

Hand gesture recognition using tensor flow and open CV

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Abstract : Gesture recognition is a topic in computer science and language technology with the goal of interpreting human gestures via mathematical algorithms. Gestures can originate from any bodily motion or state but commonly originate from the face or hand. Current focuses in the field include emotion recognition from the face and hand gesture recognition. Many approaches have been made using cameras and computer vision algorithms to interpret sign language. However, the identification and recognition of posture, gait, proxemics, and human behaviors is also the subject of gesture recognition techniques. Gesture recognition can be seen as a way for computers to begin to understand human body language, thus building a richer bridge between machines and humans than primitive text user interfaces or even GUIs (graphical user interfaces), which still limit the majority of input to keyboard and mouse.

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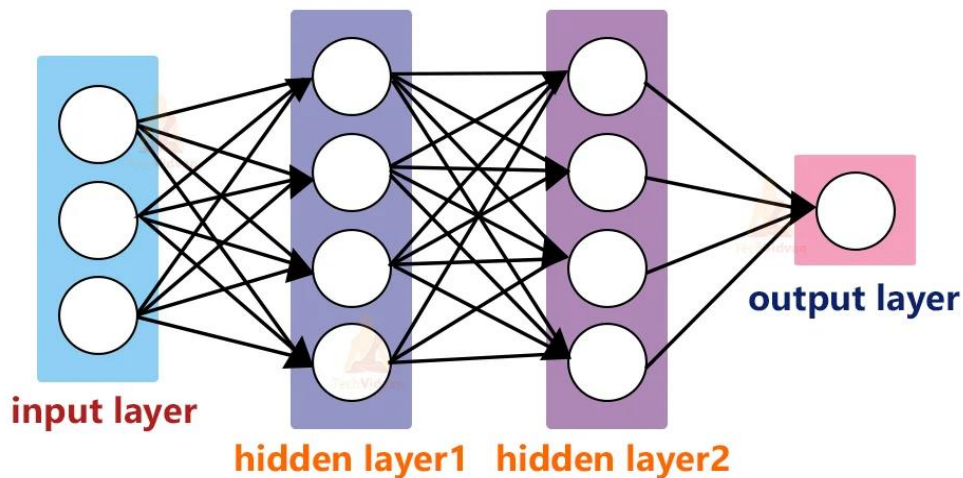
Gesture recognition enables humans to interface with the machine (HMI) and interact naturally without any mechanical devices. Using the concept of gesture recognition, it is possible to point a finger at the computer screen so that the cursor will move accordingly.

This could potentially make conventional input devices such as mouse, keyboards and even touch-screens redundant.

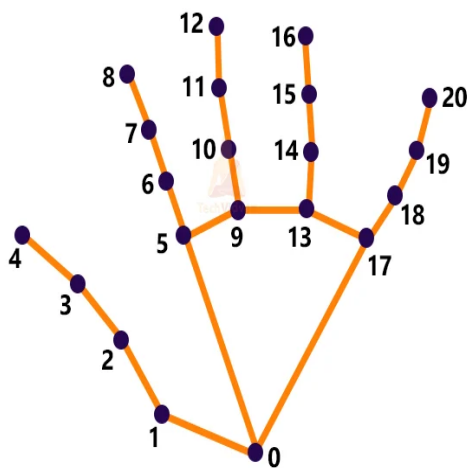
Gesture recognition can be conducted with techniques from computer vision and image processing.

Block Diagram :

Neural Networks are also known as artificial neural networks. It is a subset of machine learning and the heart of deep learning algorithms. The concept of Neural networks is inspired by the human brain. It mimics the way that biolo

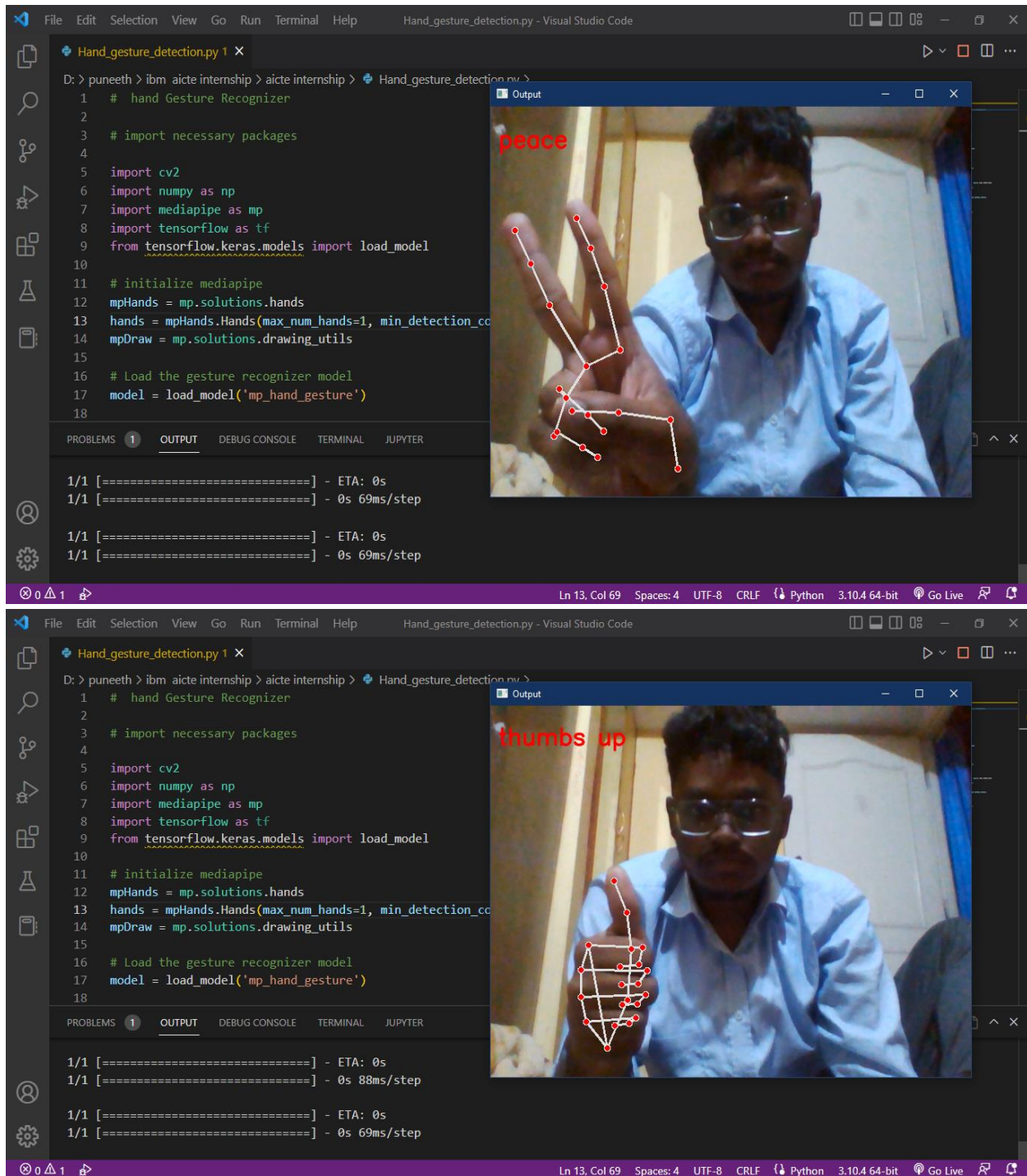


gical neurons send signals to one another. Neural networks are composed of node layers, containing an input layer, one or more hidden layers, and an output layer. We'll first use MediaPipe to recognize the hand and the hand key points. MediaPipe returns a total of 21 key points for each detected hand. These key points will be fed into a pre-trained gesture recognizer network to recognize the hand pose.



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

Results



Conclusion and future scope

In this Hand Gesture Recognition project, we've built a hand gesture recognizer using OpenCV and python. We've used MediaPipe and Tensorflow framework for the detection and gesture recognition respectively. Here we've learned about the basics of the Neural Network, File handling, some common image processing techniques, etc. Human Computer Interaction is still in its infancy. Visual interpretation of hand gestures today allows the development of potentially natural interfaces to computer-controlled environments. Though most current systems employ hand gestures for manipulation of objects the complexity of the interpretation of gestures dictates the achievable solution. Hand gestures for HCI are mostly restricted to single handed and produced by single user in the system. This consequently downgrades the effectiveness of the interaction. Computer Vision methods for hand gesture interfaces must surpass current performance in terms of robustness and speed to achieve interactivity and usability. Considering the relative infancy of research related to vision based gesture recognition remarkable progress has been made. To continue this momentum it is clear that further research in the areas of feature extraction, classification methods and gesture representation are required to realize the ultimate goal of humans interfacing with machines on their own natural terms.

References

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