Hand Tracking & Game Development

PyCK Project

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PROBLEM STATEMENT

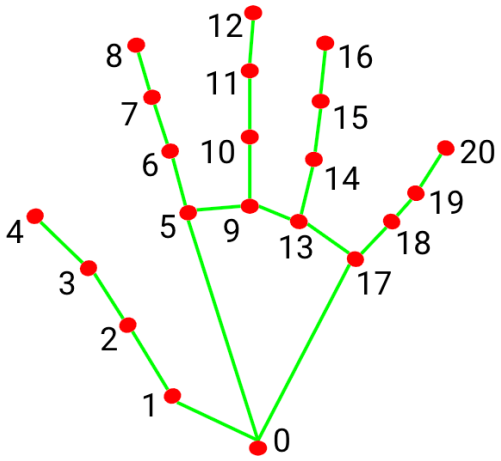
Hand Tracking :- By identifying Specific Landmarks on hand , We can easily track hands. Mediapipe hands utilizes an ML Pipeline Consisting of multiple models working together.

Game Development :- Developing a simple game using pygame that can be played using hand gestures.

DESCRIPTION OF MAIN ALGORITHM

Hand Tracking

Performed using Libraries OpenCV and Mediapipe.
Frames captured from camera are processed using mediapipe. After performing multiple hand processing features multiple hand landmarks are marked .



0. WRIST
1. THUMB_CMC
2. THUMB_MCP
3. THUMB_IP
4. THUMB_TIP
5. INDEX_FINGER_MCP
6. INDEX_FINGER_PIP
7. INDEX_FINGER_DIP
8. INDEX_FINGER_TIP
9. MIDDLE_FINGER_MCP
10. MIDDLE_FINGER_PIP
11. MIDDLE_FINGER_DIP
12. MIDDLE_FINGER_TIP
13. RING_FINGER_MCP
14. RING_FINGER_PIP
15. RING_FINGER_DIP
16. RING_FINGER_TIP
17. PINKY_MCP
18. PINKY_PIP
19. PINKY_DIP
20. PINKY_TIP

- Above shown are 21 landmarks found using mediapipe.
- A new list containing the following data is created.
  [id, pos_x , pos_y , distance_from_landmarks[0]]
- For index finger detection distance(0,6) and distance(0,8) are compared and if the finger is folded distance(0,6)>(0,8). And thus the number of fingers shown can be counted.

Game Development

- A start menu is created.
- A screen is initialised divided in four lanes for a car to move.
- Enemy cars are spawned in random lanes in incoming direction and we have to avoid them. If collision avoided then increase the score by 1.

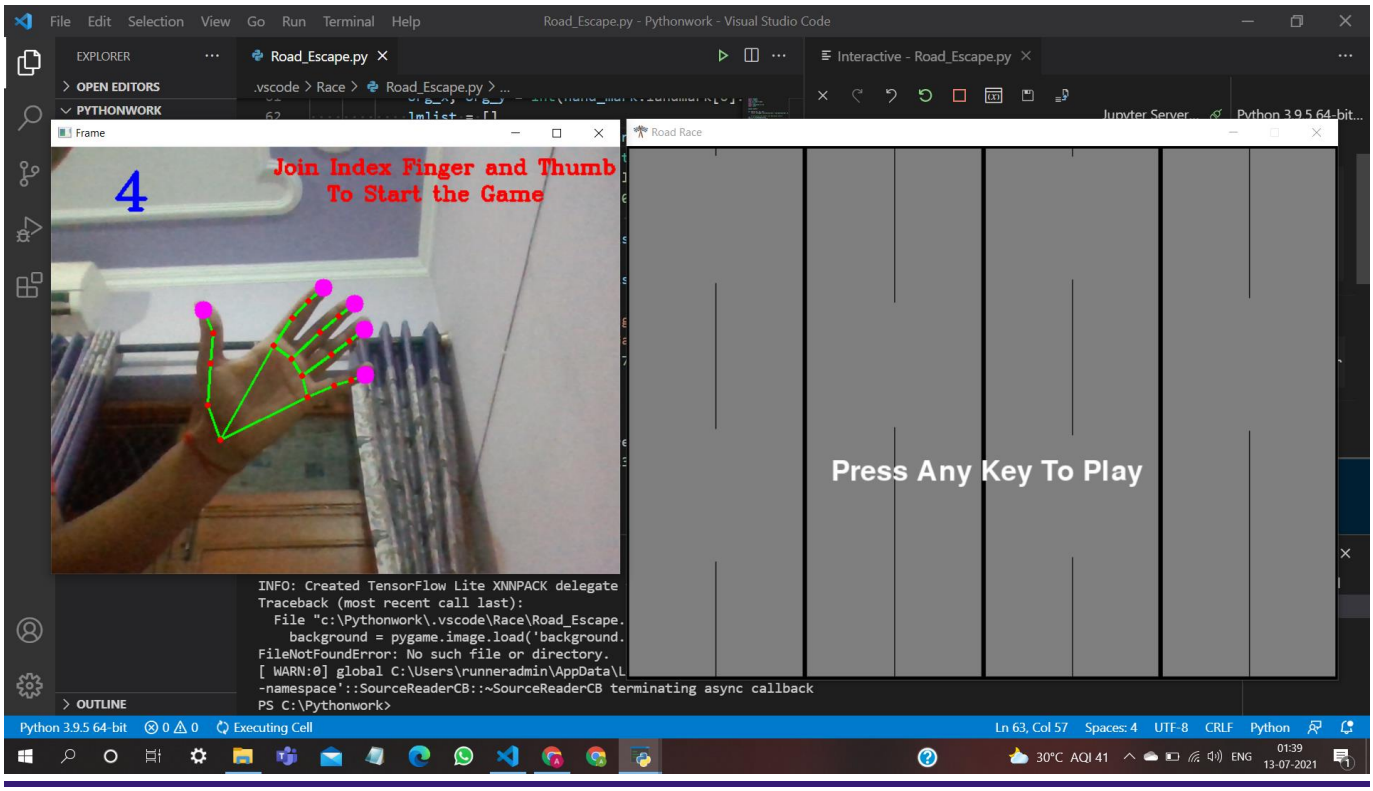
- If collision detected Game Over and create a window to Restart the game.

Connecting Both algorithms Written Above

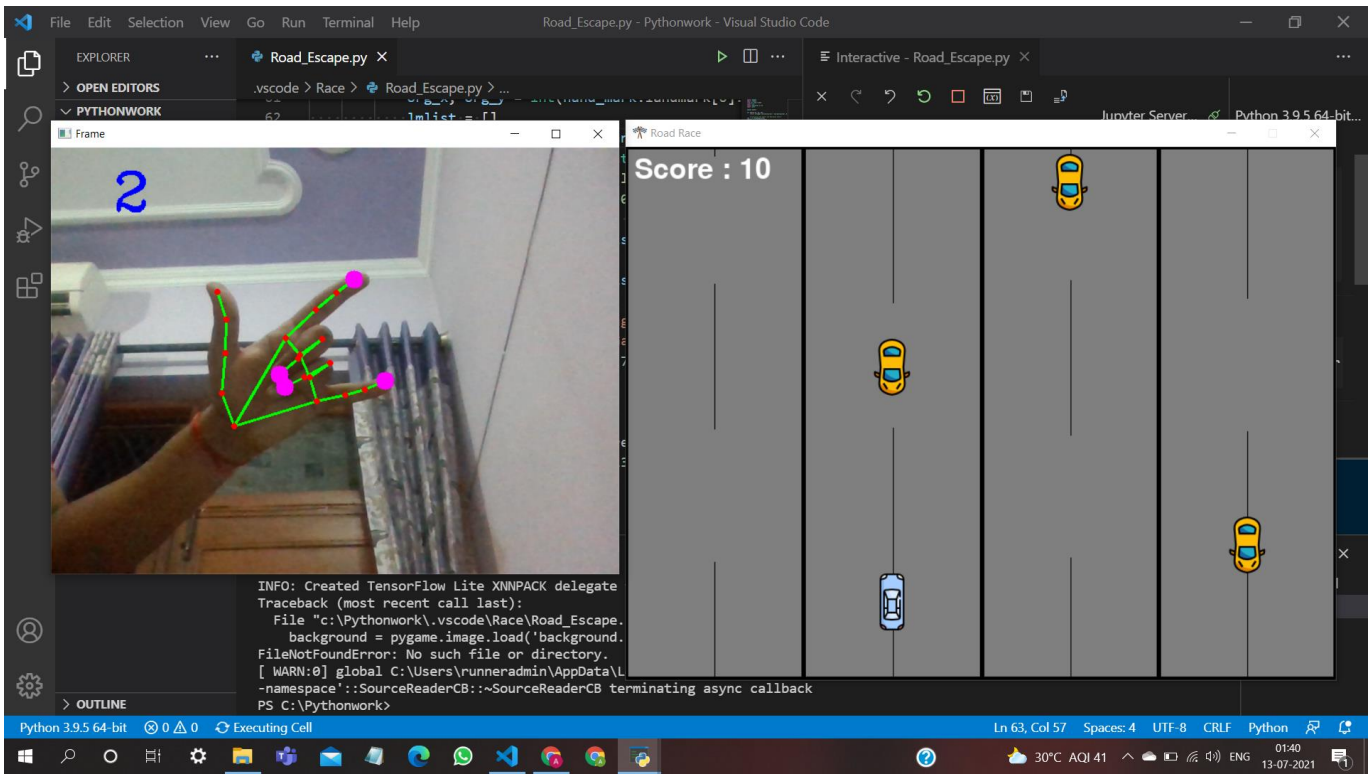
- This Part was the Most difficult to execute.
- Starting Game with a specific hand gesture.
- Car will move to the lane according to no. of fingers shown.
- If game over, restart the game with Specific Hand Gestures.

RESULTS

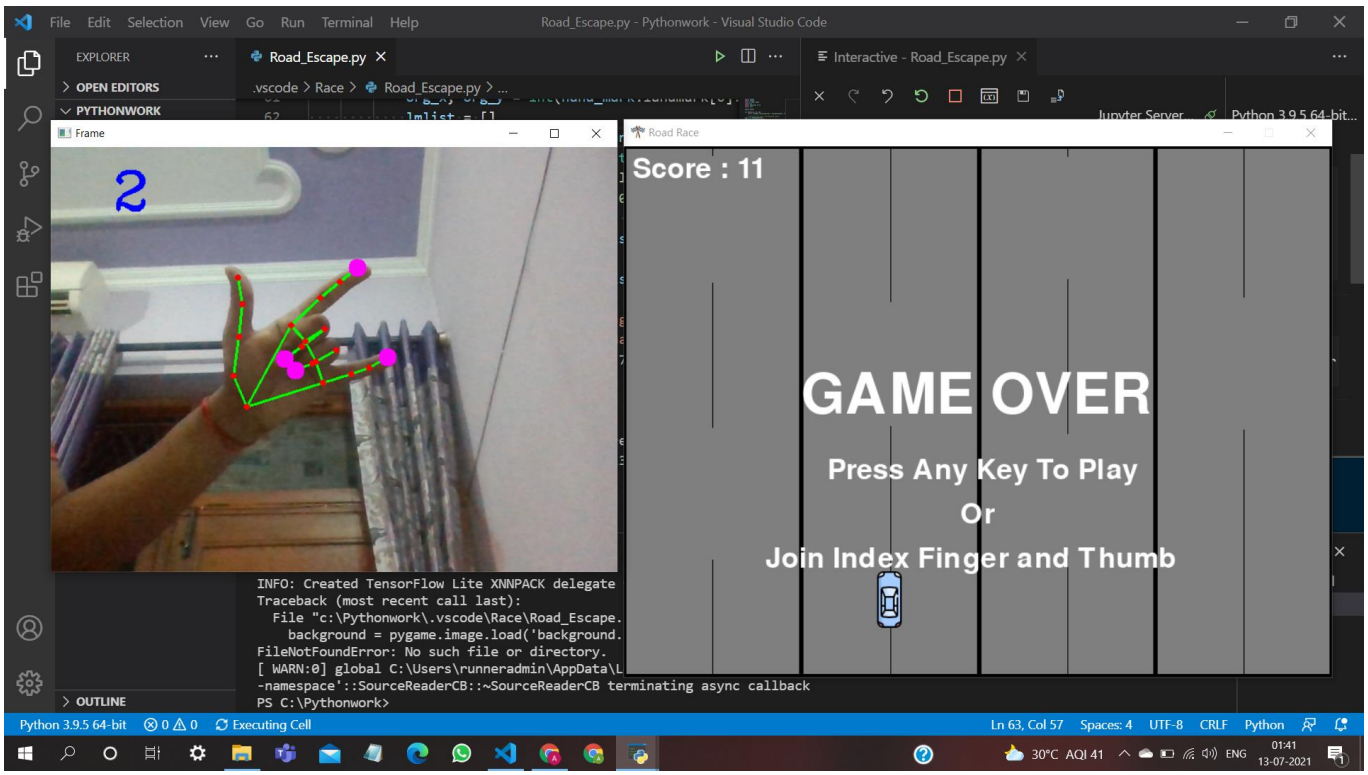
- Both camera and game window will start at the same time.



- After starting the game, control the car with your Fingers.



- After Game is Over, you can restart the game.



REFERENCES

- For documentation on Mediapipe
  https://google.github.io/mediapipe/solutions/hands.html
- For Tutorial on Pygame
Pygame Tutorial for Beginners - Python Game Development Course

CONCLUSIONS

- Better results can be obtained while playing game if the background in camera is clear and the hand gestures are displayed clearly which results in better detection and tracking.

IMPORTANCE

- We can even use the hand tracking feature to read hand signs.Example - MNIST sign Language or ASL . By applying specific parameters we can convert hand signs to written texts.
- Hand Tracking has many applications. By combining it with various other modules we can use it to control computer via hand gestures.
- It has many uses in robotics. A robotic arm can be designed to mirror a normal human hand using 2 or more cameras.