**AR/VR Use Case Document**

**1. Introduction**

This document outlines the use cases for the AR/VR system, which provides an immersive environment for users to interact with virtual objects using their hand and finger movements captured by the rolling shutter camera and LED gloves.

**2. System Components**

* **LED Gloves**: Equipped with sensors that detect finger movements.
* **Rolling Shutter Camera**: Captures real-time hand movement.
* **AR/VR Interface**: A component of the mobile app that provides a virtual environment where users can interact with objects, buttons, and menus.

**3. Primary Use Cases**

**3.1 Track Finger and Hand Movements Simulated by Software**

* **Actor**: User
* **Description**: The AR/VR system simulates the user’s hand movements, allowing interaction with virtual objects.
* **Steps**:
  1. Capture hand movements using gloves and the camera.
  2. Reflect hand and finger movements in the AR/VR interface.
  3. Provide feedback when interacting with virtual objects.
* **Exceptions**:
  + **Server Processing Error**: The server is unable to process requests from the AR/VR system.
  + **No Internet Connection**: The AR/VR system cannot connect to the server due to lack of internet access.
  + **Connection Interrupted**: The AR/VR system loses connection to the server during an active session.
  + **Hardware Error**: Glove or camera hardware malfunctions.
  + **Hardware Not Detected**: The system is unable to detect the hardware (camera or gloves).
  + **Hardware Not Compatible**: The hardware is incompatible with the AR/VR system.

**3.2 Touch Virtual Buttons, Icons and Objects**

* **Actor**: User
* **Description**: The user touches and interacts with objects in the AR/VR environment, such as buttons, icons, and controls.
* **Steps**:
  1. Detect hand movements using the sensors and camera.
  2. Simulate interaction with virtual objects.
* **Exceptions**:
  + **Server Processing Error**: The server is unable to process requests from the AR/VR system.
  + **No Internet Connection**: The AR/VR system cannot connect to the server due to lack of internet access.
  + **Connection Interrupted**: The AR/VR system loses connection to the server during an active session.
  + **Hardware Error**: Glove or camera hardware malfunctions.
  + **Hardware Not Detected**: The system is unable to detect the hardware (camera or gloves).
  + **Hardware Not Compatible**: The hardware is incompatible with the AR/VR system.

**3.3 Track Tremors on Hands and Fingers**

* **Actor**: User
* **Description**: The system detects and tracks any tremors in the user’s hands or fingers, useful for adaptive interaction in the AR/VR environment, particularly for people with Parkinson’s disease or similar conditions.
* **Steps**:
  1. Capture hand tremors using sensors.
  2. Provide feedback or adjust interaction based on tremor detection.
* **Exceptions**:
  + **Server Processing Error**: The server is unable to process requests from the AR/VR system.
  + **No Internet Connection**: The AR/VR system cannot connect to the server due to lack of internet access.
  + **Connection Interrupted**: The AR/VR system loses connection to the server during an active session.
  + **Hardware Error**: Glove or camera hardware malfunctions.
  + **Hardware Not Detected**: The system is unable to detect the hardware (camera or gloves).
  + **Hardware Not Compatible**: The hardware is incompatible with the AR/VR system.

**3.4 Setup Hardware for Software**

* **Actor**: User
* **Description**: Setup and ensure the hardware (camera, gloves) are ready for interaction with the AR/VR system.
* **Steps**:
  1. Connect the hardware to the AR/VR system.
  2. Calibrate for the virtual environment.
* **Exceptions**:
  + **Hardware Error**: Glove or camera hardware malfunctions.
  + **Hardware Not Detected**: The system is unable to detect the hardware (camera or gloves).
  + **Hardware Not Compatible**: The hardware is incompatible with the AR/VR system.

**4. Error Handling Use Cases**

**4.1 Server Exceptions**

* **Actor**: System
* **Description**: Handles issues related to the server, such as:
  + **Server Processing Error**: The server is unable to process requests from the AR/VR system.
  + **No Internet Connection**: The AR/VR system cannot connect to the server due to lack of internet access.
  + **Connection Interrupted**: The AR/VR system loses connection to the server during an active session.

**4.2 Hardware Exceptions**

* **Actor**: System
* **Description**: Handles hardware-related issues such as:
  + **Hardware Error**: Glove or camera hardware malfunctions.
  + **Hardware Not Detected**: The system is unable to detect the hardware (camera or gloves).
  + **Hardware Not Compatible**: The hardware is incompatible with the AR/VR system.

**4.3 Backend Exceptions**

* **Actor**: System
* **Description**: Backend exceptions arise as a combination of server and hardware-related issues, affecting the overall system coordination:
  + **Server Communication Error**: Failure in communication between the backend and the server, potentially due to server issues such as processing errors or network disruptions.
  + **Hardware Communication Error**: Inability to coordinate data between hardware devices (gloves, camera) and the backend system, leading to inaccurate simulations or device failures.