

SmartHome Gesture Control Application - Part 2

CSE 535: Mobile Computing

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INDEX

1. PROBLEM STATEMENT
2. TECHNOLOGIES USED
3. APPROACH TO THE PROBLEM
4. SOLUTION OF THE PROBLEM

PROBLEM STATEMENT

A python application to classify Smart Home Gestures using CNN model.

TECHNOLOGIES USED

1. TensorFlow
2. Python 3.6.9
3. OpenCV for Python
4. Keras

APPROACH TOWARDS THE PROBLEM

Generate the penultimate layer for the training videos. Steps to generate the penultimate layer for the training set:

1. Extract the middle frames of all the training gesture videos.
2. For each gesture video, you will have one frame extract the hand shape feature by calling the `get_Instance()` method of the `HandShapeFeatureExtractor` class. (`HandShapeFeatureExtractor` class uses CNN model that is trained for alphabet gestures)
3. For each gesture, extract the feature vector.
4. Feature vectors of all the gestures is the penultimate layer of the training set.



Generate the penultimate layer for the test videos. Follow the steps for Task 1 to get the penultimate layer of the test dataset.

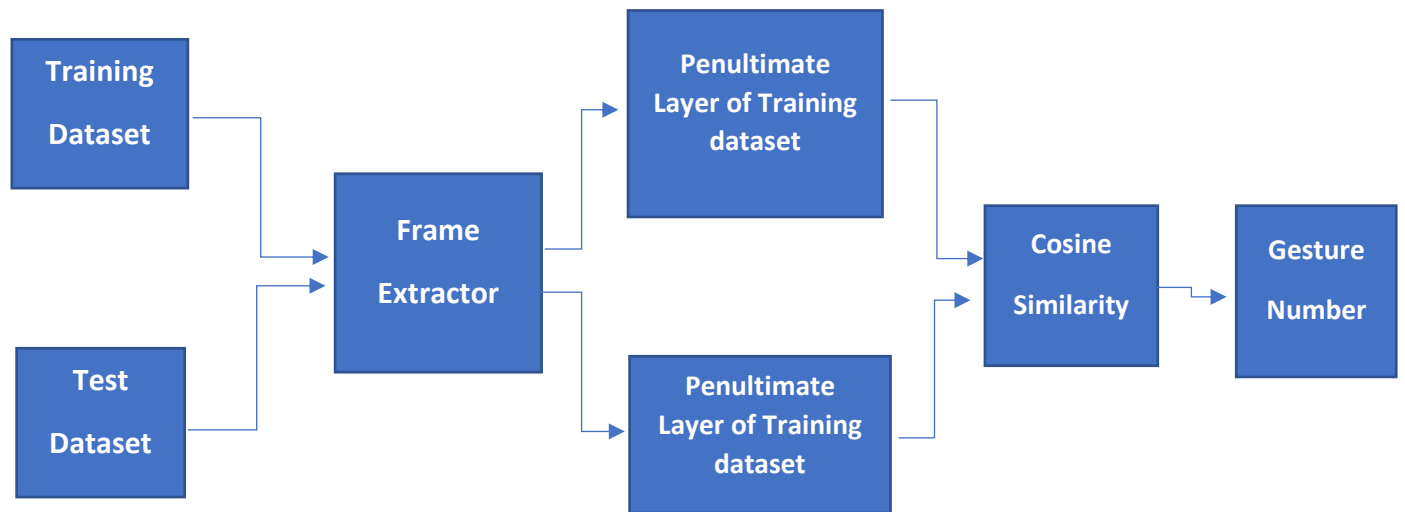


Gesture recognition of the test dataset. Steps:

1. Apply cosine similarity between the vector of the gesture video and the penultimate layer of the training set. Corresponding gesture of the training set vector with minimum cosine difference is the recognition of the gesture.
2. Save the gesture number to the `Results.csv`
3. Recognize the gestures for all the test dataset videos and save the results to the `results.csv` file.

SOLUTION TO THE PROBLEM

Below mentioned is the workflow of the project.



- cv2 library is used to process the video inputs.
- To extract the middle frame of all the training gesture videos, get_Instance() method of the HandShapeFeatureExtractor class.
- A CNN model is trained on the expert gesture videos and HandShapeFeatureExtractor class uses the CNN model.
- For each gesture the feature vector is extracted using the getVectorFromFrame()
- In this function, we use the cv2 library and convert the frame image to the grey scale and extract the vectors.
- To generate the penultimate layer for the test videos, we follow the same steps as mentioned above
- For gesture recognition on the test dataset, we apply cosine similarity between the vector of the gesture video and the penultimate layer of the training set.