

# Fingertips



November 30, 2021

## Overview

*"The art challenges the technology, and the technology inspires the art"* - said John Lasseter. This ed-tech tool helps teachers draw diagrams using their fingers without additional gadgets like pen tablets, smartphones, etc. It helps us implement mixed reality where teachers can draw figures and illustrate individual parts of it as and when necessary.

## Problems faced in Online Education

In the post COVID era, computers and smartphones are the new modes of teaching. No wonder the edu-tech domain has emerged on an immense scale ever since. However some serious issues that can be dealt with are :-

- i. Lack of adequate student-teacher interaction.
- ii. Low attendance issues.
- iii. Some teachers aren't as comfortable using gadgets as the millennials.

As a result of these, the attention is shifted from the content to distractions.

## The solution we propose - Fingertips

An application that enables one to virtually paint with free finger movements in air. It is developed in python using openCV(for image processing and drawing) and Mediapipe(for real-time hand-tracking).

### ★ Specifications :-

- Can draw on the user's device screen based on his/her index finger movement.
- Can track the user's hand in real-time.



**Simple Initial Interface** - The toolbar on top provides different colors of paintbrush to choose from. Also an **eraser** option is provided.

#### ★ Functionalities :-

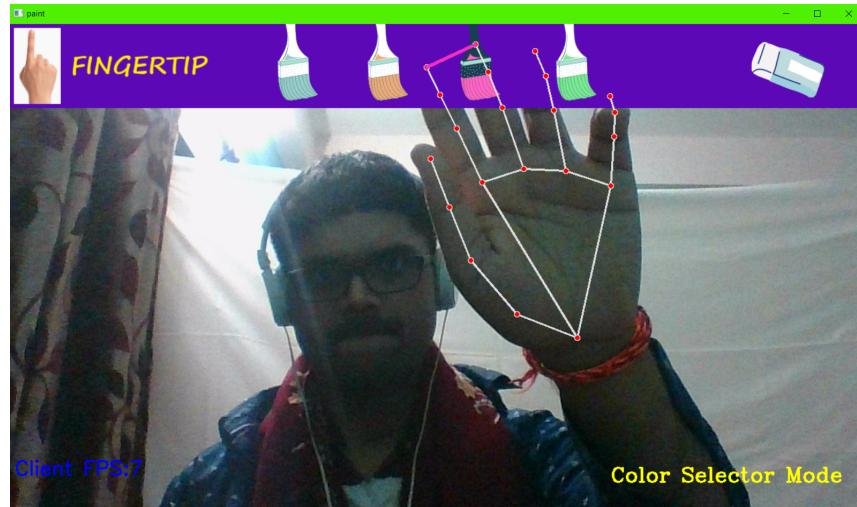
- As soon as the user shows up his hand in the camera the application detects it and creates a bounding box around the hand.



**Hand Detection in Action** as soon as I brought my palm in front of the web-cam.

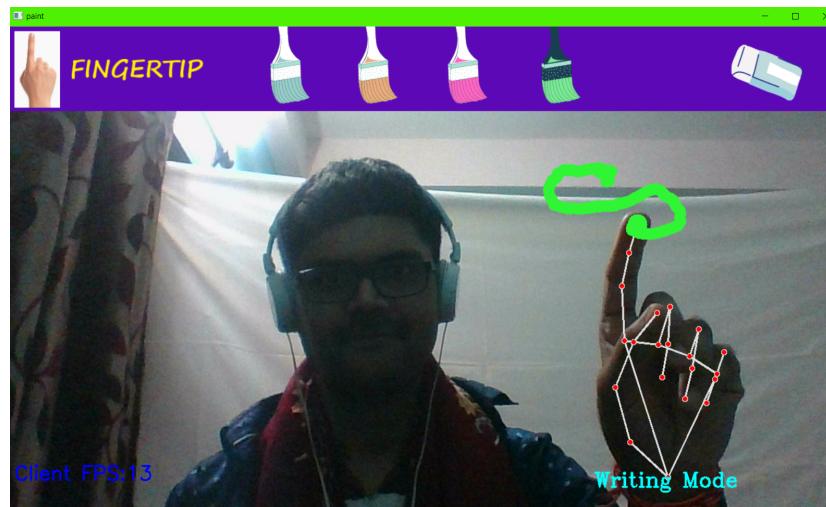
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- Currently, operates in **2** modes:
  - ◆ **Select** Mode - activated when index and middle fingers move together.

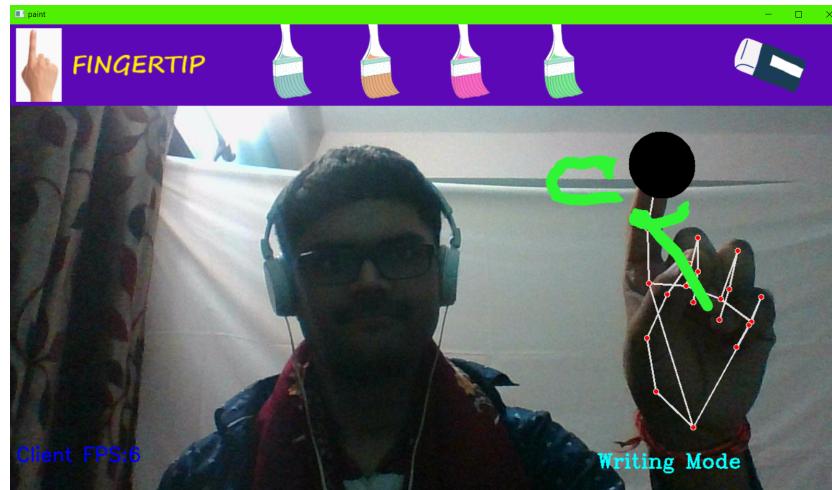


Selection mode active (notice the pink line between my index and middle fingers as soon as I selected the pink paintbrush)

- ◆ **Draw** mode - follows motion of user's index finger.



Writing / Drawing Mode : Only the INDEX finger in action



Using the Eraser to rub lines on screen.

### ★ Benefits :-

- Boosts *illustration-versatility* in **Physics, Mathematics, Medical and Engineering classes** (especially) where pictorial understanding of a model (say a **molecule's structure**, an **architectural framework of a building**, explaining axioms of **2D, 3D geometry; vector analysis, calculus**) plays a key role.
- No additional costs.
- No additional requirements (except just a PC with a webcam).
- No additional technical knowledge required for teaching.
- Light, handy and lag-free application.

## Milestones

1. **A one-of-a-kind free-hand customizable teaching experience:** It's good news for all gadget-haters and those who aren't quite comfortable with cables to operate applications on PC. This tool comes with a promise for making next-gen online tutoring a piece of cake for teachers across India.

2. **Much better interactivity:** Creativity at its peak! Options are infinite when you have your fingers to picturize your thoughts in front of an avid audience on the other side of the screen.
3. **Eliminates any tech-barrier from disrupting studies:** Teachers needn't bother about operating pen tablets, whiteboards etc. They can only focus on teaching because the screen is the canvas and fingers are the paintbrush!

**Fingertips** can thus be used as an effective platform for teachers for teaching and students for prototyping their ideas while brainstorming. This flexible technology will provide an interesting and exciting experience in online and hybrid classes encouraging student interaction and academic discourse igniting the fire of curiosity in young minds.

Let's go limitless with your imaginations in the air !

Link to video demonstration :

<https://drive.google.com/file/d/139Ga9uM6l1rvQVYSXd-ojPiec0-MJ2gZ/view?usp=sharing>

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