AI Touchless Control Studio – Technical Report

Participants: Ali Hussein Karim | Harith Taha | Hussein Abdul Hadi

Abstract

This project presents a touchless interactive system that allows users to control multiple modules using hand gestures tracked by a webcam. The system includes login authentication, a dynamic presentation viewer, image processing tools, a geometry measurement tool, a smart drawing board, and an interactive art mode.

Introduction

The main objective of the system is to provide a clean, hands-free interaction environment using MediaPipe hand-tracking technology. The program detects gestures and performs actions such as navigation, drawing, filtering, measurement, and UI selection.

System Components

1. **MediaPipe Hands:** Used for gesture detection.
2. **OpenCV:** Handles camera input, image processing, UI rendering.
3. **Tesseract OCR:** Extracts text from presentation slides.
4. **NumPy:** Mathematical operations and array manipulation.
5. **Arabic Rendering Libraries:** Fix Arabic text display issues.
6. **Winsound:** Feedback sounds during interaction.

Main Modules

- **Login System:** Hand-gesture based password input.
- **Menu Interface:** Mouse-hover based navigation.
- **Presentation Viewer:** Gesture-based page navigation.
- **Image Processing:** Filters, rotation, brightness, mobile/desktop views.
- **Geometry Tool:** Real-time measurement using two-hand gesture.
- **Smart Board:** Drawing using index finger.
- **Art Mode:** Interactive strings reacting to finger position.

Conclusion

The system demonstrates an advanced hands-free control method using only a webcam. It highlights gesture-recognition applications in education, presentations, and creative interactive tools.

References

1. MediaPipe Documentation
2. OpenCV Documentation
3. Tesseract OCR
4. Python Imaging Library (PIL)