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Project

Math with Gestures: An AI-Powered Interactive Learning System

Submitted To   **Submitted by**
Anupam Singha   Name: Sabbir Ahmed
LectureId: 21300070
Dept of CSE, RPSU   Batch: 23th
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Project Title

Math with Gestures: An AI-Powered Interactive Learning System

Introduction

This project is an exciting tool that lets users solve math problems using their hand movements. By using a webcam, the system tracks hand gestures and allows users to "write" math equations in the air. These equations are then solved using artificial intelligence (AI), and the results are displayed on the screen in real-time. This project combines hand tracking, drawing, and AI to make solving math problems fun and interactive.

Objective

The main goals of this project are:

1. To make solving math problems easier using hand gestures.
2. To let users write equations in the air and see the solutions immediately.
3. To create a fun and interactive way to learn math.
4. To explore how AI can work with hand gestures for educational purposes

Background / Related Work

Hand gesture recognition has been used in many fields like gaming, virtual reality, and sign language interpretation. Tools like OpenCV (used for image and video processing) and CVZone (used for hand tracking) make gesture detection simple. On the other hand, AI is widely used for tasks like solving problems, answering questions, and much more. This project brings these two technologies together to create a system that combines the fun of hand gestures with the power of AI to solve math problems

Methodology/Implementation

Technologies Used:

- **Libraries:** OpenCV, CVZone, Streamlit, and NumPy
- **AI Tool:** Google Generative AI (Gemini-1.5-flash)
- **Hardware:** Laptop webcam

Methodology/Implementation

How It Works

Step 1: The webcam captures the video feed.

Step 2: A hand-tracking tool (CVZone) detects hand movements and finger positions.

Step 3: Specific hand gestures are used to perform actions:

- Pointing with one finger(index finger): Write equations on the screen.
- Showing a thumbs-up: Erase everything and start fresh.
- Showing all fingers (except the little finger): Submit the equation to the AI for solving.

Step 4: The drawn equation is sent to the AI tool, which understands it and calculates the solution.

Step 5: The solution is displayed on the screen.

Methodology/Implementation

Workflow:

- Capture the video from the webcam.
- Detect hand gestures and perform actions (write, erase, or submit).
- Send the drawn equation to AI.
- Show the video feed, drawing, and solution all together

Result and Analysis

The project successfully tracks hand gestures and allows users to write and solve math equations. The system can:

- Detect and respond to gestures quickly.
- Solve math equations accurately using AI. The interface is user-friendly, and the real-time display makes it engaging. Users can easily write equations and see solutions without touching any physical device.
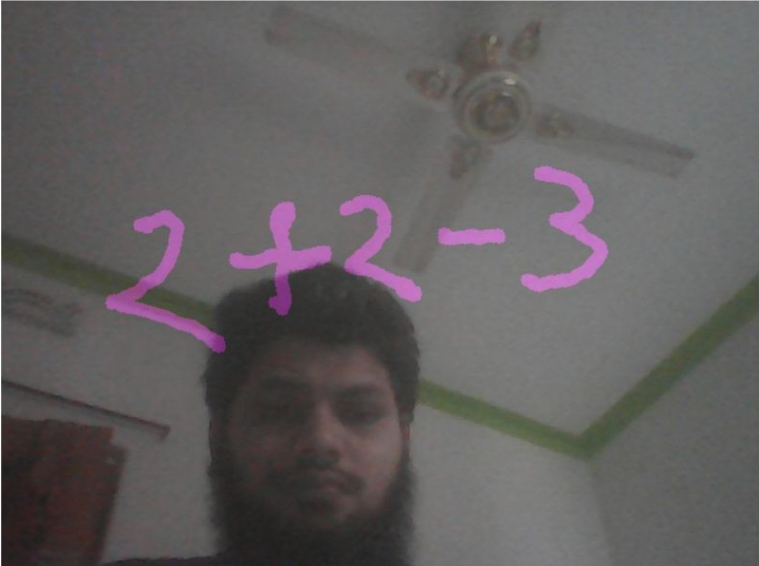
Conclusion

The Math with Gestures project is an innovative way to solve math problems by using hand movements. It makes learning more interactive and fun. The combination of gesture recognition and AI proves to be a unique and effective approach.

Future Scope

1. Add support for more complex math problems, like algebra or geometry.
2. Make the system available on mobile phones for more accessibility.
3. Improve the system's ability to recognize gestures for better accuracy.
4. Add features like voice commands for additional interaction.
5. Expand the system to work in different languages.

Reference

- CVZone Documentation: https://github.com/cvzone/CVZone
- OpenCV Documentation: https://opencv.org/
- Google Generative AI: https://ai.google/
- Python Documentation: https://www.python.org/
- Streamlit Framework: https://streamlit.io/
- YouTube Tutorial: "Hand Tracking and Gesture Control"