A DEEP LEARNING APPROACH TO CONTROL A GAME BASED ON HAND GESTURES USING A LOW RESOLUTION CAMERA

Team Members **Panel Number:19**

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Problem definition

To present the details of design and implementation of gesture controlled game application using an optimized deep learning and neural network model.

Literature survey

S.No	Authors name(or)s	Full title of the paper with year	Inference from the paper	Open Problem
1	Pavlo Molchanov, Shalini Gupta, Kihwan Kim, and Jan Kautz NVIDIA, Santa Clara, California, USA	Hand Gesture Recognition with 3D Convolutional Neural Networks,2015	Proposed an algorithm for drivers' hand gesture recognition from challenging depth and intensity data	The data was captured with the Microsoft Kinect device and have a resolution of 115 × 250 pixels.
2	Vijay John and Ali Boyali and Seiichi Mita and Masayuki Imanishi and Norio Sanm	Deep Learning-based Fast Hand Gesture Recognition using Representative Frames,2016	LRCN classifier, multiple frames sampled from the video sequence	Decrease computational complexity
3	Ji-HaeKimaGwang-SooHongbByung-GyuKimaDebi P.Dograc	DeepGesture:Deep Learning -based gesture recognition using motion sensors,2018	Gyroscope and accelerometer sensors using Deep convolutional and recurrent neural networks.	Gesture recognition based on gyroscope and accelerometer sensors - DNN
4	Marco Roccetti,Gustavo Marfia,Angelo Sameraro	Playing into the wild: A gesture-based interface for gaming in public spaces,2012	Data from gyroscope, four convolution and GRU layers are combined	Remove external devices

Literature Survey - Summary

As we had observed from the past works, the gesture recognition has either been done with the help of external devices like motor sensors , accelerometer and gyroscope or using a high costing depth camera, like kinect. In one of the works, there wasn't enough data considered.There seems to be scope to decrease the computational complexity in parallel to increase the gesture recognition accuracy.

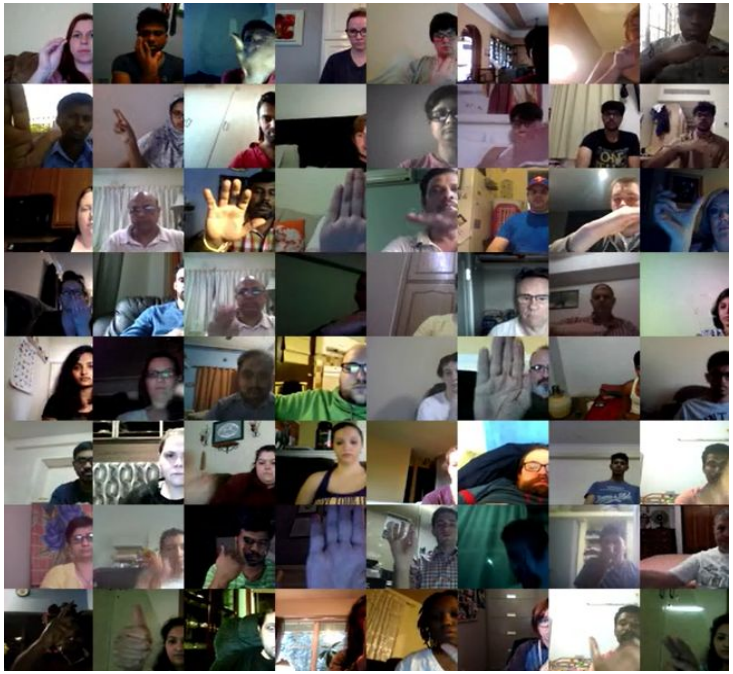
Software/Tools Requirements

- Keras Framework – a open source library built over tensorflow used for machine learning applications
- Gulp i/o - Python
- Tensorflow – a open source library used for machine learning applications
- GPU - For training the model

Data Set

Source of data set: https://20bn.com/datasets/jester/v1 (Jester Dataset) - 148,092

Sample data set



Justification – It has 148092 short clips of around 27 gestures.

Modularization of Project

Gayathri E	To capture the image through low resolution camera, Data pre-processing and Optimization
Sri hari S	To build a gesture recognition model using Deep learning
Nishanth M	To work on the iterations necessary to make the neural network run in real-time on embedded devices and performance metrics evaluation
Bhaskar reddy Y	Deploying the Deep learning model on top of an user interactive playful gesture-based application

Work Plan

Month	Work Planned
Sept	Program Environment Setup, Data Pre-processing, Optimization
Oct	Model implementation
Nov	Gesture classification, Hand extraction, Pre-filtering
Dec	Discovery of playful gesture-based applications
Jan,2021 (if required)	Re-iteration for better model

References

- Pavlo Molchanov, Shalini Gupta, Kihwan Kim, and Jan Kautz NVIDIA, Santa Clara, California, USA ,Hand Gesture Recognition with 3D ConvolutionalNeuralNetworks, https://research.nvidia.com/sites/default/files/pubs/2015-06_Hand-Gesture-Recognition/CVPRW2015-3DCNN.pdf
- V. John, A. Boyali, S. Mita, M. Imanishi and N. Sanma, "Deep Learning-Based Fast Hand Gesture Recognition Using Representative Frames" *2016 International Conference on Digital Image Computing: Techniques and Applications (DICTA)*, Gold Coast, QLD, 2016, pp. 1-8, doi: 10.1109/DICTA.2016.7797030.
- Kim, J.-H., Hong, G.-S., Kim, B.-G., and Dogra, D. P. (2018), DeepGesture: Deep Learning-based Gesture Recognition Scheme using Motion Sensors, doi:10.1016/j.display 2018.08.001.
- Marco Roccetti, Gustavo Marfia, Angelo Semeraro, Playing into the wild: A gesture-based interface for gaming in public spaces, Journal of Visual Communication and Image Representation,Volume 23, Issue 3,2012,Pages 426-440,ISSN 1047-3203, https://doi.org/10.1016/j.jvcir.2011.12.006.

THANK YOU