



DIY Graphics Tab:

A Cost-Effective Alternative to Graphics Tablet for Educators

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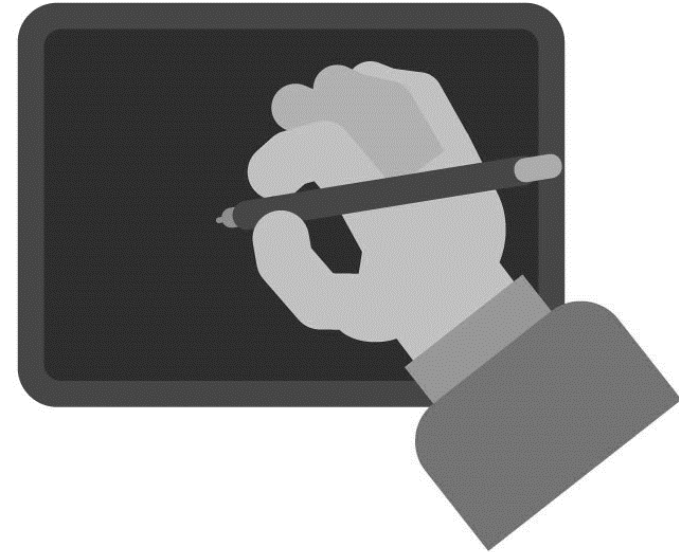
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e-Teaching lecture recording



Overhead Camera

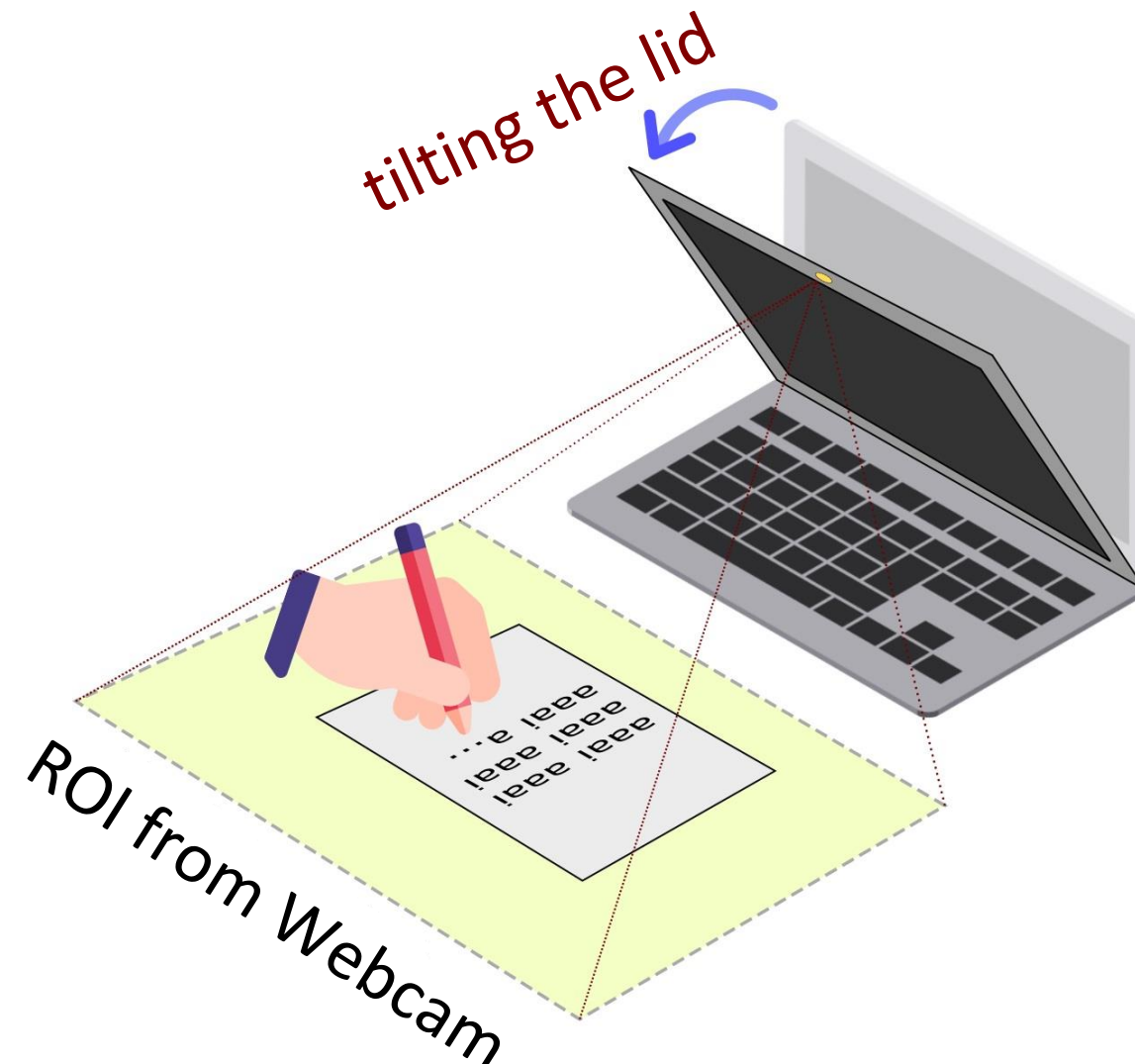


Graphics Tab

Which one? Considering -

- a) Cost
- b) Quality
- c) Comfort of using

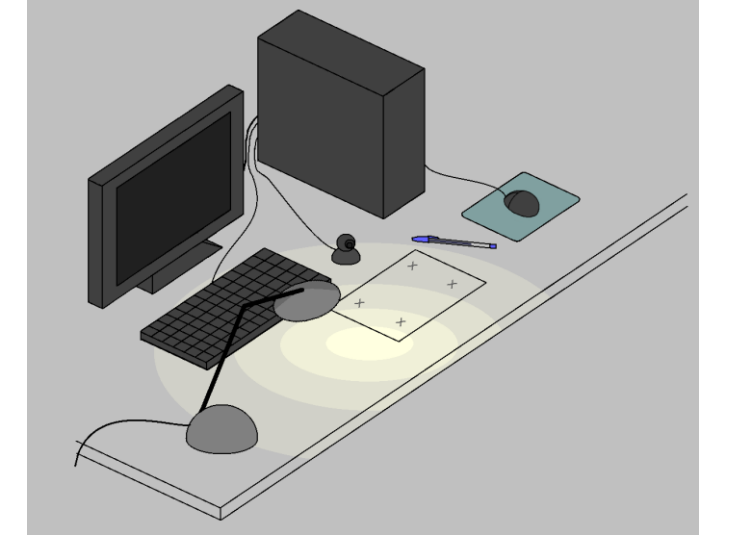
Ours: DIY Graphics Tab



What you need only -
Pen, Paper, and Laptop's Webcam

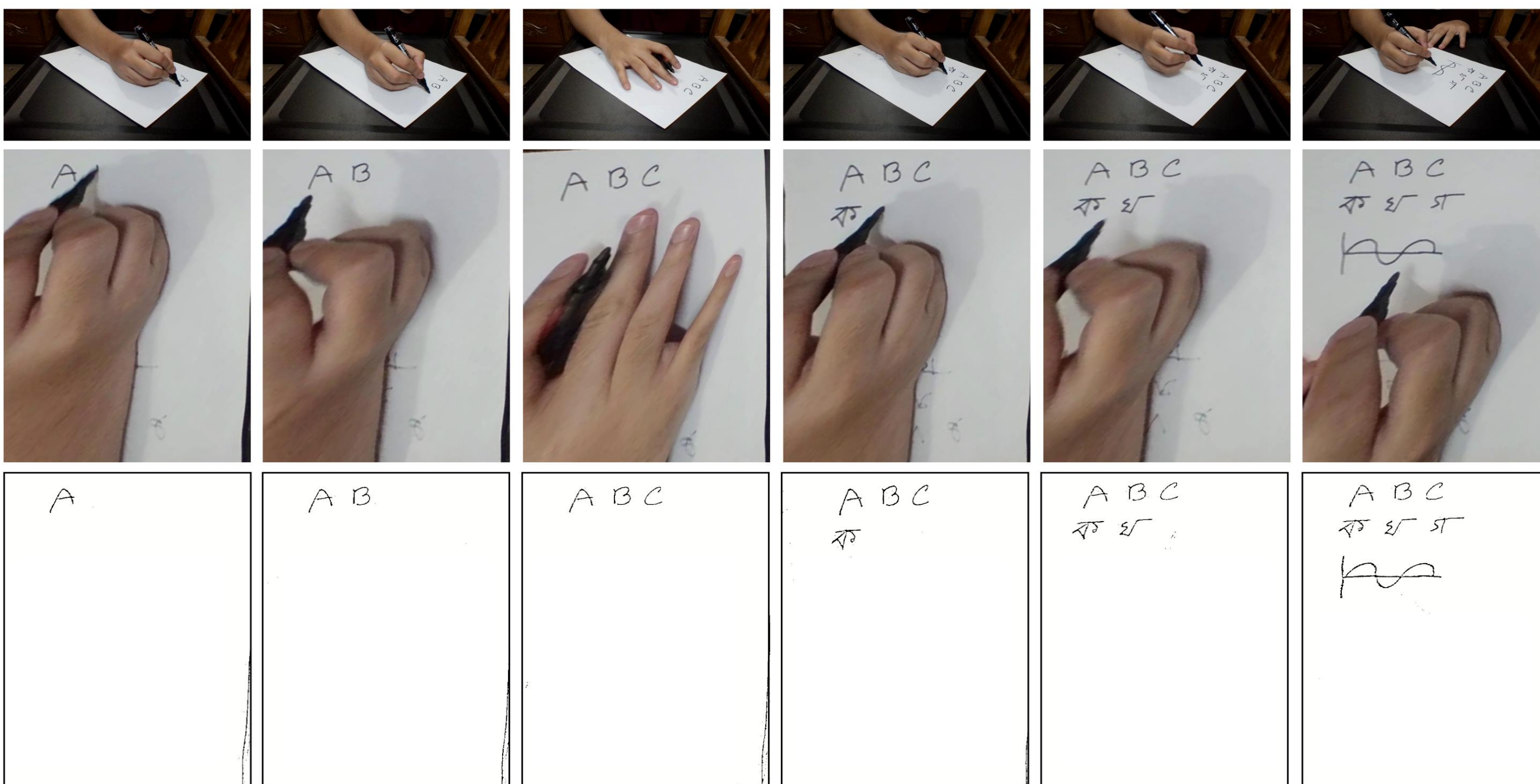
Related work

- **WebCamPaperPen [1]**
- Our DIYGT is better in terms of complexity



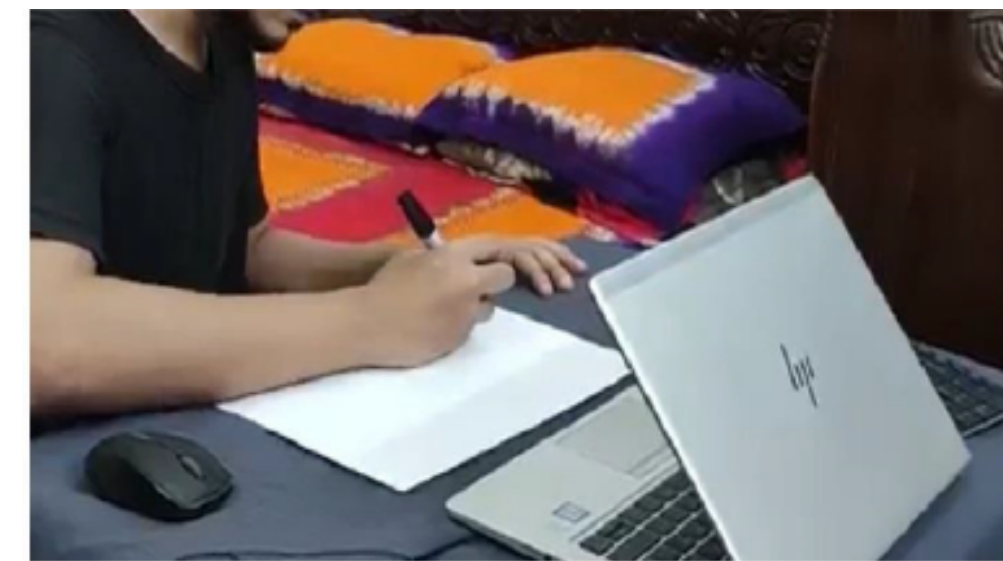
Issues	WPP	Ours
Additional task for calibration?	✓	✗
Extra camera other than the built-in one?	✓	✗
Extra equipment other than pen-paper?	✓	✗
Paper steady while writing?	✓	✗
Use specific type of pen?	✓	✗
Eye-hand coordination?	✓	✗
Restriction on handedness?	✓	✗

Results

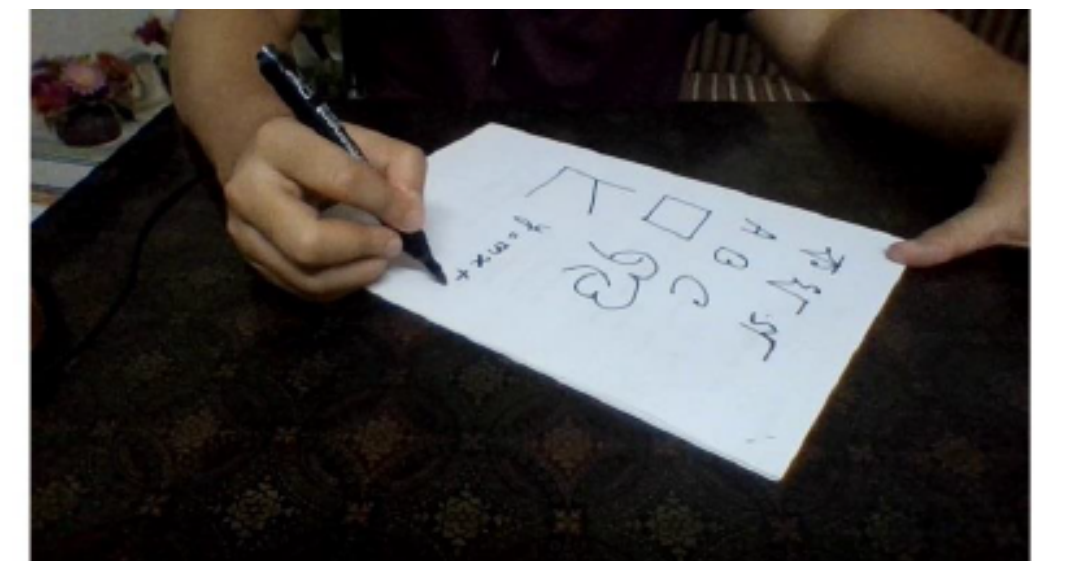


Use like overhead camera! Feels like Graphics Tab!

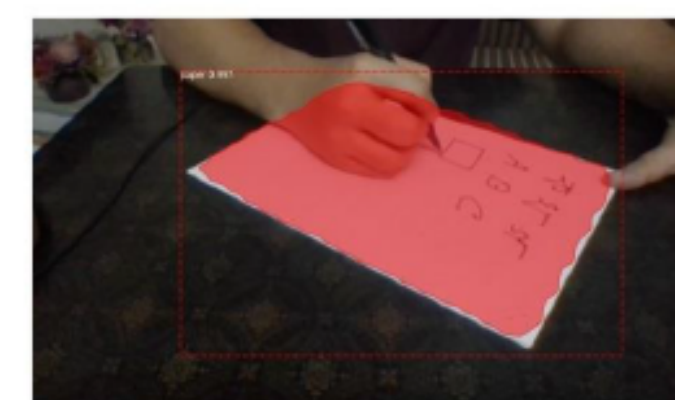
Pipeline



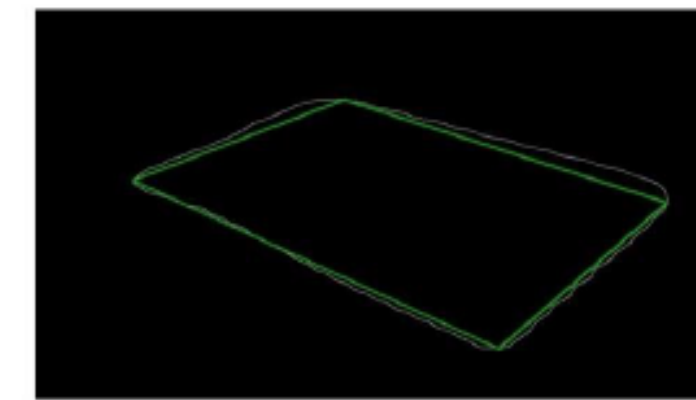
setup



input frame



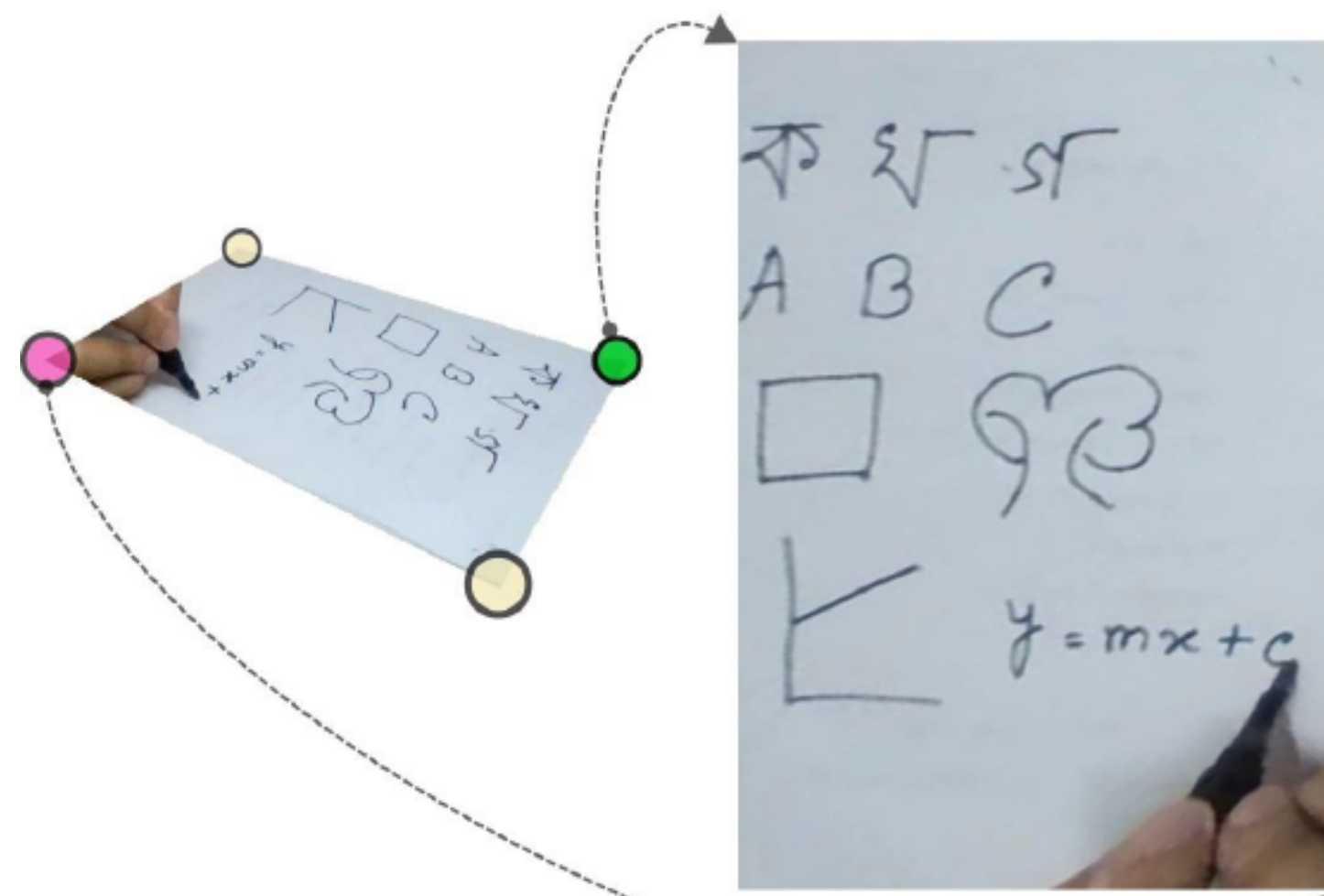
paper detection



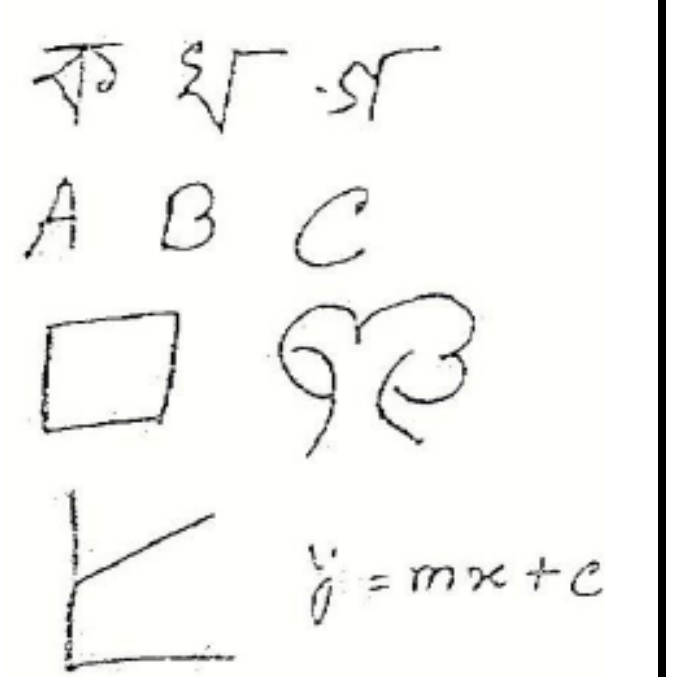
corner finding



paper segmentation



4-point perspective transformation

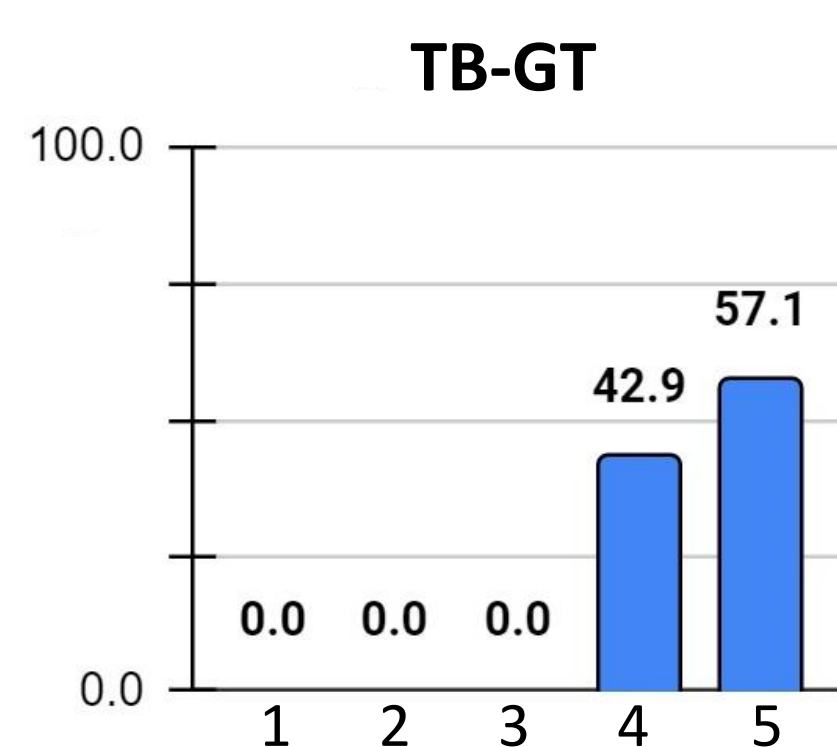
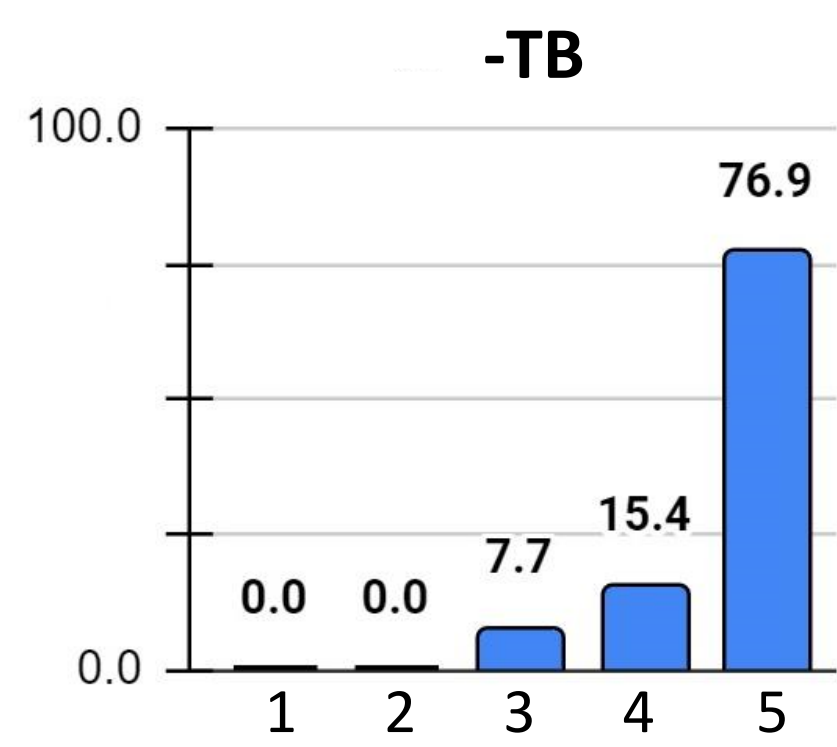


processed output

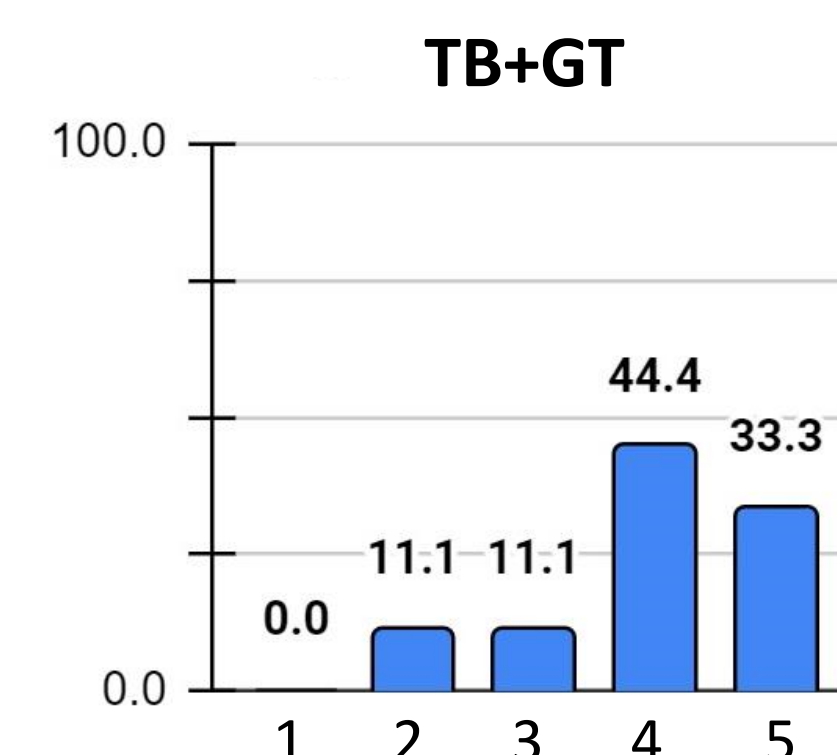
Evaluation

Quantitative [Likert]:

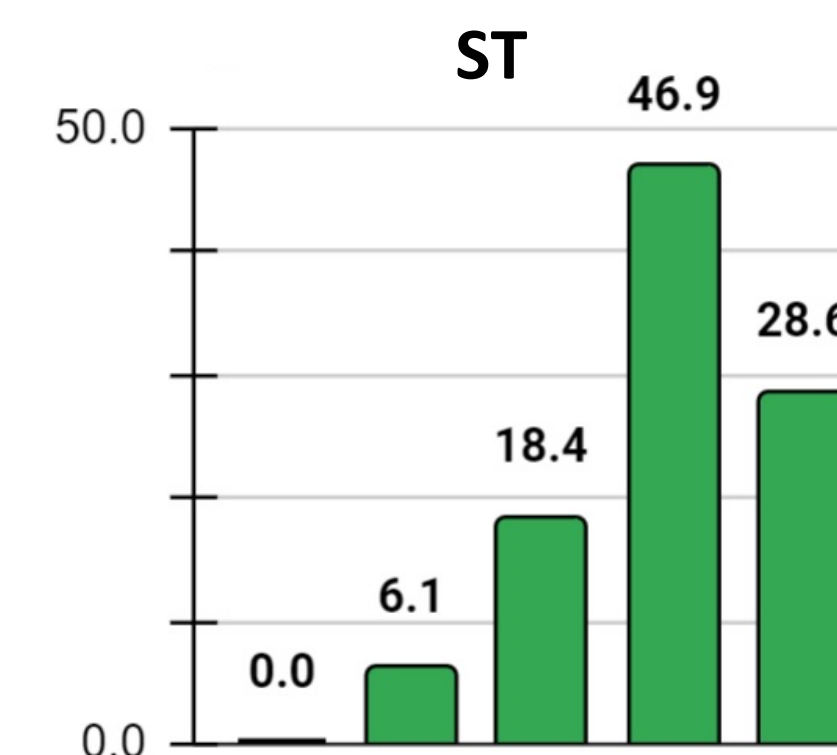
TB: technical background
GT: Graphics Tab
ST: Student



Teachers participants: 29
Average rating: 4.44 (5)



Students participants: 49
Average rating: 3.98 (5)



Qualitative [QA]:

- It replaces graphics tab perfectly for lecture recording (31.03%).
- The actual graphics tab is better but it is too expensive, I would rather use it (41.38%).
- After a certain period I would get tired of it and would buy a proper graphics tab to improve my content (20.69%).
- It does not fit my lecture recording (6.9%).

Dataset

For paper segmentation using **Mask-RCNN**



[[160.0, 95.0],
[334.0, 125.0],
[288.0, 206.0],
[57.0, 150.0]]

Future Work

- Enriching our dataset
- Using advanced instance segmentation techniques.
- Optimizing the implementation to work in real-time.

[1] Gustavo Thebit Pfeiffer, Ricardo Guerra Marroquim, and Antonio Alberto Fernandes de Oliveira. **WebcamPaperPen: A Low-Cost Graphics Tablet**. SIBGRAPI 2014