General Information

Project Title: Extension of User Interface using Visual cues from Camera

Project Type: New Application Project

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Project Description

The aim of our project is to build an "intelligent" system that enables users to interact with their computers by making hand-gestures captured by the camera and fed in to a recognition system.

The project is aimed at a setup that involves a desktop-computer/laptop with the capability to capture images via a traditional web camera. It also involves building an efficient recognition system that is trained on labelled images of acceptable hand gestures.

We plan to explore existing state of the art methodologies used to detect hand-based gestures. Additionally, our aim is to incorporate convolutional neural networks for accurate recognition.

Example Use case:

A developer usually starts multiple applications before he begins coding (Terminal, IDE, Browser etc.). In our system, the user would just make a preassigned gesture towards the camera and when recognized it will open all the required applications automatically.

Reading List

1. Vision based hand gesture recognition for human computer interaction: a survey:
https://link.springer.com/article/10.1007/s10462-012-9356-9

2. Android based Portable Hand Sign Recognition System:
https://arxiv.org/ftp/arxiv/papers/1503/1503.03614.pdf

3. Hand Gesture Recognition with 3D Convolutional Neural Networks:
http://research.nvidia.com/sites/default/files/pubs/2015-06_Hand-Gesture-Recognition/CVPRW2015-3DCNN.pdf

We will additional papers to our reading list as and when we find papers that are suitable for our project.

Research Plan & Timeline

Key milestones:

- Explore and read papers related to existing techniques to Identify appropriate recognition techniques e.g. CNN. (Week 1 – 16th March 2018)
- Define required parameters e.g. lighting conditions, camera resolution, hardware specifications etc. (Week 2 – 23rd March 2018)
- Identify framework/platform to implement recognition system e.g. Caffe, TensorFlow. (Week 2 - 23rd March 2018)

- Collect and label required images for gesture recognition. (Week 2-3 30th March 2018)
- Coding/implementing the system. (Week 3 - Week 5 13th April 2018)
- Design evaluation techniques for testing the system and testing. (Week 5 – Week 6 20th April 2018)
- Begin drafting the final report. (Week 7 30th April 2018)

Papers will be distributed among team members equally. Each member will select one recognition technique and evaluate its feasibility for our project.

Plan for Data and Experiments

The following link consists of the dataset which is suitable for our study:

https://github.com/mon95/Sign-Language-and-Static-gesture-recognition-using-sklearn/blob/master/Dataset.zip

It includes around 1600 images of hand gestures. To add to this dataset, we will need to include images that do not include hand gestures.

Note: We found additional datasets that can be used for our project. Although, suitability of those datasets can only be defined once we have the recognition system in place.

Evaluation will involve running the system on target device and marking instances of correct recognitions. As of now, we plan to conduct this manually.