

HCI PROJECT

SELECTING, TYPING USING EYES

FINAL PRESENTATION

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Problem



- ▶ 15% of the world population reserved for people with disability.
- ▶ Numerically it is One Billion people.
- ▶ From that 2 – 3% population reserved for people with no hands due to various reasons.

Problem

- ▶ Imagine yourself being an intelligent, motivated, and working person in the fiercely competitive market of information technology, but just one problem.

- ▶ **You can't use your hands.**

- ▶ Then,
How do you do your job?
How do you stay employed?

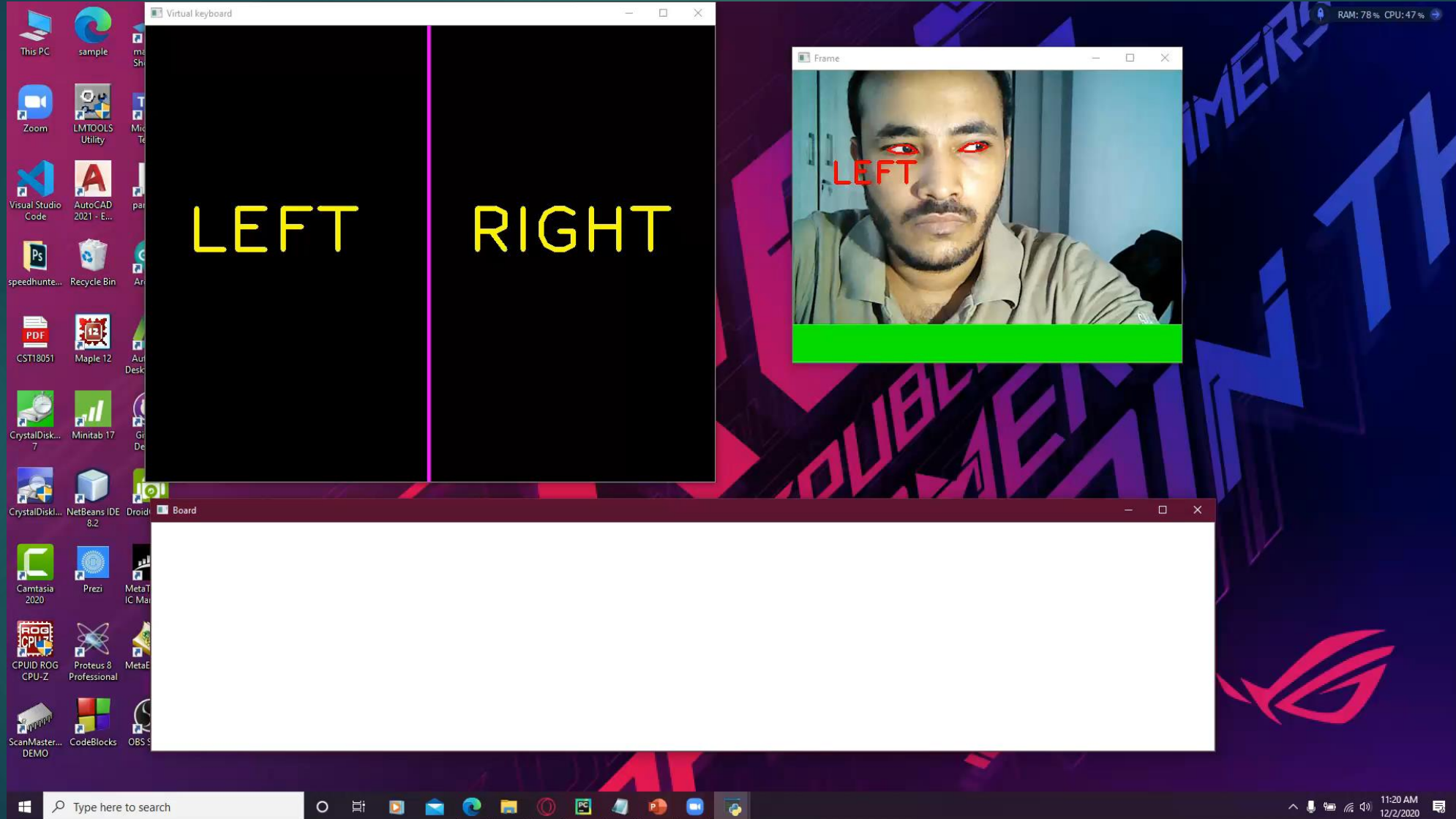


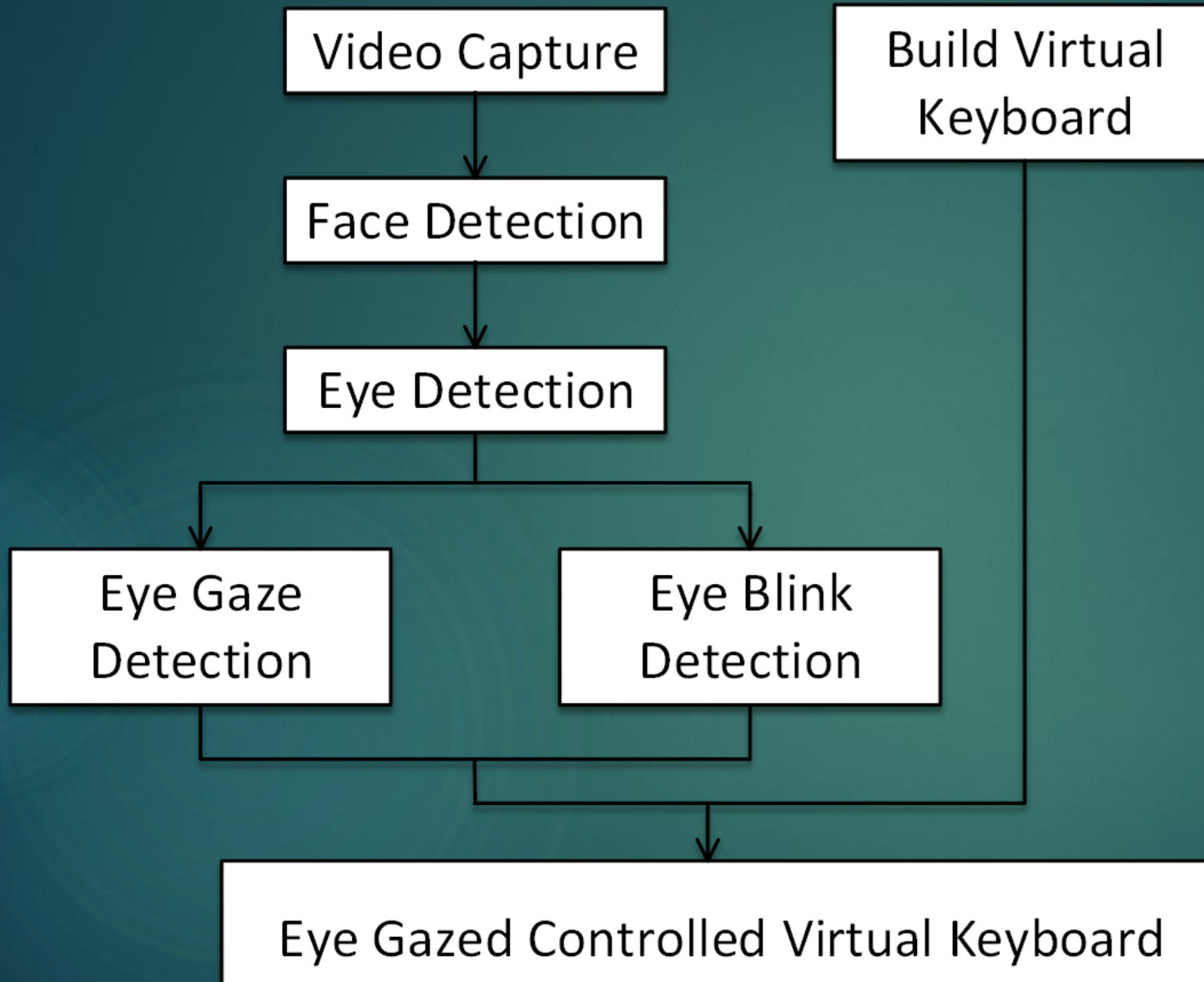
Solution



- ▶ Eye Gaze Control System is a very good gift from computer Industry.
- ▶ Simply, it is communication using eye movement.
- ▶ Technically, it is a human vision-based communication and control system.

Solution





**How it
was
Done ?**

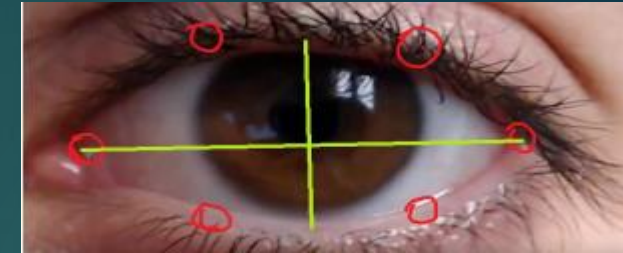
How it was Done ?

- ▶ Used real time frames from the webcam to detect the face.
- ▶ “shape_predictor_68_face_landmarks.dat” file was used detect the landmark points of eyes from the face.
- ▶ Left eye points: [36, 37, 38, 39, 40, 41]
- ▶ Right eye points: [42, 43, 44, 45, 46, 47]



How it was Done ?

- ▶ For the Eye Blink detection we drew horizontal vertical lines trough midpoint of the eye.
- ▶ Open and close of eye depend on length of vertical line.
- ▶ Ratio between horizontal length and vertical length is eye blink ratio.
- ▶ Normally, if Eye Blink Ratio ≥ 5.7 , Eye Blink will detect.

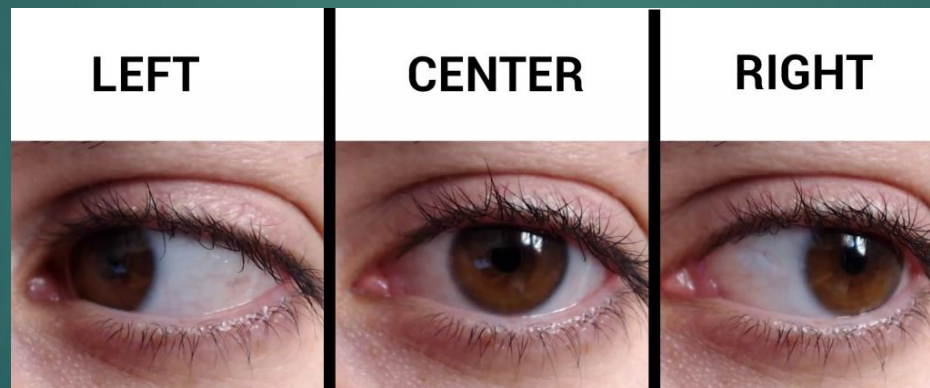


How it was Done ?

- ▶ For the Eye Gaze detection, we used a mask to remove skin area around eye.
- ▶ Did Binary Thresholding to separate black part (Iris & Pupil) and white part (Sclera) of eye.
- ▶ Count non-zeros (white parts/ Sclera) beside zeros (black part/Iris & Pupil) as left white and right white of eye.

How it was Done ?

- ▶ Ratio between left white count and right white count of eye give eye gaze ratio.
- ▶ Then detect eye position as LEFT, RIGHT and CENTER.



- ▶ Finally built Virtual Keyboard with main characters and connected all branches together.

Heuristic HCI Principles Applied

- ▶ Visibility of system status
 - ❖ We have used a loading bar to show eye blink is successful to print the letter.
 - ❖ Eye gaze detection is displayed as LEFT, RIGHT.
- ▶ User control and freedom.
 - ❖ Usual eyeblinks can happen during work. So mistaken eyeblinks do not print letter that time.
- ▶ Aesthetic and minimalist design.
 - ❖ User friendly system with attractive design.

Heuristic HCI Principles Applied

- ▶ Match between system and the real world.
 - ❖ Vision based image processing process after gathering real world human eye details.
- ▶ Flexibility and efficiency of use.
 - ❖ Efficiency is increased by selecting keyboard as left and right.
 - ❖ Speedup the letter movement.
- ▶ Recognition rather than recall.
 - ❖ Only eye blink, eye left turn and eye right turn.

We Used..

- ▶ Web Camera.
- ▶ Laptop.
- ▶ Python 3.6.7 version.
- ▶ PyCharm Software for Python programming.



Limitations & Drawbacks

- ▶ Distance between the camera and the human eye should be within 25cm to 50cm.
- ▶ Image acquisition (lighting) is very important.
- ▶ Lower lighting gives wrong reading and delays.
- ▶ Camera quality is very important.
- ▶ Should have good control of eyes to look correct position.
- ▶ Eyes should be healthy. (Avoid Diplopia, Blurred vision, Different eyeball position etc.)

Uses of Eye Gaze Control

- ▶ In this project, we focused on typing for disability people with lack of hand function.
- ▶ During this COVID-19 season, can use eye gaze control to avoid touch contacts.
 - ▶ Food ordering from super restaurants.
 - ▶ Vehicle Parking payment machines.
 - ▶ ATM money withdrawal, transfers.
- ▶ Can use to read a virtual book, paper while having food by turning pages, scroll down using eye.
- ▶ When mother holding a baby in her hand, can use eye gaze control to do her typing work on computer screen if needed.





THANK YOU !