CENTRE FOR INNOVATIVE STUDIES

##### **PROJECT REPORT ON**

*HAND GESTURE CONTROLLED PRESENTATION*

FINAL YEAR PROJECT BCA 694

##### **BY**

##### **BCA\_PROJ\_2025\_02**

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**Under the Guidance**

**of**

**Prof. Mr. MITHUN ROY**

**Year of Submission: 2025**



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**DECLARATION**

This is to certify that Report entitled “…………………………”which is submitted by me in partial fulfillment of the requirement for the award of degree BCA in **Bachelor in Computer Application** at **CENTRE FOR INNOVATIVE STUDIES** under **North Bengal University**, West Bengal. We took the help of other materials in our dissertation which have been properly acknowledged. This report has not been submitted to any other Institute for the award of any other degree.

Date:

|  |  |  |  |
| --- | --- | --- | --- |
| SN | Name of the Student | Roll No | Signature |
| 1 |  |  |  |
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**CERTIFICATE**

This is to certify that the project report entitled \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

submitted to **Department of Bachelor in Computer Application** of  **CENTRE FOR INNOVATIVE STUDIES** in partial fulfilment of the requirement for the award of the degree of **Bachelor in Computer Application** during the academic year **2024-25,** is a bonafide record of the project work carried out by them under my guidance and supervision.

|  |  |  |  |
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**---------------------------------------**

**Signature of Project Guide**

**Acknowledgement**

The acknowledgement page depicts the gratitude, respect and thankfulness of the student towards the people who helped him in pursuing the project successfully and ensured successful completion and implementation of the project. In this page, the author expresses his gratitude and concern by using praising and thanksgiving words.

Signature of all the group members with date

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Table of Contents

Type chapter title (level 1)1

Type chapter title (level 2)2

Type chapter title (level 3)3

Type chapter title (level 1)4

Type chapter title (level 2)5

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Type chapter title (level 3)9

**Table of Contents**

**List of Tables**

Table of contents provides a complete sketch of the title, subtitles, headings, topics and the project elements that are involved in those headings. In other words, different sections and their titles are included here.

The whole project report in a nutshell is made known in the table of contents section, and therefore, it should include the titles of the first, second and third level headers, and must give a clear picture of the report to the reader.

**List of Figures**

Similarly, a list of figures and tables helps the reader to locate diagrams, charts and tables in the document, and therefore, it should be numbered accordingly by chapter and page number. It is not necessary to indicate page numbers for symbols and abbreviations used in the document.

# ABSTRACT

This project presents a smart and touchless presentation system that allows users to control PDF or slide presentations using only hand gestures. The system uses a camera or video to track the user’s hand movements in real-time. With the help of computer vision and the cvzone HandTrackingModule, the program can recognize different hand gestures, such as swiping left or right to move between slides, or pointing and drawing to annotate directly on the slides.

To make the presentation process easy, the system first converts each page of a PDF file into an image. These images are then shown as slides. The user can stand at a distance and use simple hand gestures to go to the next or previous slide, or to draw and highlight important points during the presentation. The system also displays the current frame rate (FPS) to show how smoothly it is running.

This gesture-controlled presentation tool is especially useful in classrooms, meetings, and conferences, where presenters want to move freely and avoid touching devices. It also helps in maintaining hygiene, as there is no need to touch a mouse, keyboard, or remote. The project combines technologies like OpenCV, PyMuPDF, and MediaPipe to create an interactive and user-friendly experience.

Overall, this project demonstrates how computer vision and gesture recognition can make presentations more modern, interactive, and convenient, making it a valuable tool for education and professional use.

**Main Text:** Candidate is strongly advised to discuss with their supervisor the styleof writing of the project report before writing begins. The Stages of investigation and writing are likely to be according to the nature of the subject and should be worked out in consultation with supervisor. However the text should be divided in the chapters and each chapter, headings and subheadings should be numbered like x.y.z.A.B….. where x stands for chapter number y stands for headings and z,A,B.. etc stands for subsequent subheadings. Chapter heading should be edited at center while heading and subheadings should be edited at left. There should be separated uniformity in headings and subheadings. Main chapter heading should be in capital letters. Each paragraph should be started from the next line of heading and subheadings. The general guidelines for chapters are as follows, references should be quoted by authors name or by S.No.

**Introduction**

**System Analysis**

1. Identification of Need
2. Preliminary Investigation
3. Feasibility Study
4. Project Planning
5. Project Scheduling
6. Software requirement specifications (SRS)
7. Software Engineering Paradigm applied
8. Data model, Control Flow diagrams, State Diagrams/Sequence diagrams ERD’s/ Class Diagrams/CRC Models/Collaboration Diagrams/Use-case Diagrams/Activity Diagrams depending upon your project requirements

**System Design**

1. Modularisation details
2. Data integrity and constraints
3. Database design/Procedural Design/Object Oriented Design
4. User Interface Design

**Coding**

1. **Complete Project Coding is not required.** Include important modules' codes only.
2. Comments and Description
3. Standardization of the coding /Code Efficiency
4. Error handling
5. Parameters calling/passing
6. Validation checks

**Testing**

1. Testing techniques and testing strategies used ***along with the test case designs*** and test reports. **(Don’t include definition and description of testing techniques.)**
2. Debugging and Code improvement

System Security measures (Implementation of security for the project developed)

1. Database/data security
2. Creation of User profiles and access rights

**Cost Estimation of the Project**

**Reports** (sample layouts should be placed)

**PERT Chart, Gantt chart**

**Conclusion and Recommendations**

The conclusion and recommendations part summarizes the whole report by highlighting all the chapters and their significance and the importance of the project and about the achievements.

The Recommendations are interlinked with conclusion. The conclusion drawn from the project report can be further implemented in the recommendation section to overcome the constraints of the project (i.e. Future scope and further enhancement of the project).

**Referencing and Appendices**

The project report must be considered as a very standard report, and therefore, it should follow all rules, guidelines and protocols of gathering and presenting information, and implementing that and drawing conclusions out of it.

All these activities require appropriate and authentic sources of information and that particular information must be **referenced or cited** according to the copyrights and other guidelines. Therefore, to make the report original, it should be free from **plagiarism** and must follow standard citations and guidelines of citations to represent the reference names.

The appendices of a project report should be written in Times New Roman format of font size 10, and it should contain the information which is appropriate and added to the main text like [Reference No].

**Reference:** All the references should be arranged alphabetically or serially as thecase may be for quoting in text.

**For Journals:**

Kerr, G.T. : Chemistry of Crystalline Aluminositicate; **The J. Phy.** **Chem.**, April 1968, vol.73, no.3 pp1385-1386.

Garside, J. et-al; Industrial crystallization from solution;

**Chem..Engg.Sci**., 1985, vol. 40, no.2, pp. 3-26.

**For books:**

MeCabe and Smith; **Unit Operations in Chemical Engg.**, 4th ed., TMH, pp.812-814.

1. **Introduction**

Human communication has evolved far beyond spoken and written language. One of the most intuitive and natural forms of non-verbal communication is **gesture**—the movement of parts of the body, especially the hands and arms, to express ideas, interact with the environment, or control devices. In the context of human-computer interaction (HCI), **gesture recognition** enables machines to interpret human movements and respond accordingly, paving the way for more seamless and immersive user experiences.

**What is a Gesture?**

A gesture is a deliberate physical movement made with the body, typically the hands, to convey information or control a system. In technology, gesture recognition refers to the capability of a device to identify and interpret these movements as input commands without the need for physical contact. For example, a simple wave of a hand can be interpreted as a command to change a slide, play a video, or scroll a page.

**Why Gesture-Based Interaction?**

Gesture-based systems offer a **touchless, intuitive, and hygienic** alternative to traditional input methods. This is especially relevant in situations where hands-free operation is desired or required, such as:

* **Presentations**, where the speaker wants to move freely without being confined to a podium or device.
* **Medical or industrial environments**, where touching devices can compromise cleanliness or safety.
* **Public displays or kiosks**, where touch can be inconvenient or unsanitary.

Benefits of gesture-based systems include:

* Improved user engagement through natural interaction.
* Increased mobility and freedom of movement.
* Reduced dependence on physical hardware like remotes or clickers.
* Enhanced accessibility for users with mobility challenges.

**Types of Gestures**

Gestures can be broadly classified into the following categories:

1. **Static Gestures**: These involve holding a particular hand pose or shape. For example, forming a fist might indicate "stop" or "select."
2. **Dynamic Gestures**: These are based on movement over time, such as swiping left to go to the next slide or drawing a circle to annotate.
3. **Symbolic Gestures**: Gestures that represent specific symbols or commands, such as a "thumbs up" for approval.
4. **Interactive Gestures**: Gestures that respond in real-time to provide control, like pinching to zoom or swiping to navigate.

**The Need for Gesture-Controlled Presentation Systems**

In traditional presentation settings, presenters often rely on keyboards, mice, or handheld remotes to navigate slides. These tools, while effective, can restrict movement, break the flow of speech, and require the speaker to stay near a podium or computer. Moreover, in the post-pandemic world, **touchless solutions** are increasingly preferred to maintain hygiene in shared environments.

This project proposes a **Gesture-Controlled Presentation System** that allows users to control PDF or slide presentations using real-time hand gestures. By converting each page of a PDF into an image and using computer vision techniques, the system recognizes gestures such as swiping to change slides or pointing to annotate. Built using **OpenCV**, **cvzone's HandTrackingModule**, **MediaPipe**, and **PyMuPDF**, this system delivers a modern, touch-free presentation experience.

Now, let’s talk about what the gestures we are using and what functions these gestures in particulate have. We make categories for our project shown in Table 1.

Table 1 : Gestures used for the projects.

|  |  |
| --- | --- |
| **Gesture** | **Working** |
| Swiping Left | Move to the previous slide |
| Swiping Right | Move to the next slide |
| Pointer | Activate the pointer tool to highlight specific areas on the slide |
| Highlighter | Activate the highlighter tool to mark and emphasize parts of the slide |
| Undo | Revert the last performed action in the presentation |

1. **LITERATURE SURVEY**

Gesture recognition has emerged as a significant field within human-computer interaction (HCI), enabling intuitive communication between users and machines. Over the years, researchers and developers have explored various approaches to detect and interpret human gestures for applications ranging from gaming and robotics to accessibility tools and presentation systems.

**2.1 Traditional Presentation Control Methods**

Earlier systems for presentation control primarily relied on:

* **Keyboard and mouse input**, requiring physical contact and limiting user mobility.
* **Wireless remotes**, which improved movement flexibility but still involved device dependency.
* **Voice-controlled systems**, which introduced hands-free control but were often hindered by noise sensitivity, language variations, and latency.

These systems, while effective to an extent, lacked the natural interaction and hygienic benefits offered by gesture-based solutions.

**2.2 Evolution of Gesture Recognition**

Research in gesture recognition began gaining momentum with the development of computer vision and machine learning techniques. Initially, gesture recognition systems relied on **data gloves or infrared sensors**, which were accurate but expensive and intrusive.

As computer vision advanced, researchers began exploring **vision-based gesture recognition**, which uses cameras to detect and track hand movements without additional hardware. Key contributions in this domain include:

* **MediaPipe by Google**: An open-source framework that provides real-time hand tracking and landmark detection. It identifies 21 key points on the hand, making gesture detection accurate and robust.
* **OpenCV (Open Source Computer Vision Library)**: Widely used for image processing and computer vision applications. It enables capturing video, processing frames, and integrating gesture detection algorithms.
* **cvzone and HandTrackingModule**: Built on top of OpenCV and MediaPipe, cvzone simplifies hand gesture recognition by offering ready-to-use modules for finger counting, distance measurement, and gesture classification.

**2.3 Gesture-Controlled Presentation Tools**

Several gesture-based tools and projects have been proposed or implemented:

* **Kinect-based presentation systems** used depth sensors to detect full-body or hand gestures, but required costly hardware.
* **Leap Motion Controller** provided accurate hand tracking in 3D space but was limited in environmental flexibility and integration complexity.
* **DIY OpenCV-based projects** allowed custom implementations using webcams, but often lacked stability, modularity, or extensibility.

While many of these systems demonstrated potential, they often faced challenges such as:

* Poor performance under varying lighting conditions.
* Limited gesture vocabulary.
* High latency or computational demands.

**2.4 Summary and Research Gap**

The existing literature reveals a clear progression toward **vision-based, touchless presentation control**. However, many solutions still face practical constraints regarding cost, portability, and user-friendliness. There is a growing need for lightweight, accurate, and affordable systems that:

* Work with standard webcams.
* Do not rely on expensive sensors or devices.
* Provide real-time, smooth control over presentations.
* Allow drawing or annotation on slides using gestures.

**2.5 Contribution of the Proposed System**

This project addresses the above gaps by introducing a **low-cost, real-time gesture-controlled presentation system**. Built using OpenCV, MediaPipe, cvzone, and PyMuPDF, it enables users to control PDF presentations with hand gestures such as:

* Swipe left/right to change slides.
* Pointing gestures to annotate or highlight content.
* Real-time frame rate (FPS) display for performance monitoring.

The system is intuitive, hygienic, and ideal for classrooms, conferences, and remote presentations, making it a practical and innovative step forward in HCI applications.

Would you like references to real papers or IEEE articles to include in a bibliography section? I can provide those too.

|  |  |
| --- | --- |
| Exit | Close the presentation and return to the main interface |