A Low Cost System for Video Surveillance

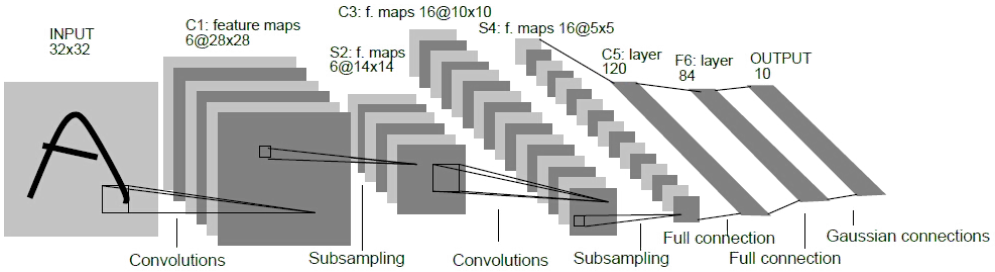
Team 5

Introduction

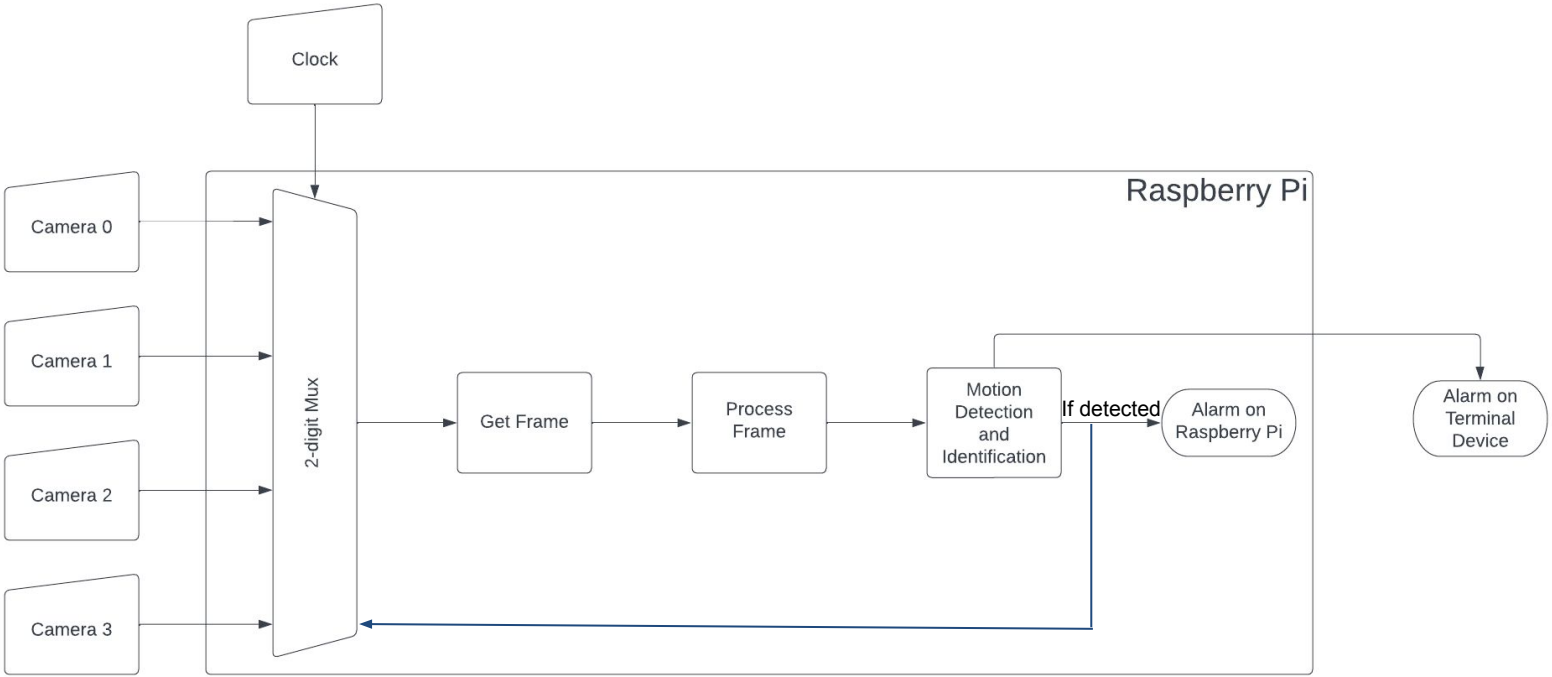
- Motivation
  - Automatically detect the moving objects in real time
  - Judge whether they are human
  - Alarm when necessary
- Hardware
  - Raspberry Pi 3b
  - Camera & Extender
- Environment
  - Python 3.9
  - OpenCV

State-of-the-art

- Deep Neural Network Model
  - Variational autoencoder
  - Generative adversarial net
- Lightweight Network
  - MobileNet
  - GhostNet
  - ShuffleNet

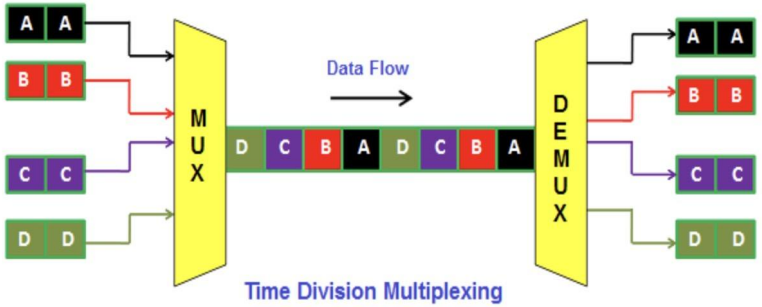


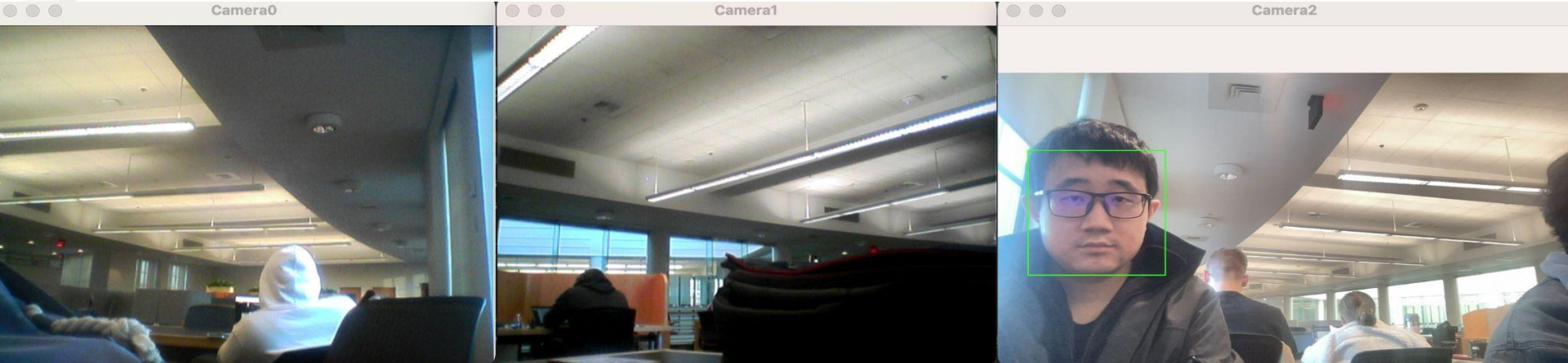
Methods & Approach



Implementation: multi-camera

- TDM: use single processor
- Take into account all 4 camera inputs and raise a global alert when necessary
- Use flags to indicate the status of each camera input and the whole system



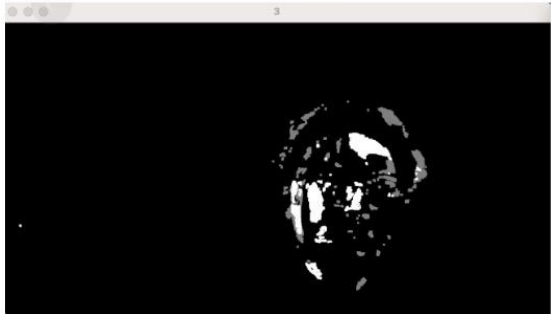


Video processing part

Input: current frame

Detect frame difference using GMM

Apply a 5x5 kernel



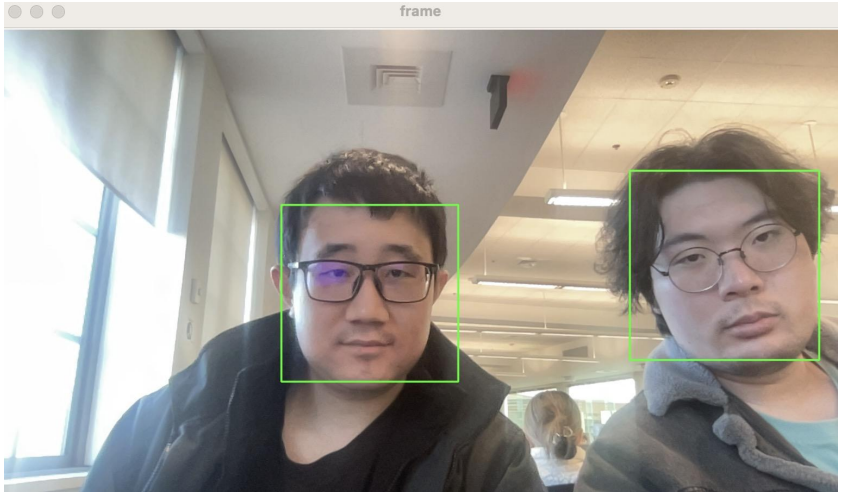
Thresholding

Find contour

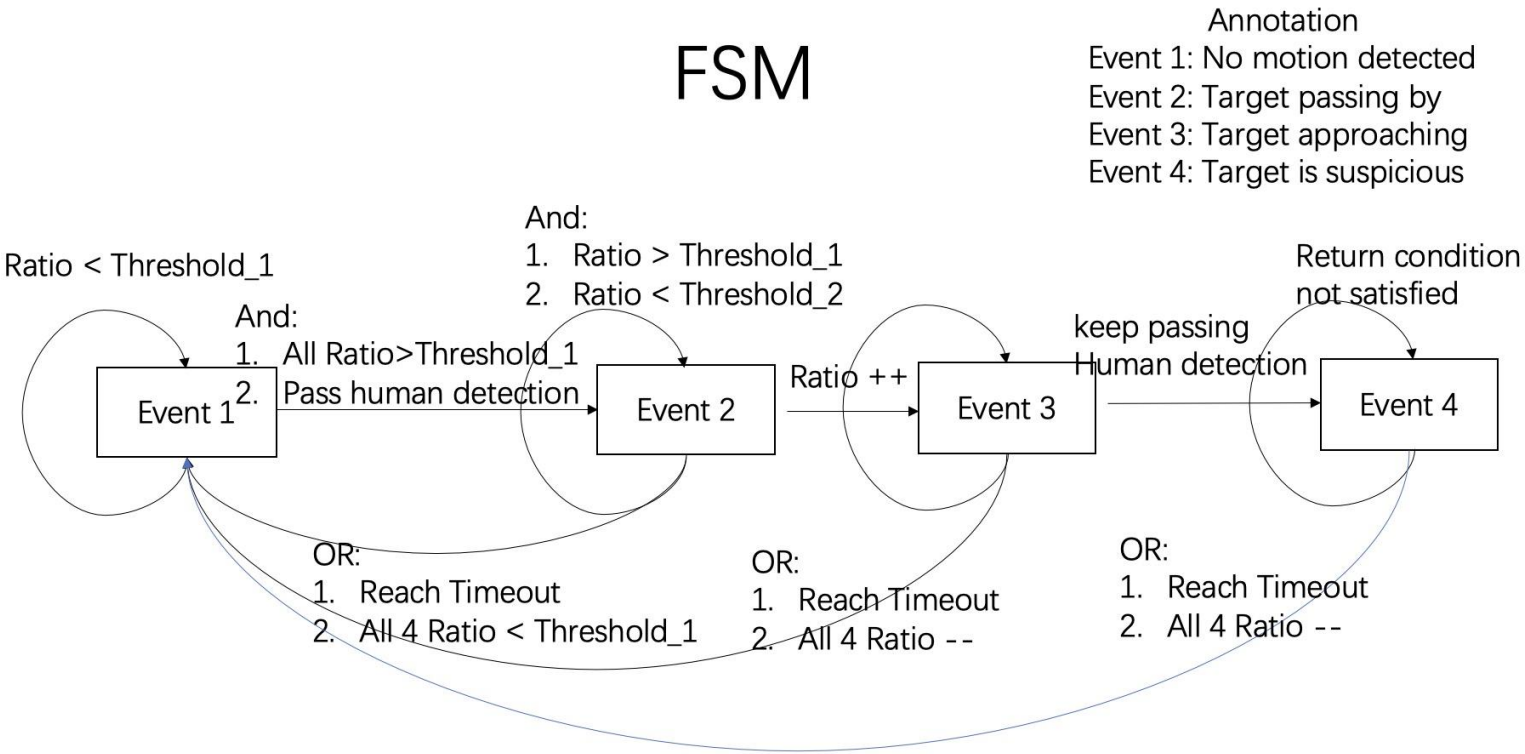
Output: Ratio = (ContourArea/Resolution)

Human detection

- Using CascadeClassifier to distinguish between human and other moving objects
- Only use face detection before the system is about to raise an alarm
- (to reduce CPU resource usage)



Stages of events



Alarm

- Print “Approaching” or “Passing by”
- Turn on the LED Light
- Save a 10 seconds video to certain directory

output.avi

Hardware Cost Analysis

Name	Number	Total Price($)
Raspberry Pi 3b	1	70
Camera	4	80
Extender	1	70
SD Card (1T)	1	80
Total	N/A	300

Results

Project status (next)

- Stability and robustness test on Raspberry Pi
- Fine-tuning parameters
- Reduce resource cost to improve performance (fps)
- Try Image/Video compression algorithm to save storage
- Final report