 User Characteristics

- **Mobility :** The proposed system would be platform independent as it can be used using desktop as well as smart phone and tablets.
- **Efficiency :** The new proposed learning system is very efficient and less time consuming compared to current learning system.
- **User-friendly :** It provides user friendly interface in form of web application, mobile application or desktop application so user can easily access and use it.
- **Reduce Work load:** It needs less manpower relatively current learning system to manage all activities regarding to institutes and colleges.
- **Remove Documentation:** It eliminates the documents to carry for all activities either it is attendance or assignment or practical to verify.
- **Safety:** It validates user by login activity and provides facilities like forgot password and create new user.

2.2 Hardware & Software Requirements

Hardware Requirements:

- 8 GB RAM
- 1 TB Hard Disk
- 64-bit Intel Core i5/i7 Processor
- Internet / LAN
- Smartphone / Laptop

Software Requirements:

- Ubuntu 18.04 Server Operating System
- Python
- Selenium
- Open cv
- MySQL
- Mozilla Firefox / Google Chrome

2.3 System Analysis

Feasibility Study

- Interoperability: To integrate with related peripheral applications and services like courses, users and roles.
- Flexibility: Easily move learning contents and to customize for the needs of colleges or institutes like user authentication, course enrolment, test/quiz export-import, etc.
- Cost Effectiveness: Includes vendor hosting fees and additional fees.
- Ease of Use: Includes easily accessible interface.
- Scalability: Ability to effectively serve both large and small institutes like total no. of active courses, total no. of active users, etc.
- Sustainability: Ability to maintain consistent level of learning.

CHAPTER- 3 DESCRIPTIONS

3.1 ADVANTAGES OF SYSTEM

- Easy to learn and easy to remember, because its structure and vocabulary are already familiar to the user.
- People need little training to use it in interfacing with a computer system
- It allows considerable flexibility in executing the steps of a task
- For many applications, the use of natural language in NLI is faster than using a menu system, composing formal queries, or writing computer programs
- Natural languages allow follow-up questions to build on the linguistic context established by previous dialogue
- The automatic-programming aspect of many Natural Language Interface systems is a key benefit of the interface technology, in that it provides a means for reducing the high labour cost of using humans to program computer algorithms.

3.2 DISADVANTAGES OF SYSTEM

- Users can easily pose questions or give commands that are beyond the ability of the system to interpret.
- Flexibility of an NLI could also be considered a disadvantage. For example, in an application that implements NLI (Natural Language Interface) to access database of information, users will tend to believe that it can deduce other facts from that information. This is not necessarily true, even after explicitly coding with external data.

Chapter: 4 System Design

4.1 Functional Diagram

4.1.1 Class Diagram

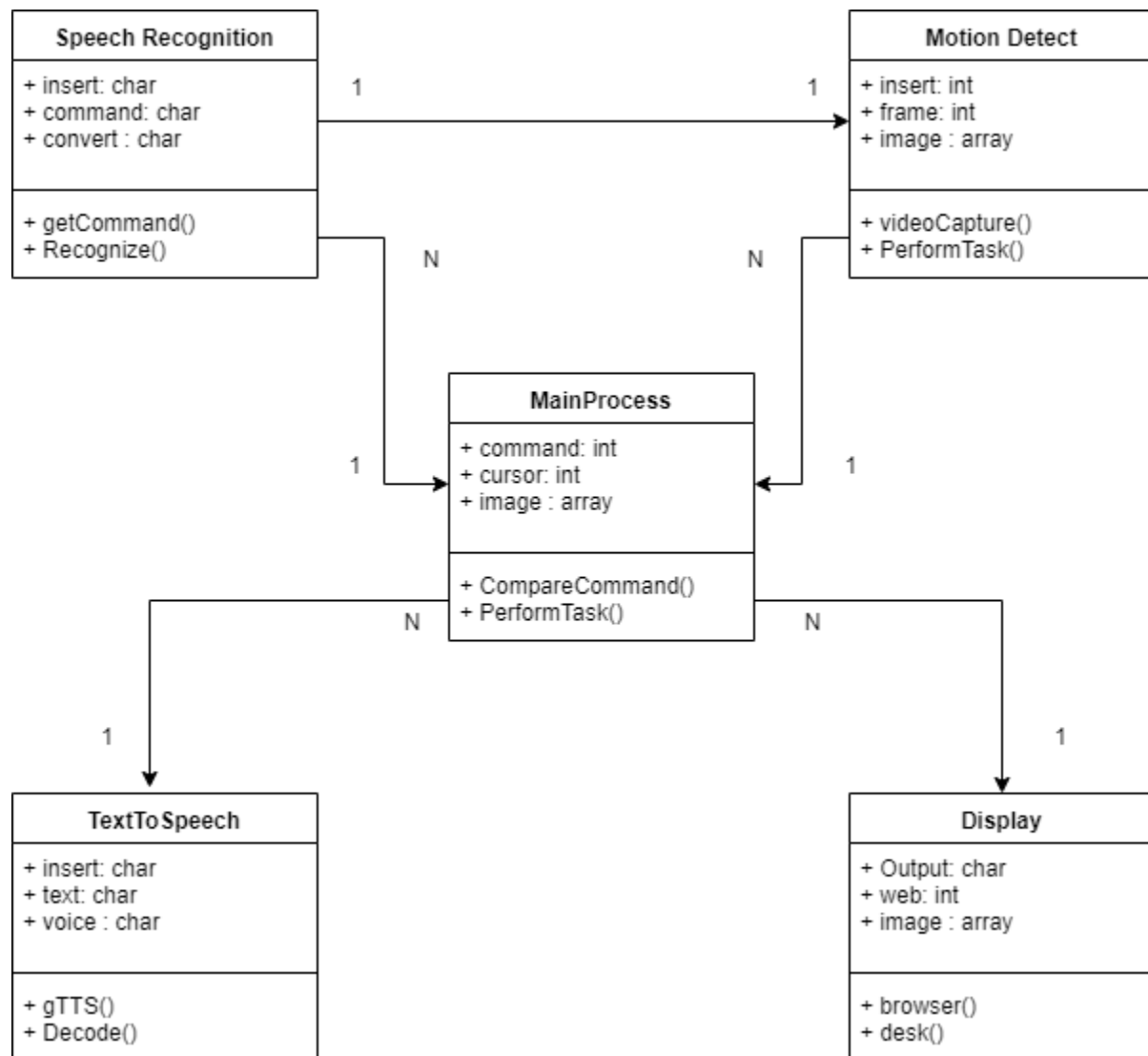


Figure 4.1 Class Diagram of N.L.U.I.S.

4. 1.2 Use-Case Diagram

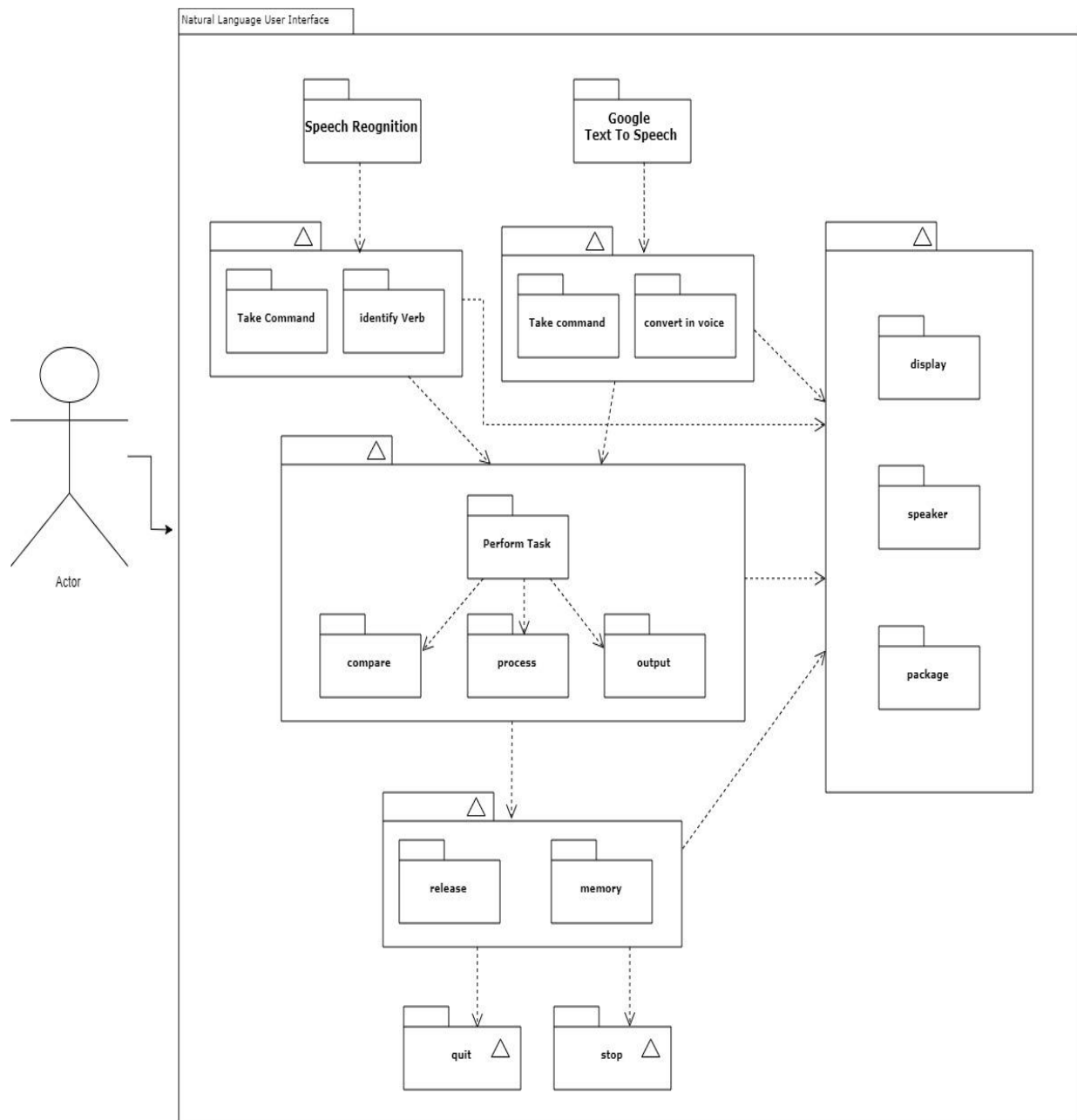


Figure 4.2 Use-Case Diagram for Natural Language User Interface

4.1.3 Data Flow Diagram

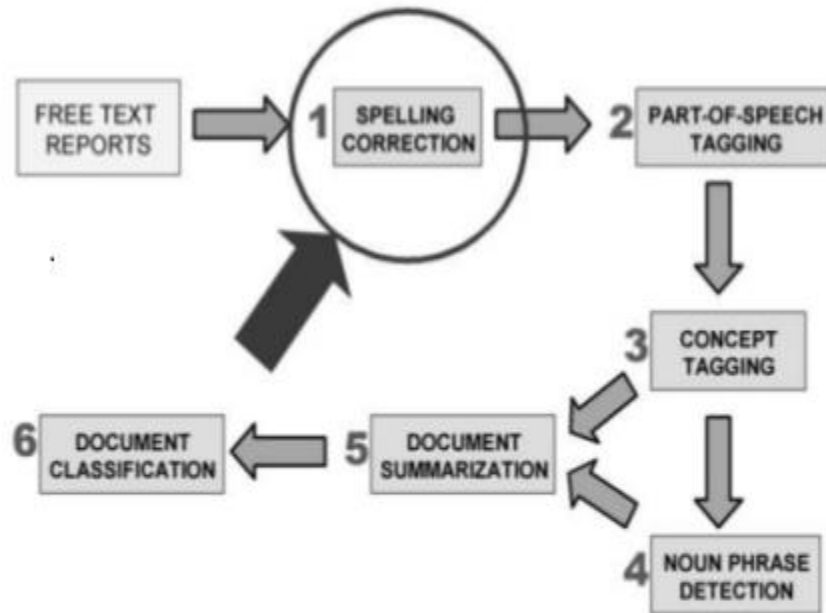


Figure 4.3 Data Flow Diagram

4.1.4 Sequence Diagram

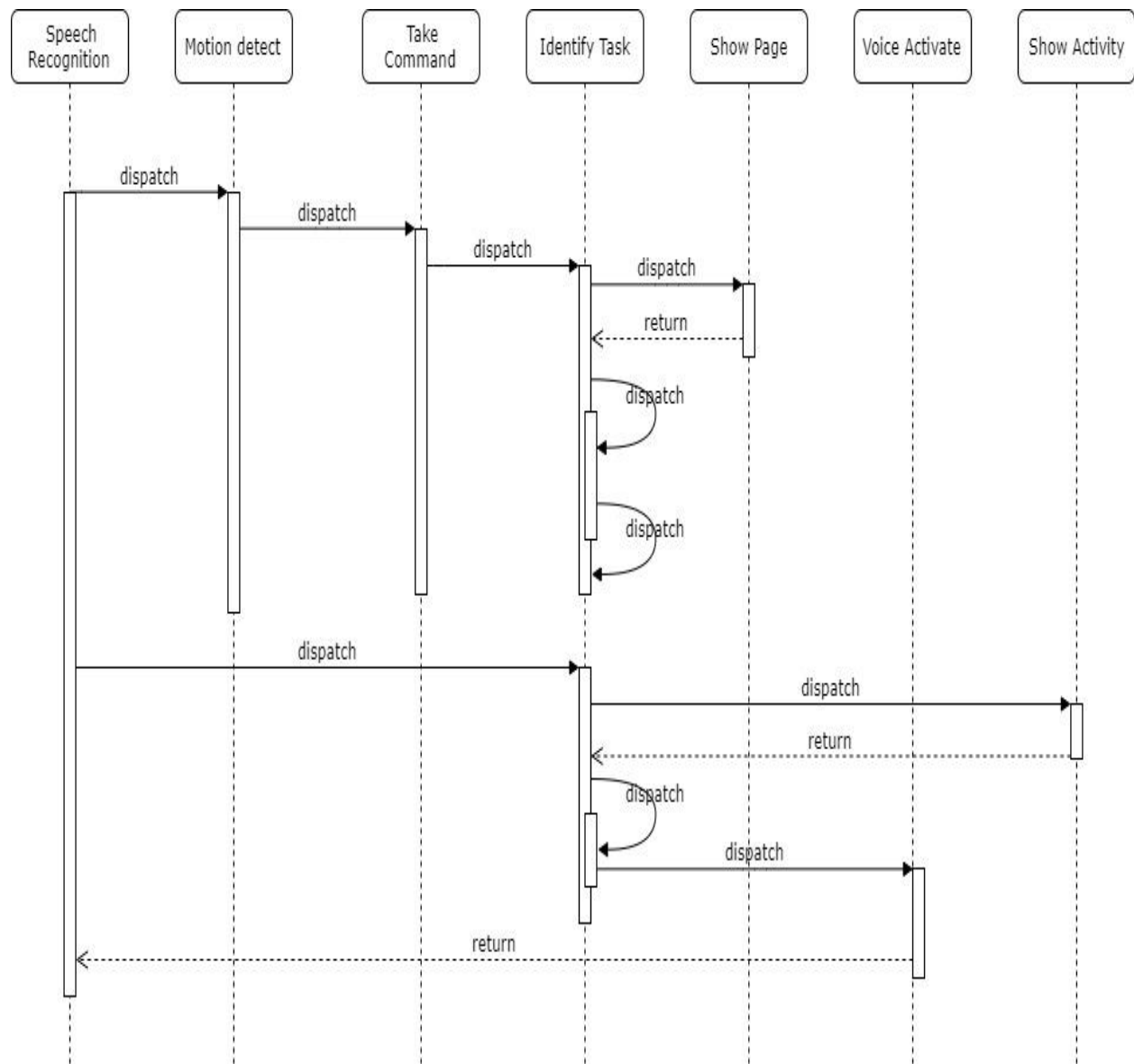


Figure 4.4 Sequence Diagram For Natural language user interface

Chapter: 5 Implementation strategy and review

5.1 Future Scope

The current setup can be further enhanced by using machine learning and more advanced module such as deep learning to get the accurate speech to text and then interpreting that text with UI command and then respond accordingly.

5.2 Conclusion

Natural-language user interface is a type of computer human interface where linguistic phenomena such as verbs, phrases and clauses act as UI controls for accessing a device.

Appendix

Periodic Progress Reports (PPR)

PPR Details

Periodic Progress Report : First PPR

Project : Natural Language User Interface System

Status : Reviewed

1. What Progress you have made in the Project ?

We have gone through different research papers and different resources to see if any such project is done in the past or not.

2. What challenge you have faced ?

We had the dilemma which design should we use - user interface of webpage, a Chatbot or a backend running process without any interface.

3. What support you need ?

We just need a proper guidance and a decent approach to design the project.

4. Which literature you have referred ?

Online research papers, various blogs and related articles.

Document : Download

Comments

Comment by Internal Guide :

None

PPR Details

Periodic Progress Report : Second PPR

Project : Natural Language User Interface System

Status : Reviewed

1. What Progress you have made in the Project ?

We had developed a sample program file of our project using libraries like Google Text to Speech (gTTS), speech recognition and pyTTS.

2. What challenge you have faced ?

Since there are two libraries for text to speech: (a) Google Text to Speech (gTTS), (b) pyTTS. gTTS requires high speed internet for errorless text to speech. And pyTTS is offline so it is little less effective. So, we needed to carefully check all the pros and cons of both methods to choose the appropriate one.

3. What support you need ?

We had two ways that a user can give input to the system 1) text input and 2) voice input which is both accepted as valid input and we had to design that accordingly.

4. Which literature you have referred ?

Speech Recognition Using Deep Learning Algorithms by Yan Zhang, SUNet ID: yzhang5 Instructor: Andrew Ng

Document : Download

Comments

Comment by Internal Guide :

None

PPR Details

Periodic Progress Report : Third PPR

Project : Natural Language User Interface System

Status : Reviewed

1. What Progress you have made in the Project ?

We had developed a program to automate web browser and 3-4 web applications such as Wikipedia, Whatsapp web and Youtube using linguistic phenomenon such as verb, phrase or clause on selenium using python language.

2. What challenge you have faced ?

We can process only limited length voice string.

3. What support you need ?

It would be better if user gives clear and detailed document for better and optimized result.

4. Which literature you have referred ?

Selenium with Python: <https://www.selenium-python.readthedocs.io>

Document : Download

Comments

Comment by Internal Guide :

None

PPR Details

Periodic Progress Report : Forth PPR

Project : Natural Language User Interface System

Status : Reviewed

1. What Progress you have made in the Project ?

We learned to implement machine learning and deep learning on voice commands to make effective voice command implementation on different platforms.

2. What challenge you have faced ?

The challenging task is to interpret complex voice commands using machine learning algorithm.

3. What support you need ?

The main support we needed in this task was to get guidance on how to improve accuracy of the input taken in voice form.

4. Which literature you have referred ?

<https://github.com/rasbt/python-machine-learning-book>

Document : Download

Comments

Comment by Internal Guide :

None

Design Engineering Canvas

AEIOU Canvas

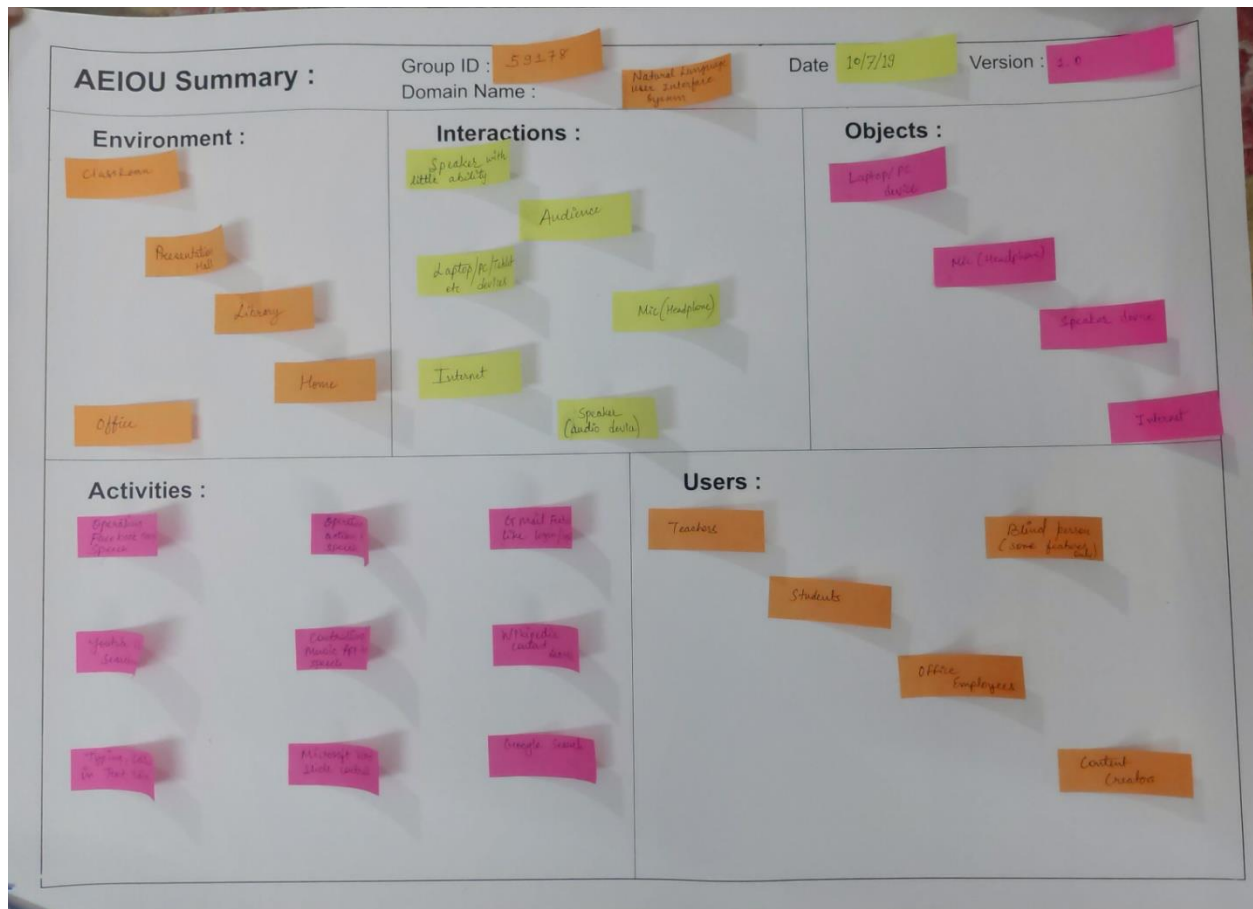


Figure 7.1 AEIOU Summary

Empathy Mapping Canvas

Design For Natural Language User Interface System		Design By Darganath Sridhar (025) Anand K. S. (034) Darganath Sridhar (035) Anand K. S. (036)	
Date 10/7/19		Version 1.0	
USER Teachers, Students Blind person, Office Employee		STAKEHOLDERS product oriented companies like Google, Shell and big MNC companies, Service oriented companies like TCS	
ACTIVITIES Facebook through speech, Gmail login/logout, Youtube search, Music App (play/store), Map (location/Route), Typing/Editing text in text-editor, Wikipedia search (content oriented), Google Search			
STORY BOARDING HAPPY Our team approached the group of juniors, shown them this amazing features of the project. They all amazed by the cool technology, say code that can operate facebook, Google search, Youtube, Wikipedia, Music app, text typing just by their voice commands. They also gave valuable feedback to improve and add some features to project.			
HAPPY We met a blind person to whom we talk about us and our ongoing project. Though he can't see but we encouraged him to give voice command by which he can able to send message. He got happy as he had sent message and realized the value of project.			
SAD We have the feature of facebook login - logout in our project. We shown this to one user. He used it by his command (voice) but he also need to speak password, he disliked this thing and give his feedback. Then, we got the solution of encrypt password within code.			
SAD We approached some seniors of ours from same field. They somewhat disliked the build of project. They said instead of covering many features you should go all the details of one particular feature like every actions of in facebook should run through voice command only not just login - logout, also they gave feedback that it is not something very new to market.			

Figure 7.2 Empathy Mapping Canvas

Ideation Canvas

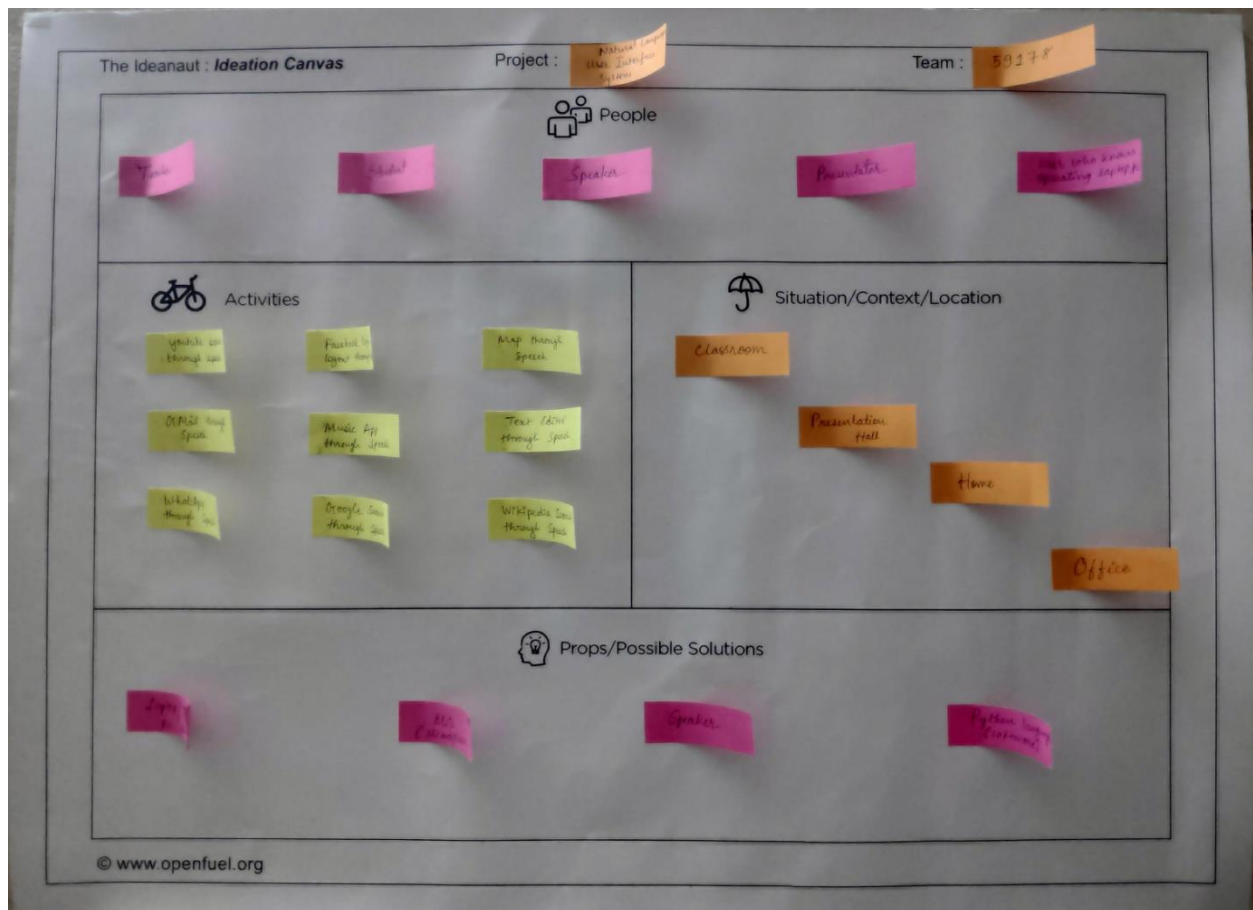


Figure 7.3 Ideation Canvas

Product Development Canvas

Product Development Canvas

Team/Date/Version : 59178 10/7/19

<p>Purpose</p> <p>What is the purpose of this concept you're developing? Does it solve a problem or enhance a certain experience? Is it filling a need or is it trying to create a new need or tap an unmet need?</p> <p>Expanding the experience of the user</p> <p>Self system of the product</p> <p>It's a user system</p>	<p>Product Experience</p> <p>Define what your customer should feel like when he uses your product/service? What emotions, feelings would define his experience? (Feeling of comfort, convenience, or feeling of buying more with less (cost conscious) or feeling of greater security, safety etc.)</p> <p>Must eliminate/never get excited</p> <p>User want to know how doing and feature</p> <p>Product Functions</p> <p>Functions are a products answer to user problems/needs. They do something that user wants. They are often verbs in nature. Every function is powered by many features. Multitasking is a function. Browser tabs is a feature that powers the multitasking feature. A function can have one or more features powering it. Functions are very generic in nature. Features are often more specific. Functions can be similar to product experience. Safety product function provides a feeling of safety (product experience).</p> <p>Function: login</p> <p>Google search, Youtube search, Email access (login)</p> <p>Product Features</p> <p>Product features are specific. One or more features can power a function. Android, Windows, AirTags are features that power the safety function. Browser tabs, Apple's home button to multitask, browser apps are features powering the multitasking function. Each feature will have many components/sub components powering it. Sometimes a very popular component becomes a feature itself. Like car stereo is a major component and a feature at the same time powering the in car entertainment function providing entertainment as a product experience.</p> <p>Operating system in a device</p> <p>Search through speech</p> <p>Video search through speech</p>	<p>Customer Revalidation</p> <p>Once you're finished with your feature set, test with the customer / user if the features, functions are useful. Speak to the customer / user.</p> <p>Think feature can also operate in other ways</p> <p>login/logout function are useful</p> <p>discuss message in whatsapp through speech</p>
<p>People</p> <p>Who is the key customer segment who will use this product/service or the end product of the concept you're pursuing? Write here about them, describe them a little.</p> <p>Teacher can operate with the system</p> <p>Students can be operated system in class possible</p> <p>In this case, employees can be used</p>	<p>Components</p> <p>Components build up the features. For a website it will comprise a list of component like bags, triggers etc. that go into making it. For a tablet browser it will comprise of various chunks of code that will make the table work. It's such where the feature is a major component, you could list here the auxiliary components that are required to make the major component work. You can also list new adjustments and innovations you're planning here at the component level.</p> <p>Laptop / PC / Tablet etc</p> <p>Python software (Python 3)</p> <p>Speaker</p> <p>Internet</p> <p>Micro (headphone)</p> <p>Python Automation tools</p>	<p>Reject, Redesign, Retain</p> <p>Post customer validation, reject, those functions or features that the customers don't find useful. Redesign those that were partially useful and retain those that the user / locate with this unit as functions/features are accepted.</p> <p>login password need to be spoken to be rejected</p> <p>making speech directed changes in voice password need not to retain</p> <p>some customer reject feature cause of pronunciation error</p> <p>rejected cause of extra unwanted roles error</p>

Figure 7.4 Product Development Canvas

References

- 1) Kongthon, Alisa; Sangkeettrakarn, Chatchawal; Kongyoung, Sarawoot; Haruechaiyasak, Choochart (October 27–30, 2009). Implementing an online help desk system based on conversational agent. MEDES '09: The International Conference on Management of Emergent Digital EcoSystems. France: ACM. doi:10.1145/1643823.1643908
- 2) Hutchins, J. (2005). "The history of machine translation in a nutshell" (PDF).
- 3) Chomskyan linguistics encourages the investigation of "corner cases" that stress the limits of its theoretical models (comparable to pathological phenomena in mathematics), typically created using thought experiments, rather than the systematic investigation of typical phenomena that occur in real-world data, as is the case in corpus linguistics. The creation and use of such corpora of real-world data is a fundamental part of machine-learning algorithms for natural language processing. In addition, theoretical underpinnings of Chomskyan linguistics such as the so-called "poverty of the stimulus" argument entail those general learning algorithms, as are typically used in machine learning, cannot be successful in language processing. As a result, the Chomskyan paradigm discouraged the application of such models to language processing.
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