**GestureFlow**

GestureFlow is an interactive system that allows users to control presentations using hand gestures captured by a webcam. This touchless presentation system enhances the presenting experience by eliminating the need for physical remotes or keyboard interactions.

**Features**

**Intuitive Hand Gesture Controls:**

* Navigate between slides using simple hand gestures
* Draw annotations directly on slides
* Use a virtual pointer to highlight content
* Erase annotations with gesture commands
* Zoom in/out of slides for better visibility
* Jump to first/last slide instantly

**Document Support:**

* Compatible with PDF files
* Support for PowerPoint presentations (.pptx)

**User Interface:**

* Interactive splash screen
* Custom file dialog for selecting presentations
* Picture-in-picture display showing your camera feed
* Slide counter to track presentation progress
* Help dialog with gesture controls guide

**Technologies Used**

* **Python**: Core programming language
* **OpenCV**: Computer vision and image processing
* **MediaPipe**: Hand tracking and landmark detection
* **PyMuPDF (fitz)**: PDF rendering and manipulation
* **Tkinter**: GUI components for dialogs and interfaces
* **Pillow (PIL)**: Image processing for GIF animations
* **NumPy**: Numerical operations and array handling
* **comtypes**: COM interface for PowerPoint integration

**Project Structure**

* **apk.py**: Main application file containing the core functionality
* **HandTracker.py**: Handles hand detection and tracking using MediaPipe
* **file\_manager.py**: Manages file operations and custom file dialogs
* **gestures.py**: Contains the GestureRecognizer class for interpreting hand gestures
* **pdf\_handler.py**: Handles loading and rendering PDF files
* **ppt\_handler.py**: Manages PowerPoint presentation loading and slide conversion
* **splash\_screen.py**: Displays the initial application splash screen

**Setup Instructions**

**Prerequisites**

* Python 3.7 or newer
* Webcam (built-in or external)
* Operating System: Windows (for full PowerPoint support)
* Microsoft PowerPoint installed (for .pptx support)

**Installation**

1. Create and activate a virtual environment (recommended):

python -m venv venv

# On Windows

venv\Scripts\activate

# On macOS/Linux

source venv/bin/activate

2. Install required dependencies:

pip install opencv-python mediapipe PyMuPDF numpy pillow comtypes

3. Update the GIF path in splash\_screen.py:

* + Open splash\_screen.py and modify the gif\_path variable to point to your splash screen GIF location

**Running GestureFlow**

1. Start the application:

python apk.py

1. The splash screen will appear, followed by a file dialog.
2. Select a PDF or PowerPoint presentation to begin.
3. Use the following gestures to control your presentation:

| **Gesture** | **Description** | **Finger Configuration** |
| --- | --- | --- |
| Thumb only | Previous Slide | [1,0,0,0,0] |
| Four fingers (no thumb) | Next Slide | [0,1,1,1,1] |
| All five fingers | Clear Annotations | [1,1,1,1,1] |
| Index finger only | Draw | [0,1,0,0,0] |
| Index + Middle fingers | Pointer | [0,1,1,0,0] |
| Index + Middle + Ring | Erase Last Annotation | [0,1,1,1,0] |
| Thumb + Index (spread apart) | Zoom In | [1,1,0,0,0] |
| Middle + Ring + Pinky | Zoom Out | [0,0,1,1,1] |
| Thumb + Index + Middle | Reset Zoom | [1,1,1,0,0] |
| Index + Pinky | Jump to First Slide | [0,1,0,0,1] |
| Pinky only | Jump to Last Slide | [0,0,0,0,1] |

**Additional keyboard controls:**

* Press 'ESC' to toggle fullscreen mode
* Press 'O' to open a different file
* Press 'H' to display the help dialog
* Press 'Q' to quit the application

**PowerPoint Integration**

GestureFlow uses the ppt\_handler.py module to handle PowerPoint presentations. This module:

* Uses COM interface through comtypes to interact with Microsoft PowerPoint
* Temporarily exports slides as JPG images for display in the application
* Automatically cleans up temporary files after closing the presentation
* Requires Microsoft PowerPoint to be installed on the system
* Currently supports Windows operating systems only for PowerPoint functionality

**Usage Tips**

* Position yourself where the webcam can clearly see your hand gestures.
* Use deliberate hand gestures for better recognition.
* For best results, use the application in well-lit environments.
* Keep a reasonable distance from the camera (approximately 1-2 feet).
* Practice the gestures before giving an important presentation.

**Future Enhancements**

* Multi-platform support for PowerPoint integration (MacOS, Linux)
* Additional gesture controls for more presentation features
* Voice command integration for enhanced accessibility
* Multiple hand tracking for more complex interactions
* Custom gesture programming for user-defined controls
* Remote presentation capabilities over network
* Automatic gesture calibration for different users
* Integration with cloud-based presentation services

**Troubleshooting**

* Camera not detected: Try different camera indices in the code (change the number in cv2.VideoCapture(0))
* Gestures not recognized: Ensure adequate lighting and proper hand positioning
* PowerPoint files not loading: Verify that PowerPoint is installed on your system
* Performance issues: Reduce camera resolution in the code for better performance

**Contributors**

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**Support**

For issues, questions, or contributions please:

* Open an issue on the GitHub repository
* Contact : shuklashreya2904@gmail.com

**Acknowledgments**

* MediaPipe team for the hand tracking library
* PyMuPDF for PDF rendering capabilities
* The OpenCV community for computer vision tools