Software Requirements Specification

for

Gesture Virtual Mouse

Version 1.1 approved

Ayush Kumar and Deepanshu Singh

KIET Group of Institutions

18/4/2023

Table of Contents

Table of Contents ..... **ii**
Revision History ..... **ii**
1. Introduction **1**
1.1 Purpose 1
1.2 Document Conventions 1
1.3 Intended Audience and Reading Suggestions 1
1.4 Product Scope 1
1.5 References 1
2. Overall Description **2**
2.1 Product Perspective 2
2.2 Product Functions 2
2.3 User Classes and Characteristics 2
2.4 Operating Environment 2
2.5 Design and Implementation Constraints 3
2.6 User Documentation 3
2.7 Assumptions and Dependencies 3
3. External Interface Requirements **3**
3.1 User Interfaces 3
3.2 Hardware Interfaces 4
3.3 Software Interfaces 4
3.4 Communications Interfaces 4
4. System Features **5**
4.1 System Feature 1 5
4.2 System Feature 2 6
5. Other Nonfunctional Requirements **7**
5.1 Performance Requirements 7
5.2 Safety Requirements 7
5.3 Security Requirements 7
5.4 Software Quality Attributes 7
5.5 Business Rules 7
6. Other Requirements **8**
Appendix A: Glossary **8**
Appendix B: Analysis Models **8**
Appendix C: To Be Determined List **16**

Revision History

Name	*Date*	*Reason For Changes*	*Version*
Anshula mam	*18/4/23*	*Change in dfd*	*1.0*

1. Introduction

The introduction section provides an overview of the Software Requirements Specification (SRS) document, including the purpose, document conventions, intended audience, reading suggestions, product scope, and references.

1.1 Purpose

The purpose of this SRS document is to define the requirements for an AI Gesture Virtual Mouse and Voice Assistant software system. This document outlines the functional and non-functional requirements, as well as the system architecture, design, and performance characteristics.

The SRS serves as a guide for the development team, stakeholders, and project managers, to ensure that the software system meets the business needs and goals. It also provides a framework for testing and validation to ensure that the software is of high quality.

1.2 Document Conventions

This SRS document follows the IEEE Standard for Software Requirements Specifications, which includes the use of UML diagrams, use cases, and other industry-standard conventions. All requirements are identified by a unique identifier and are categorized by priority and type.

1.3 Intended Audience and Reading Suggestions

This document is intended for the development team, stakeholders, and project managers involved in the development of the AI Gesture Virtual Mouse and Voice Assistant software system. It is recommended that the document is read in its entirety to gain a full understanding of the requirements and design of the system.

1.4 Product Scope

The product scope of the AI Gesture Virtual Mouse and Voice Assistant software system includes the development of a software application that allows users to control their computer using hand gestures and voice commands. The software will enable users to perform tasks such as opening and closing applications, navigating web pages, and controlling media playback.

The software system will be developed for Windows and macOS operating systems and will be compatible with a wide range of input devices, including webcams and microphones. The system will be designed to provide a user-friendly interface, with intuitive controls and minimal setup requirements.

1.5 References

The following references were used in the development of this SRS document:

- IEEE Std 830-1998, IEEE Recommended Practice for Software Requirements Specifications
- UML User Guide (2nd Edition) by Grady Booch, James Rumbaugh, and Ivar Jacobson

- Microsoft Windows and macOS operating system documentation
- Web-based resources on computer vision and speech recognition technologies.

2. Overall Description

The overall description section provides a high-level overview of the AI Gesture Virtual Mouse and Voice Assistant software system, including its product perspective, functions, user classes and characteristics, operating environment, design and implementation constraints, user documentation, and assumptions and dependencies.

2.1 Product Perspective

The AI Gesture Virtual Mouse and Voice Assistant software system is a standalone application that is designed to run on Windows and macOS operating systems. It will use computer vision and speech recognition technologies to enable users to control their computers using hand gestures and voice commands.

The software system will be compatible with a wide range of input devices, including webcams and microphones, and will be designed to provide a user-friendly interface, with intuitive controls and minimal setup requirements. The system will be developed using modern software development methodologies and will be designed to be scalable and extensible.

2.2 Product Functions

The product functions of the AI Gesture Virtual Mouse and Voice Assistant software system include the following:

- Allow users to control their computers using hand gestures and voice commands
- Enable users to open and close applications, navigate web pages, and control media playback
- Provide a user-friendly interface, with intuitive controls and minimal setup requirements
- Support a wide range of input devices, including webcams and microphones
- Be compatible with Windows and macOS operating systems

2.3 User Classes and Characteristics

The user classes and characteristics of the AI Gesture Virtual Mouse and Voice Assistant software system include the following:

- Novice computer users who want a user-friendly interface for controlling their computers using hand gestures and voice commands
- Experienced computer users who want a more efficient way to interact with their computers
- Users who have mobility impairments or disabilities that make it difficult to use traditional input devices such as a mouse or keyboard

2.4 Operating Environment

The operating environment for the AI Gesture Virtual Mouse and Voice Assistant software system includes the following:

- Windows 10 or macOS 10.15 or later
- Minimum 4 GB RAM

- Minimum Intel Core i3 or equivalent processor
- Webcam and microphone for input

2.5 Design and Implementation Constraints

The design and implementation constraints of the AI Gesture Virtual Mouse and Voice Assistant software system include the following:

- The software system must be developed using modern software development methodologies, including agile development and continuous integration and delivery
- The system must be scalable and extensible to accommodate future enhancements and updates
- The computer vision and speech recognition technologies used in the system must be reliable and accurate

2.6 User Documentation

The user documentation for the AI Gesture Virtual Mouse and Voice Assistant software system will include the following:

- Quick start guide
- User manual
- Online help system
- Video tutorials

2.7 Assumptions and Dependencies

The assumptions and dependencies of the AI Gesture Virtual Mouse and Voice Assistant software system include the following:

- The system assumes that users have a webcam and microphone for input
- The system depends on reliable and accurate computer vision and speech recognition technologies
- The system depends on the availability of the Windows and macOS operating systems and their associated libraries and frameworks.

3. External Interface Requirements

The external interface requirements of the AI Gesture Virtual Mouse and Voice Assistant software system include user interfaces, hardware interfaces, software interfaces, and communications interfaces.

3.1 User Interfaces

The user interfaces of the AI Gesture Virtual Mouse and Voice Assistant software system will include the following:

- A graphical user interface (GUI) for configuring the system settings and preferences
- A visual feedback interface for displaying the hand gesture recognition and mouse movement
- An audio feedback interface for providing feedback on voice commands and system status
- A control interface for users to switch between different modes and control the system using gestures and voice commands
- The GUI will be designed to be user-friendly and intuitive, with easy-to-understand controls and a clean, modern look and feel.

3.2 Hardware Interfaces

The hardware interfaces of the AI Gesture Virtual Mouse and Voice Assistant software system will include the following:

- A webcam for hand gesture recognition and tracking
- A microphone for voice recognition
- A computer mouse and keyboard for backup input in case of failure of the hand gesture recognition and voice recognition

The system will be designed to work with a wide range of hardware devices, including built-in webcams and microphones, external webcams and microphones, and high-end specialized cameras and microphones.

3.3 Software Interfaces

The software interfaces of the AI Gesture Virtual Mouse and Voice Assistant software system will include the following:

- A computer vision library for hand gesture recognition and tracking
- A speech recognition library for voice recognition
- An operating system interface for accessing system settings and preferences
- A GUI library for developing the user interface

The system will be designed to work with standard software libraries and frameworks, and will be developed using modern programming languages and development tools.

3.4 Communications Interfaces

The communications interfaces of the AI Gesture Virtual Mouse and Voice Assistant software system will include the following:

- A network interface for communicating with external devices, such as a remote control application or a smart home automation system
- An application programming interface (API) for developers to extend the functionality of the system

The system will be designed to support a variety of communication protocols, including TCP/IP, Bluetooth, and Wi-Fi, and will provide a well-documented API for developers to integrate the system with other applications and devices.

4. System Features

<This template illustrates organizing the functional requirements for the product by system features, the major services provided by the product. You may prefer to organize this section by use case, mode of operation, user class, object class, functional hierarchy, or combinations of these, whatever makes the most logical sense for your product.>

4.1 System Feature 1

The AI Gesture Virtual Mouse and Voice Assistant software system will include the following features:

4.1.1 Description and Priority

This feature will enable users to control the computer mouse using hand gestures. The priority of this feature is high, as it is the primary functionality of the system.

4.1.2 Stimulus/Response Sequences

• Stimulus: The user performs a hand gesture in front of the webcam
•Response: The system recognizes the gesture and moves the mouse cursor accordingly

4.1.3 Functional Requirements

•REQ-1: The system shall use computer vision algorithms to recognize and track hand gestures in real-time.
•REQ-2: The system shall allow users to configure the sensitivity of the gesture recognition algorithm.
•REQ-3: The system shall provide visual feedback to the user on the screen, indicating the position of the cursor and the recognized gesture.
•REQ-4: The system shall allow users to perform left-click, right-click, and scroll functions using hand gestures.
•REQ-5: The system shall provide audio feedback to the user on the status of the gesture recognition and mouse control.

4.2 System Feature 2: Voice Command Recognition and System Control

4.2.1 Description and Priority:

This feature will enable users to control the system using voice commands. The priority of this feature is high, as it is an essential functionality of the system.

4.2.2 Stimulus/Response Sequences:

- Stimulus: The user speaks a voice command into the microphone
- Response: The system recognizes the command and performs the requested action

4.2.3 Functional Requirements:

- REQ-1: The system shall use speech recognition algorithms to recognize and interpret voice commands.
- REQ-2: The system shall allow users to configure the sensitivity of the voice recognition algorithm.
- REQ-3: The system shall provide audio feedback to the user on the recognition status of the voice commands.
- REQ-4: The system shall allow users to perform system functions such as opening applications, adjusting system settings, and controlling the mouse using voice commands.
- REQ-5: The system shall provide a list of available voice commands to the user, which can be accessed using a hand gesture or a voice command.

4.3 System Feature 3: User Preferences and Settings

4.3.1 Description and Priority:

This feature will allow users to configure and customize the system preferences and settings. The priority of this feature is medium, as it is not essential for the basic functionality of the system, but it enhances the user experience.

4.3.2 Stimulus/Response Sequences:

- Stimulus: The user selects the preferences or settings option from the GUI
- Response: The system displays the corresponding settings and preferences options for the user to configure

4.3.3 Functional Requirements:

- REQ-1: The system shall provide a GUI for users to configure and customize the system preferences and settings.
- REQ-2: The system shall allow users to configure the sensitivity of the gesture and voice recognition algorithms.
- REQ-3: The system shall allow users to select the mouse control mode, which can be either relative or absolute.
- REQ-4: The system shall allow users to configure the audio and visual feedback settings.
- REQ-5: The system shall provide a save and load functionality for user preferences and settings.

5. Other Nonfunctional Requirements

5.1 Performance Requirements

- The system shall respond to hand gestures and voice commands within 1 second.
- The system shall have a recognition accuracy of at least 90% for hand gestures and voice commands.
- The system shall be able to handle at least 10 gestures and voice commands per minute.
- The system shall not significantly impact the overall system performance and resources.

5.2 Safety Requirements

- The system shall not cause any physical harm or discomfort to the user.
- The system shall not interfere with other safety-critical applications running on the system.
- The system shall provide a safety mechanism to prevent accidental clicks and actions.

5.3 Security Requirement

- The system shall not collect or store any sensitive user data.
- The system shall use encryption to protect any communication with external servers or devices.
- The system shall provide authentication and authorization mechanisms to prevent unauthorized access to system resources.

5.4 Software Quality Attributes

- The system shall be user-friendly and easy to use.
- The system shall be reliable and robust, with minimal crashes or errors.
- The system shall be maintainable and extensible, with clean and well-documented code.
- The system shall be compatible with different operating systems and hardware configurations.

5.5 Business Rules

- The system shall be user-friendly and easy to use.
- The system shall be reliable and robust, with minimal crashes or errors.
- The system shall be maintainable and extensible, with clean and well-documented code.
- The system shall be compatible with different operating systems and hardware configurations.

6. Other Requirements

There are no other specific requirements for the AI gesture virtual mouse and voice assistant software.

Appendix A: Glossary

- AI: Artificial Intelligence
- GUI: Graphical User Interface
- API: Application Programming Interface
- OCR: Optical Character Recognition
- NLP: Natural Language Processing

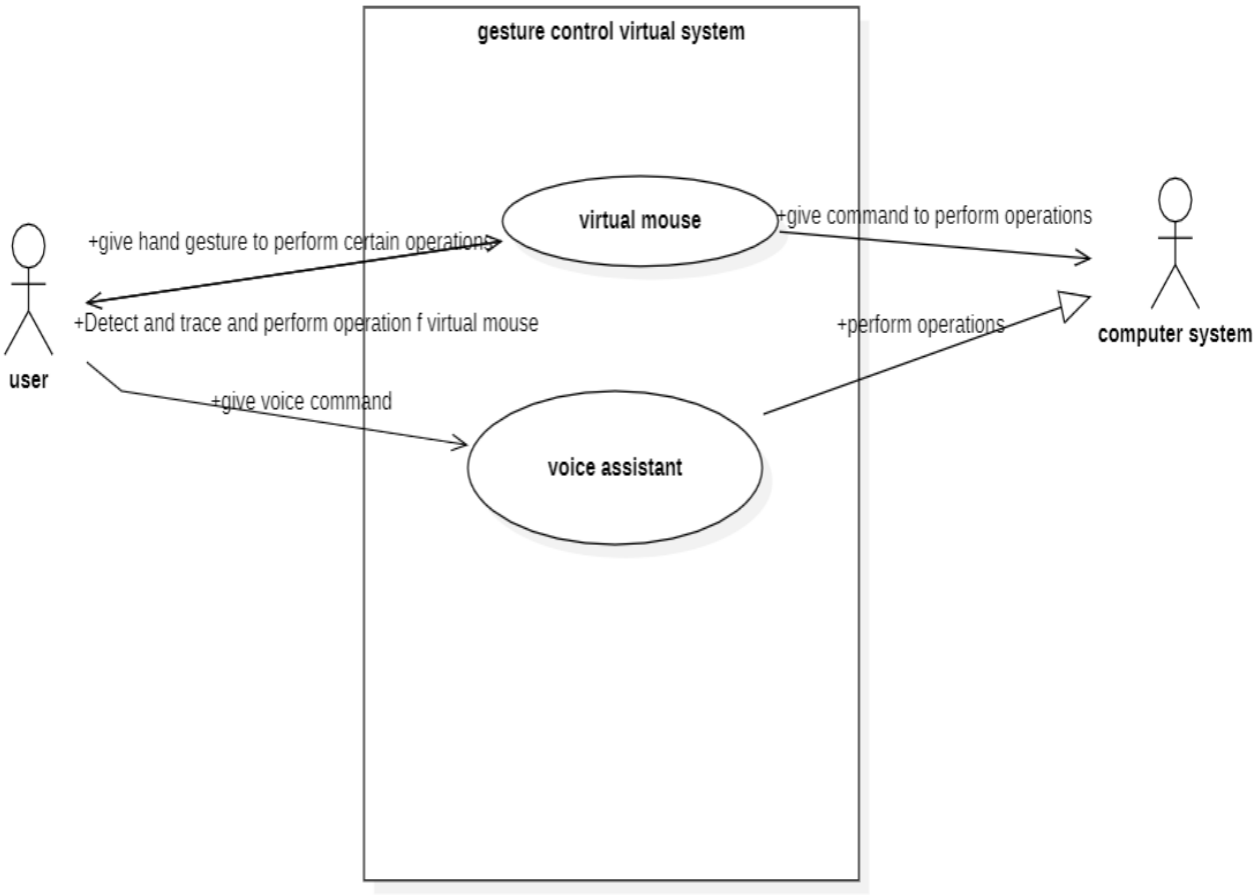
Appendix B: Analysis Models

The following analysis models will be used for the development of the AI gesture virtual mouse and voice assistant software:

- Use case diagrams
- Activity diagrams
- Class diagrams
- Sequence diagrams
- Data flow diagram

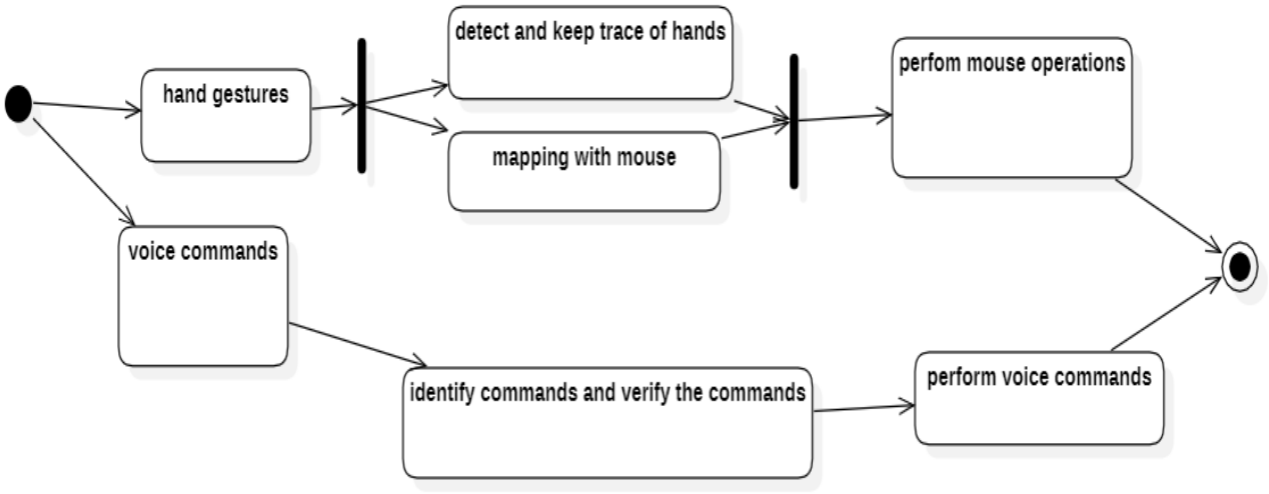
Use Case Diagram

The use case diagram below shows the actors and the use cases of the software.



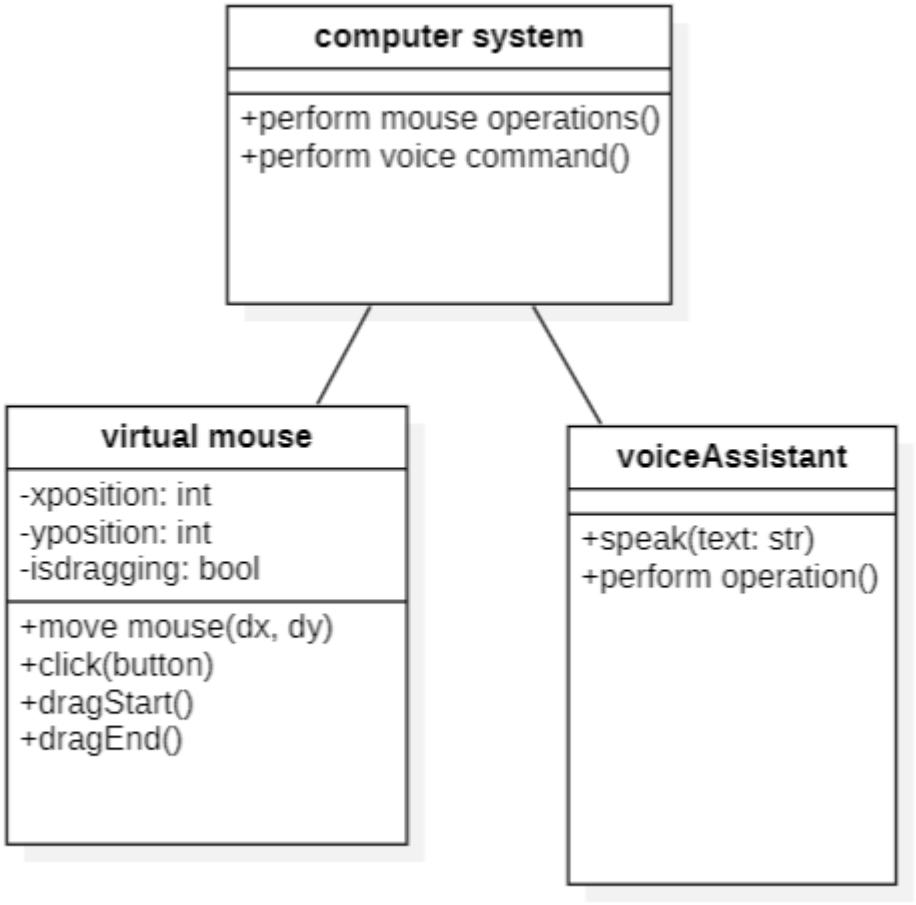
Activity Diagram

The activity diagram below shows the flow of activities for using the software.



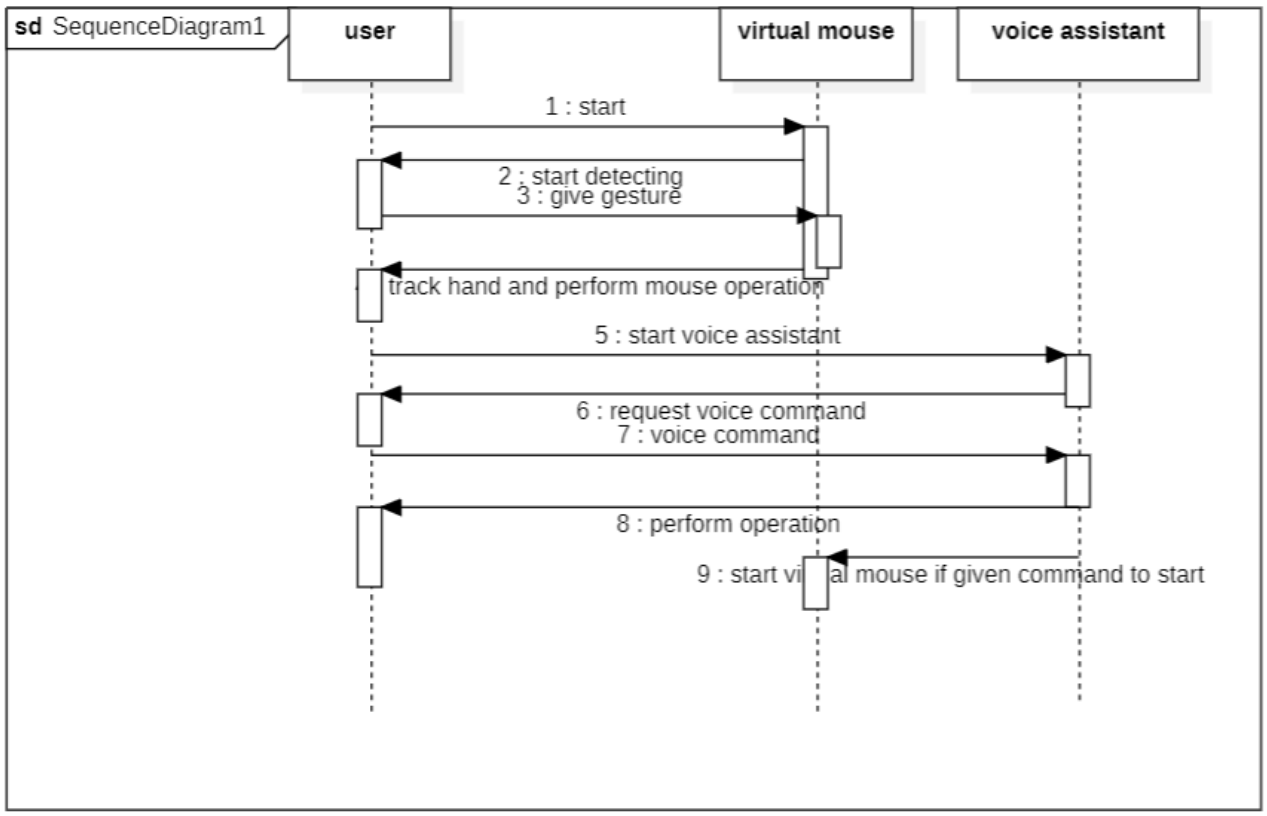
Class Diagram

The class diagram below shows the classes and their relationships in the software.



Sequence Diagram

The sequence diagram below shows the sequence of interactions between the user, the virtual mouse, and the voice assistant.

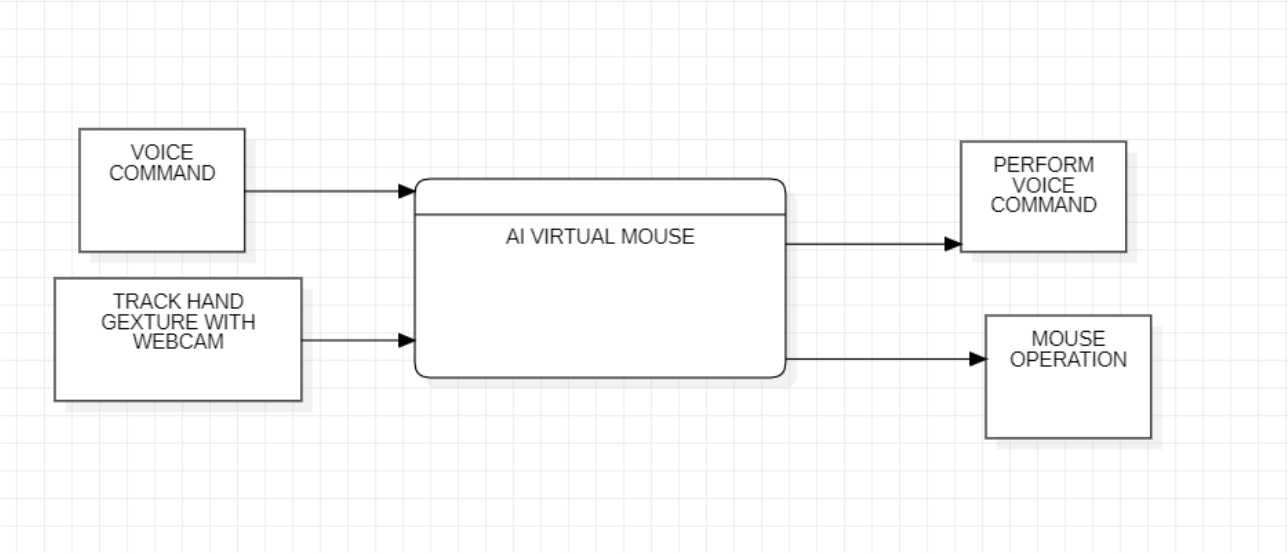


These analysis models provide a better understanding of the requirements and functionality of the software.

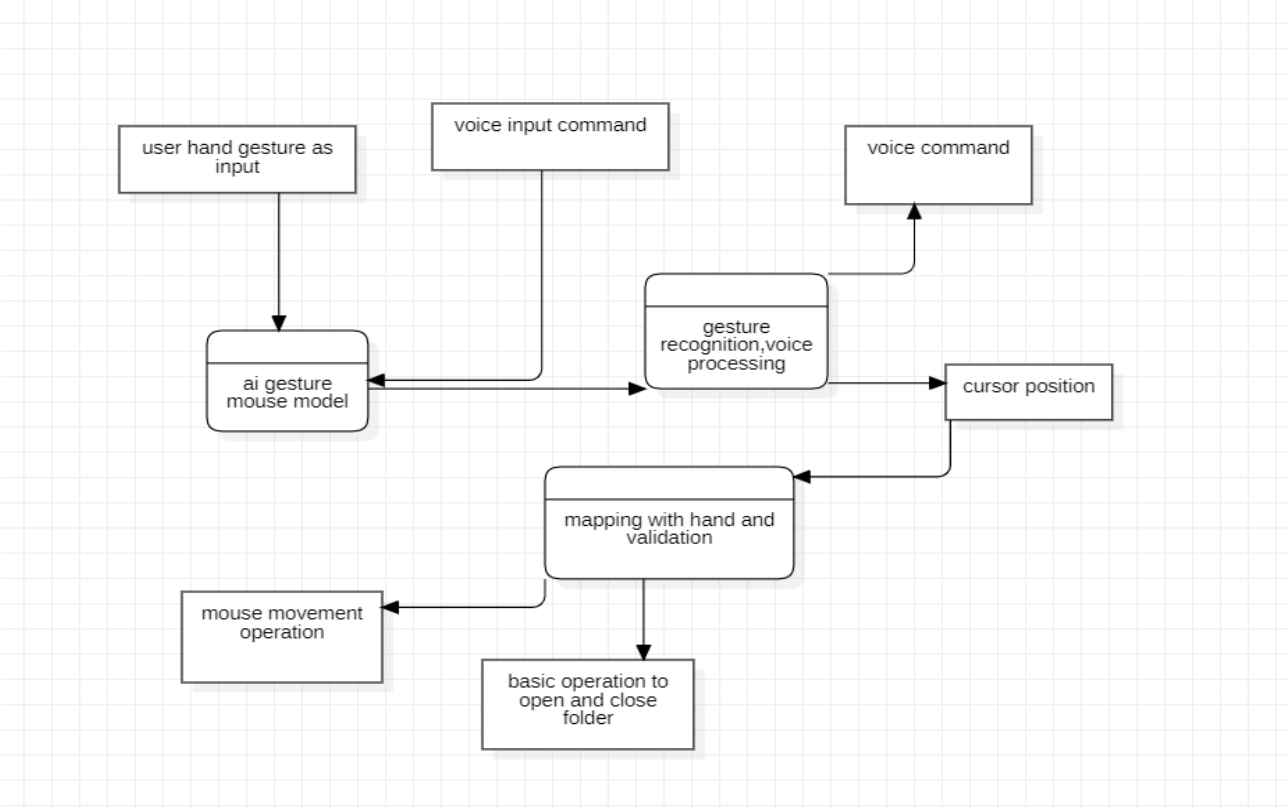
They serve as a foundation for the design and implementation of the software.

DATA FLOW DIAGRAM

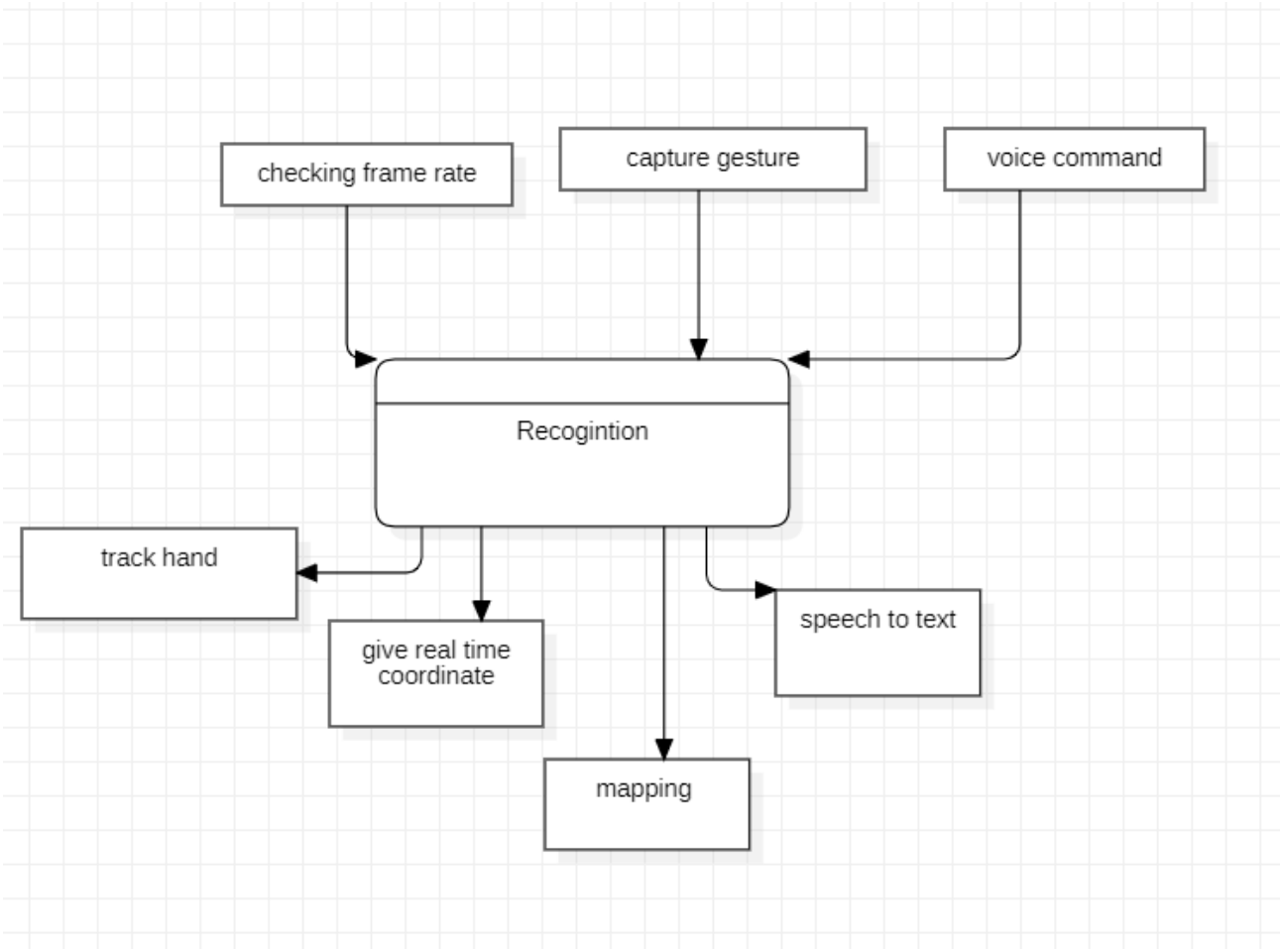
Data flow Diagram-0

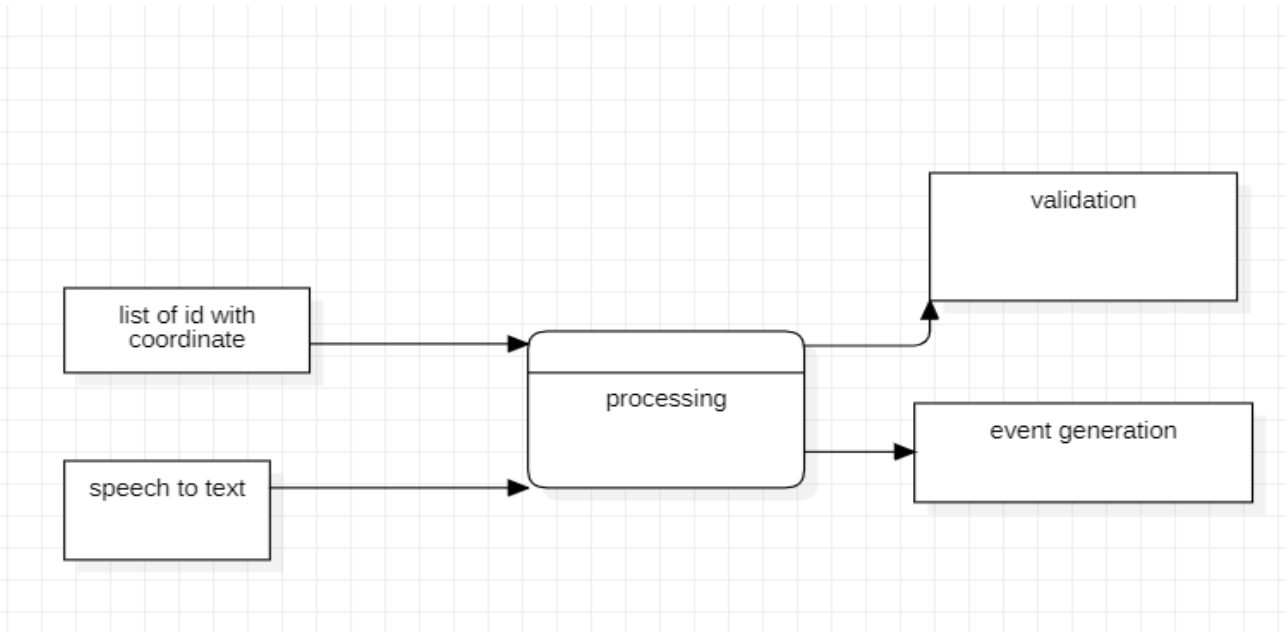


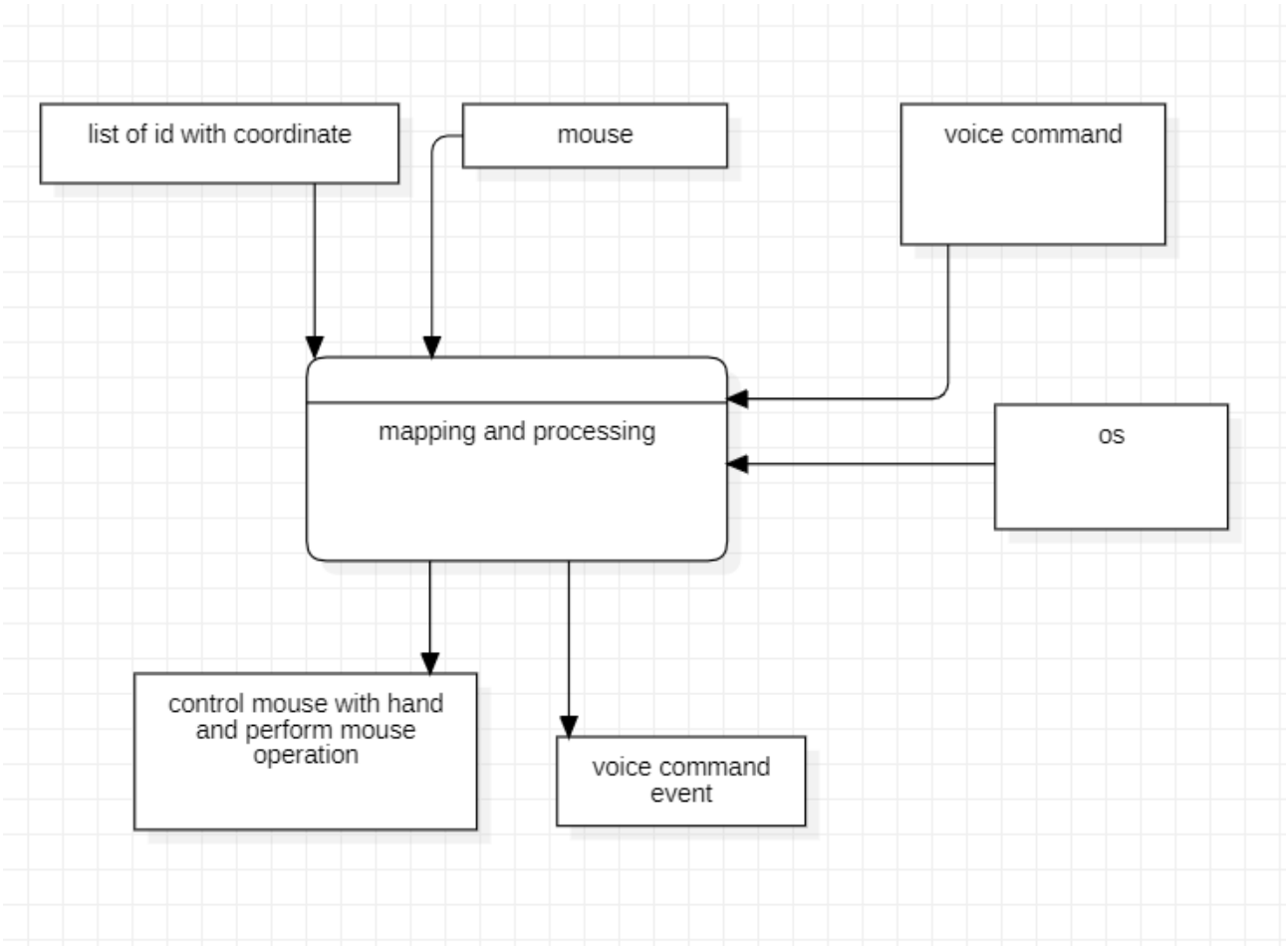
Data flow Diagram--1



Data flow Diagram--2






list of id with coordinate
mouse
voice command
mapping and processing
os
control mouse with hand and perform mouse operation
voice command event

Appendix C: To Be Determined List

There are no items in the "To Be Determined" list at this time.