

Team 13

Automatic Action Recognition

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Abstract

- ◇ Use automatic action recognition to solve a real-world problem.
- ◇ Our goal is to offer a successful application to recognize real time gestures to a camera. Specifically, we will be recognizing gestures in order to manipulate commands in Microsoft PowerPoint.



Problem

- ◇ The requirement of a mouse and keyboard can be very limiting in certain situations.
- ◇ In many of these situations, it would be more beneficial to have a camera recognize gestures and perform commands accordingly.

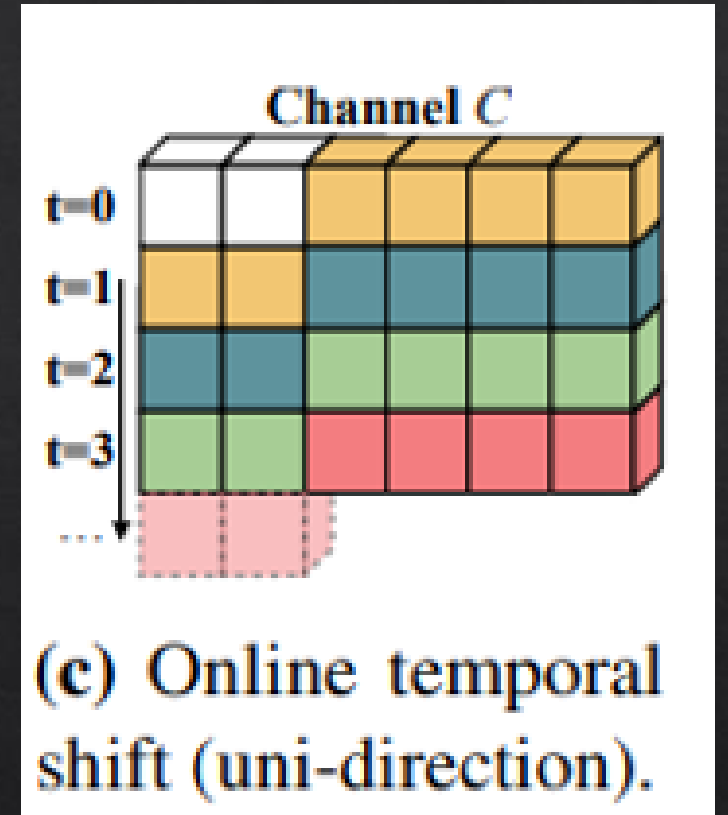
Main Objectives

- ◆ Create a GUI using the model-view-controller method
- ◆ Utilize deep learning libraries and video processing software to recognize gestures according to our standards
- ◆ Design our final project so that it may act as a launching platform for more complex variations in the future.

Background

- ◇ TSM – Temporal Shift Module
- ◇ 3D CNN with 2D complexity
- ◇ Real-time application utilizes uni-directional model
- ◇ Webcam feed as input parameter
- ◇ Python 3.6, PyTorch, OpenCV, Scikit-Learn

- ◇ Related Work:
- ◇ Sensor-fitted gloves as input parameter with a CNN [2]
- ◇ Infrared-imaging as input parameter with a CNN [1]



Design

- ◇ Integrate with PowerPoint to be used in an educational environment as virtual classes become more prevalent.
- ◇ Be able to execute commands based on exact gestures and not performing commands if it is unable to identify a gesture.
- ◇ At an architectural level the GUI will display the webcam feed and beside it, an interactive medium like PowerPoint while displaying the gestures commands.

Deliverables

- ◇ Design Document: Containing list of each major software and hardware components that are used in the implementation of the project
- ◇ Python code for the GUI application
- ◇ Python code for hand gesture controller application that implements TSM
- ◇ Presentation slides
- ◇ Final Report/demonstration

Key Personnel

- ◆ Advisor: Dr. Khoa Luu
 - ◆ Received Ph.D in Computer Science at Concordia University
 - ◆ Research interests in various topics including: Biometrics, Image Processing, Computer Vision and Machine Learning



Works Cited

- ◇ ±[1] Tao, Wenjin & Lai, Ze-Hao & Leu, Ming & Yin, Zhaozheng. (2018). American Sign Language Alphabet Recognition Using Leap Motion Controller.
- ◇ ±[2] Benitez-Garcia, Gibran et al. (Jan. 2021) “Improving Real-Time Hand Gesture Recognition with Semantic Segmentation.” *Sensors (Basel, Switzerland)*