**Image Processing Use Case Document**

**Introduction**

This document outlines the use cases for the image processing system that tracks user gestures through camera input. The system identifies hand and gesture movements, processes the data, and provides real-time feedback, while also addressing potential exceptions during operation.

**System Components**

* **Camera**: Captures hand gestures for real-time tracking and image processing.
* **Image Processing Module**: Analyzes the camera input and extracts the necessary features for gesture recognition.
* **User Interface (UI)**: Allows the user to start and stop gesture tracking and view the processed data.

**Primary Use Cases**

1. **Start Tracking Gestures**

* **Actor**: User
* **Description**: The user initiates the gesture tracking process, enabling the camera to capture hand gestures and sending data to the image processing module.
* **Steps**:
  1. The user opens the gesture tracking system.
  2. The user starts tracking gestures via the UI.
  3. The system displays real-time gesture movements.
* **Exceptions**:
  + **Camera Exception**:
    - **Hardware Error**: The camera has malfunctioned or is not working.
    - **Not Detected**: The camera is not recognized by the system.
    - **Not Compatible**: The camera is incompatible with the system.
  + **Image Processing Exception**:
    - **Software Error**: An internal software issue prevents image processing.
    - **Insufficient Image Data**: The camera does not capture enough data for accurate gesture tracking.
    - **Bad Lighting**: The lighting conditions are inadequate for proper image processing.
    - **Failed Feature Extraction**: The system fails to extract the necessary features from the camera input for gesture recognition.
    - **Failed Gesture Smoothing**: The system fails to smooth the gesture data for accurate tracking.

1. **Stop Tracking Gestures**

* **Actor**: User
* **Description**: The user stops the gesture tracking process, ending the capture and processing of hand gestures.
* **Steps**:
  1. The user presses the stop button in the UI.
  2. The system ceases tracking and processing gestures.
  3. The user can save or discard the captured gesture data.
* **Exceptions**:
  + **Image Processing Exception**:
    - **Software Error**: The image processing system encounters an issue while stopping the tracking process.
    - **Insufficient Image Data**: Incomplete or insufficient data is detected during the tracking session.
    - **Bad Lighting**: Poor lighting interfered with the image processing, causing incomplete tracking.
    - **Failed Feature Extraction**: Issues occurred while extracting gesture features, leading to incomplete results.
    - **Failed Gesture Smoothing**: The system was unable to smooth the gestures properly, leading to inaccurate data.

**Error Handling Use Cases**

1. **Camera Exceptions**

* **Actor**: System
* **Description**: Handles camera-related issues that occur during gesture tracking.
  + **Hardware Error**: The camera malfunctions during the session.
  + **Not Detected**: The system fails to detect the camera.
  + **Not Compatible**: The camera is not compatible with the gesture tracking system.

1. **Image Processing Exceptions**

* **Actor**: System
* **Description**: Handles image processing-related issues during gesture tracking.
  + **Software Error**: An error occurs in the image processing module.
  + **Insufficient Image Data**: The captured image data is insufficient for accurate processing.
  + **Bad Lighting**: Lighting conditions affect the quality of the captured data.
  + **Failed Feature Extraction**: The system is unable to extract key features from the camera input.
  + **Failed Gesture Smoothing**: The system fails to process and smooth gesture data accurately for real-time feedback.