High Level Design (HLD)

TEXT TO SPEECH

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Contents

Abstract

The text-to-speech (TTS) is the process of converting words into a vocal audio form. The program, tool, or software takes an input text from the user, and using methods of natural language processing understands the linguistics of the language being used, and performs logical inference on the text. This processed text is passed into the next block where digital signal processing is performed on the processed text. Using many algorithms and transformations this processed text is finally converted into a speech format. This entire process involves the synthesizing of speech.

1 Introduction

1.1 Why this High-Level Design Document?

The purpose of this High-Level Design (HLD) Document is to add the necessary detail to the current project description to represent a suitable model for coding. This document is also intended to help detect contradictions prior to coding, and can be used as a reference manual for how the modules interact at a high level.

The HLD will:

- Present all of the design aspects and define them in detail
- Describe the user interface being implemented
- Describe the hardware and software interfaces
- Describe the performance requirements
- Include design features and the architecture of the project
- List and describe the non-functional attributes like:
    - Security
    - Reliability
    - Maintainability
    - Portability
    - Reusability
    - Application compatibility
    - Resource utilization
    - Serviceability

1.2 Scope

The HLD documentation presents the structure of the system, such as the database architecture, application architecture (layers), application flow (Navigation), and technology architecture. The HLD uses non-technical to mildly-technical terms which should be understandable to the administrators of the system.

1.3 Definitions

Term	Description
TTS	Text To Speech
Database	Collection of all the information monitored by this system
IDE	Integrated Development Environment
GCP	Google Cloud Platform

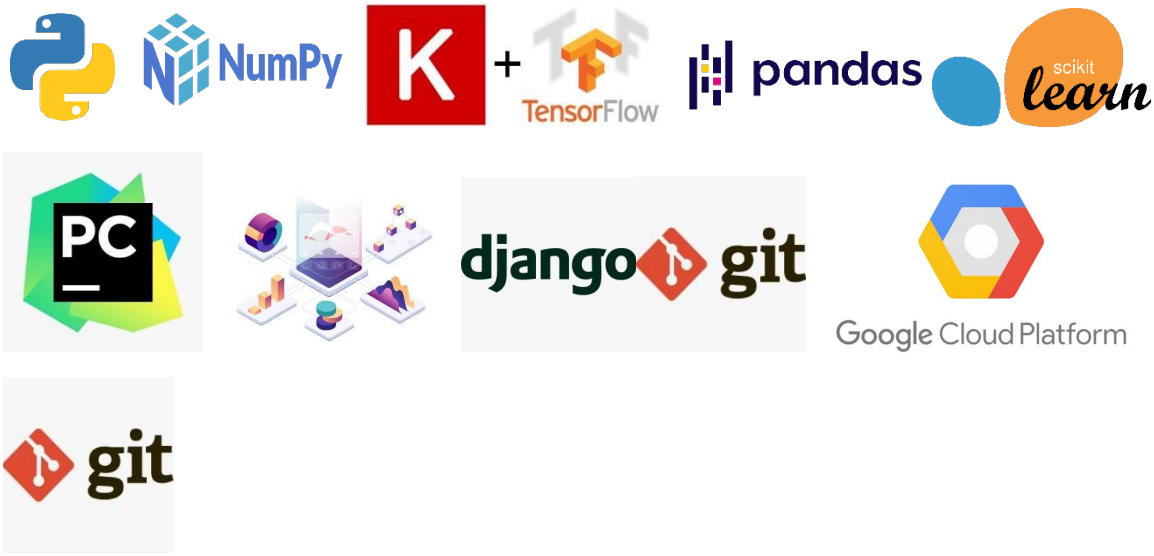
2 General Description

2.1 Product Perspective

Text to speech is a web application which will take the text from user and convert that text into a audio file and this process can be repeated at a very much faster speed in order to convert thousands of audio file in very less time with high accuracy. SQL is used to retrieve, insert, delete, and update the database. Here the system store each and every data given by user or received in request to the MySQL/MongoDB database.

2.2 Tools used

Python programming language and frameworks such as Numpy, Pandas, Scikit-learn, TensorFlow, Keras are used to build the whole model.



- PyCharm is used as IDE.
- For visualization of the plots, Matplotlib, Seaborn and Plotly are used.
- GCP is used for deployment of the model
- MySQL/MongoDB is used to retrieve, insert, delete, and update the database.
- Front end development is done using HTML/CSS
- Python Flask is used for backend development.
- GitHub is used as a version control system.

2.3 Constraints

Text to Speech must be user friendly, as automated as possible and users should not be required to know any of the workings.

2.4 Assumptions

The main objective of the project is to convert text into audio based on the information in the TTS by using Machine Learning and Deep Learning techniques. It is also assumed that all aspects of this project have the ability to work together in the way the designer is expecting.

3 Design Details

3.1 Functional Architecture

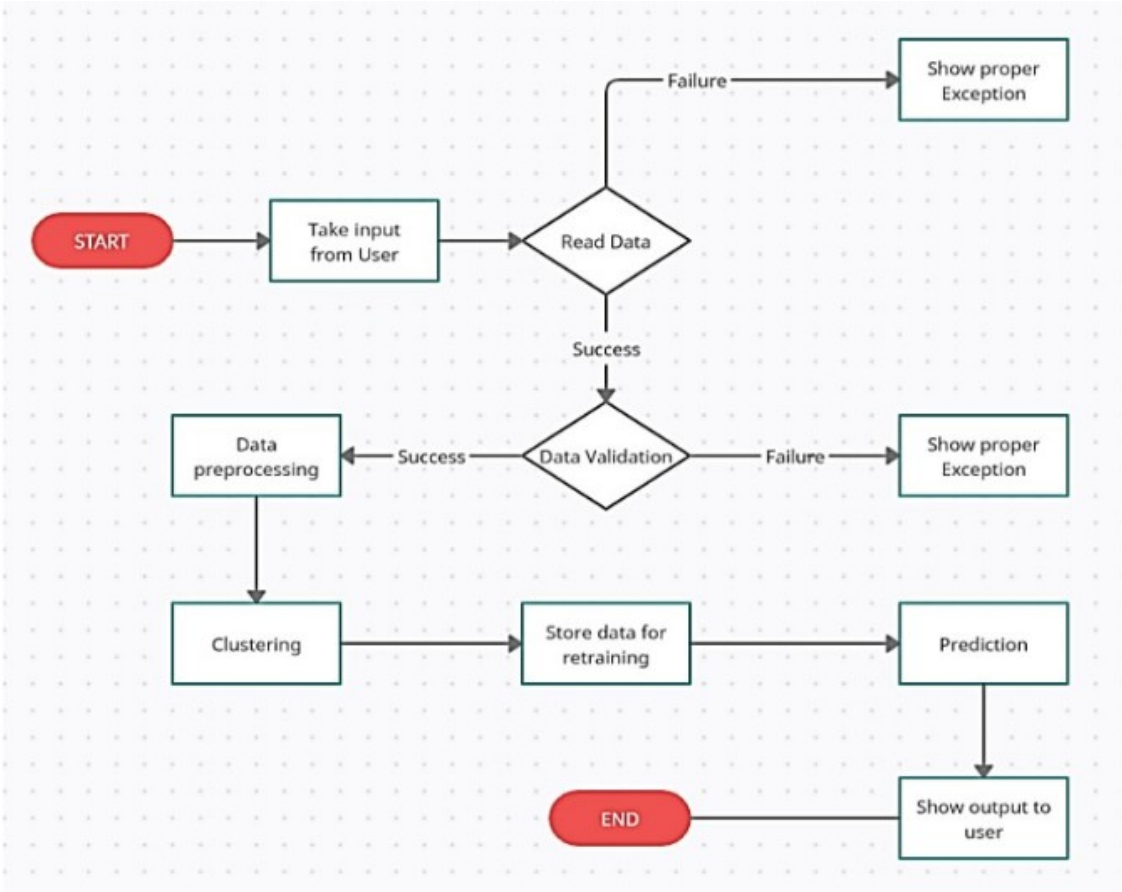


Figure 1: Functional Architecture of Text To Speech

3.2 Database Design

Text to Speech needs to store every request into the database and it needs to store in such a way that if you want to retrain a model it should be easy to retrain the model with new data as well.

Initial Step-By-Step Description:

1. The User write the text.

2. The User gives required information..
3. The system store each and every data given by user or received in request to the database.

3.3 Web Application Architecture

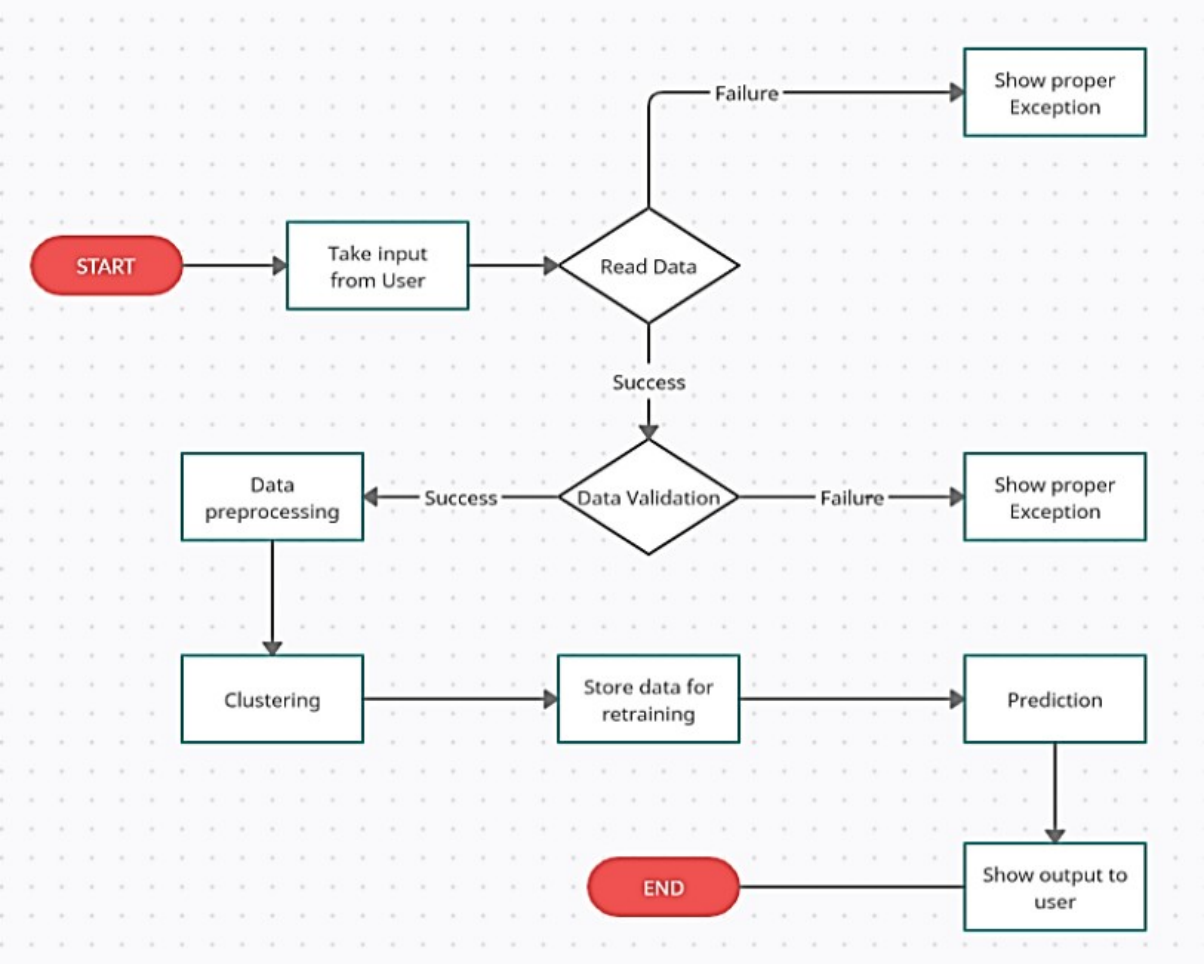


Figure 2: Web application architecture

The user interface is a very simple plain layout with little graphics. It will display information very clearly for the user and will primarily output information to the user through HTML pages. Also, all the details for the user input will be provided.

3.4 Event log

The system should log every event so that the user will know what process is running internally.

Initial Step-By-Step Description:

1. The System identifies at what step logging required.
2. The System should be able to log each and every system flow.

3. Developer can choose logging method. You can choose database logging/ File logging as well.
4. System should not hang even after using so many loggings. Logging just because we can easily debug issues so logging is mandatory to do.

3.5 Error Handling

Should errors be encountered, an explanation will be displayed as to what went wrong? An error will be defined as anything that falls outside the normal and intended usage.

3.6 Help

The 'Help' option is provided in web application for guiding users regarding maximum range of valid inputs required for predicting a particular apparel.

3.7 Performance

Text to Speech is used for convert text into audio file, it should be as accurate as possible. So that it will not mislead the user. Also, model retraining is very important to improve the performance.

3.8 Security

Since the Text to Speech consists of textual data, the information should be secured.

3.9 Reusability

The code written and the components used should have the ability to be reused with no problems.

3.10 Application compatibility

The different components for this project will be using Python as an interface between them. Each component will have its own task to perform, and it is the job of the Python to ensure proper transfer of information.

3.11 Resource utilization

When any task is performed, it will likely use all the processing power available until that function is finished.

3.12 Deployment

Model deployment will be done by integrating the model with Flask.

4 Dashboards

Dashboards will be implemented to display and indicate certain KPIs and relevant name of that apparel.

As and when, the system starts to capture the historical/periodic data for a user, the dashboards will be included to display charts over time with progress on various indicators or factors

4.1 KPIs (Key Performance Indicators)

Key indicators displaying a summary of the recognizing and classifying people's clothing.

1. Time and workload reduction using Text to Speech
2. Comparison of accuracy of model prediction and person's prediction.
3. Number of times model convert text into audio correctly .
4. Time taken in converting text into audio accurately.
5. Context of that particular textual information.

5 References

1. A Survey on Neural Speech Synthesis

Xu Tan, Tao Qin, Frank Soong, Tie-Yan Liu

(https://arxiv.org/pdf/2106.15561)