

# EECS 488 Class Project (Security Camera System)



# Outline

1. Event Switching
2. Specification
3. Software System Design
4. Hardware System
5. Progress



# Event Switching

- Event level raises when a target is first detected/approaching
- Event level lowers when the target is confirmed leaving for 3 seconds/72 frames
- Event level triggers the system action
- Can be configured by the users





# Specification

Output Video Format	MPEG Encoded (XVID in OpenCV)	Alarm Waiting Time	5 minutes
Output Video Frame Rate	24 fps	Alarm Triggered Level	Event 3
Output Video Resolution	1280*720, 144 ppi	Alarm Release Time	Immediately if switches to Event 1
Output Picture Format	PNG formatted	Event Lowering Time	5 seconds
Output Picture Resolution (Low)	640*480	Event Raising Time	Immediately when the condition meets
Output Picture Resolution (High)	1280*720		



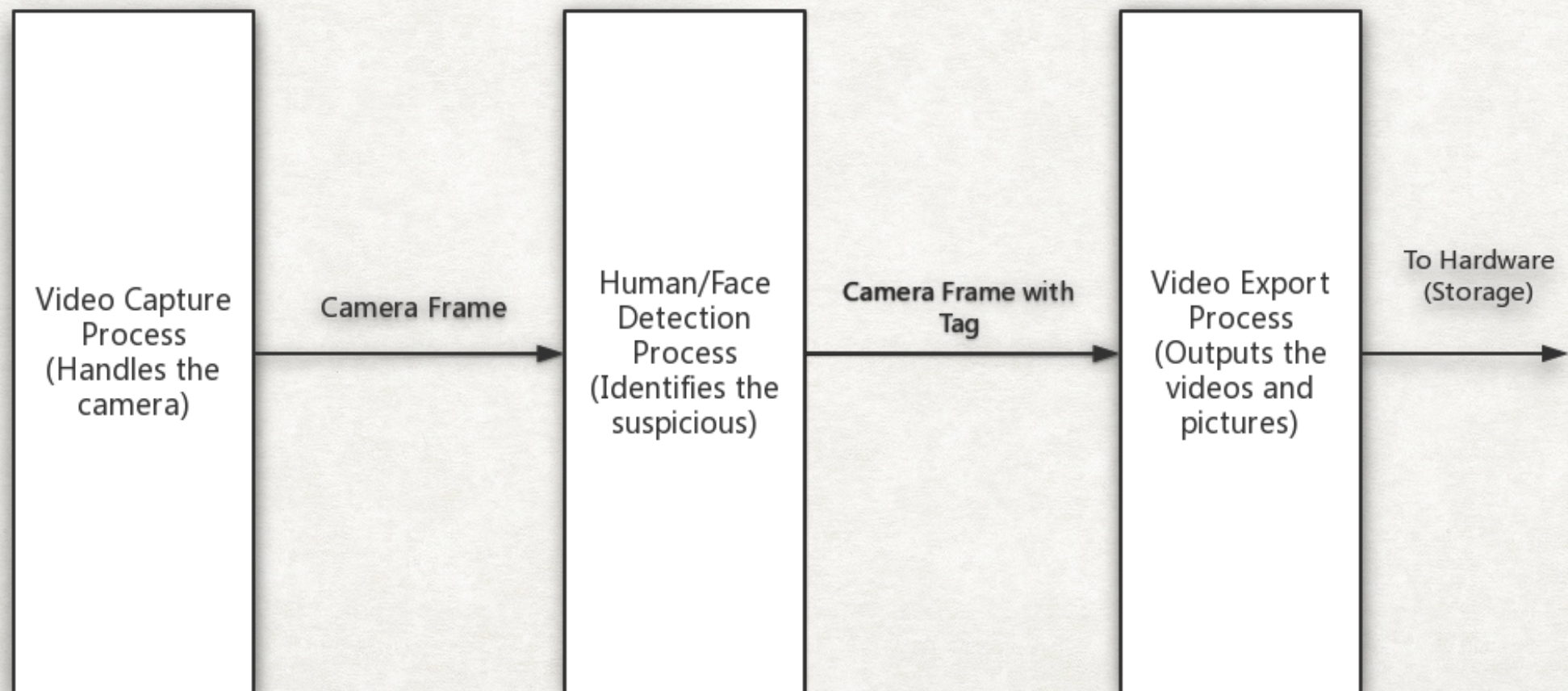
# Software System Design

- The software system is developed with Python 3
- Camera operation/Human detection/Image output will be handled by OpenCV
- The system is multiprocessing to alleviate the pressure on buffer and improve runtime efficiency



# Software System Design (Cont'd)

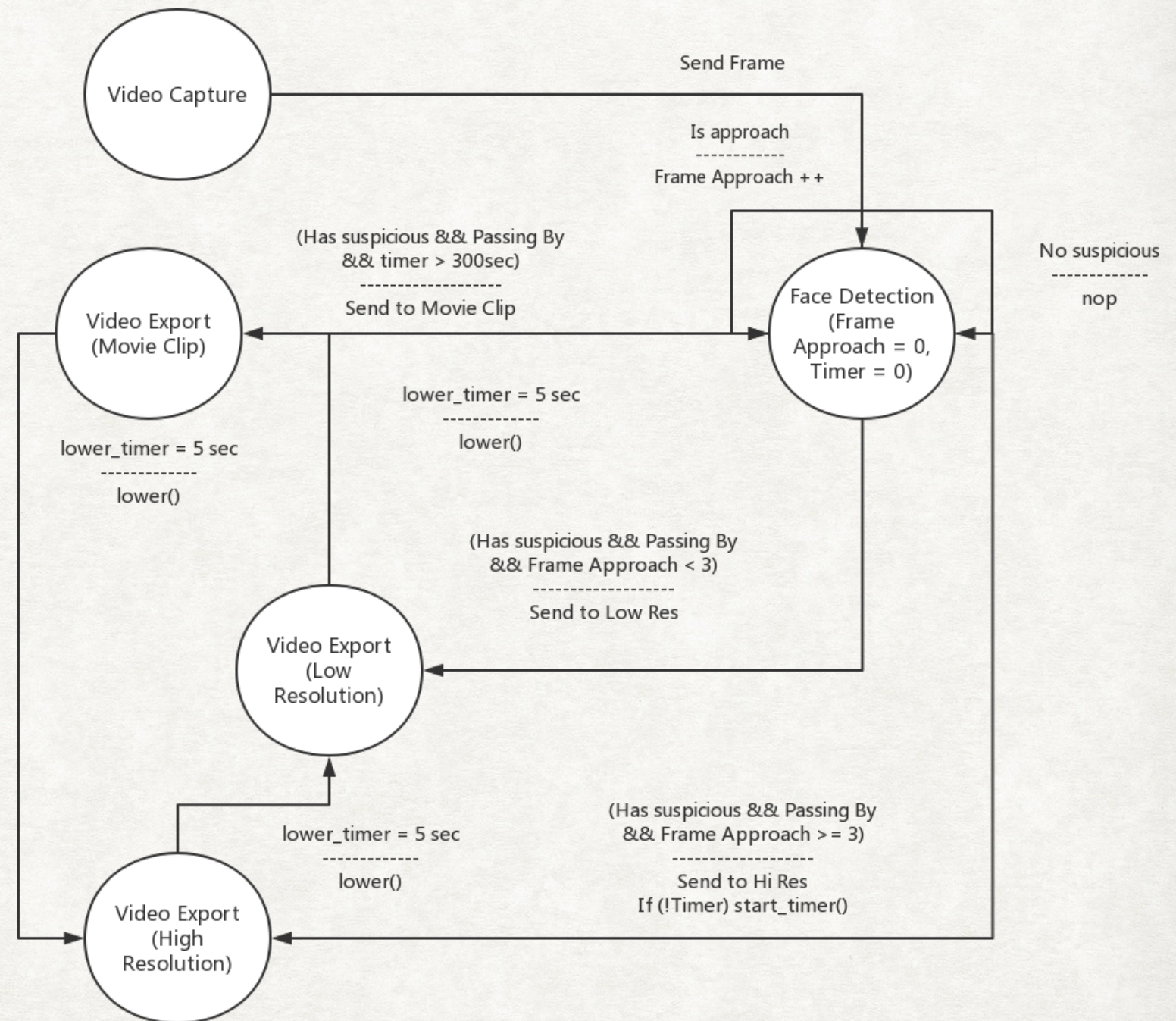
- Each camera has 3 processes
- Inter-process-communication is handled by queue
- Queues send tagged images, as well as the signals





# Software System Design (Cont'd)

- Camera Handler processes stream the images to the human detection processes
- Human Detection processes identify the human in the image, tag the frames and send to Video Exporter processes
- Video Exporter processes write images/videos to the storage, but are usually idle





# Software System Design (Cont'd)

- User Configuration
  - Users are able to configure some of the values in specification
  - Some can be changed in runtime

Alarm Silence	Runtime	True/False
Alarm Waiting Time	Runtime	2-10 minutes
Disable Exporting	Runtime	True or False
Event 2 Capture Rate	Runtime	2-7 fps
Event 3 Capture Rate	Runtime	2-7 fps
Event 4 Video Frame Rate	Before Running	12, 23.976, 24 fps
Event 4 Video Resolution	Before Running	1280*720 or 640*480



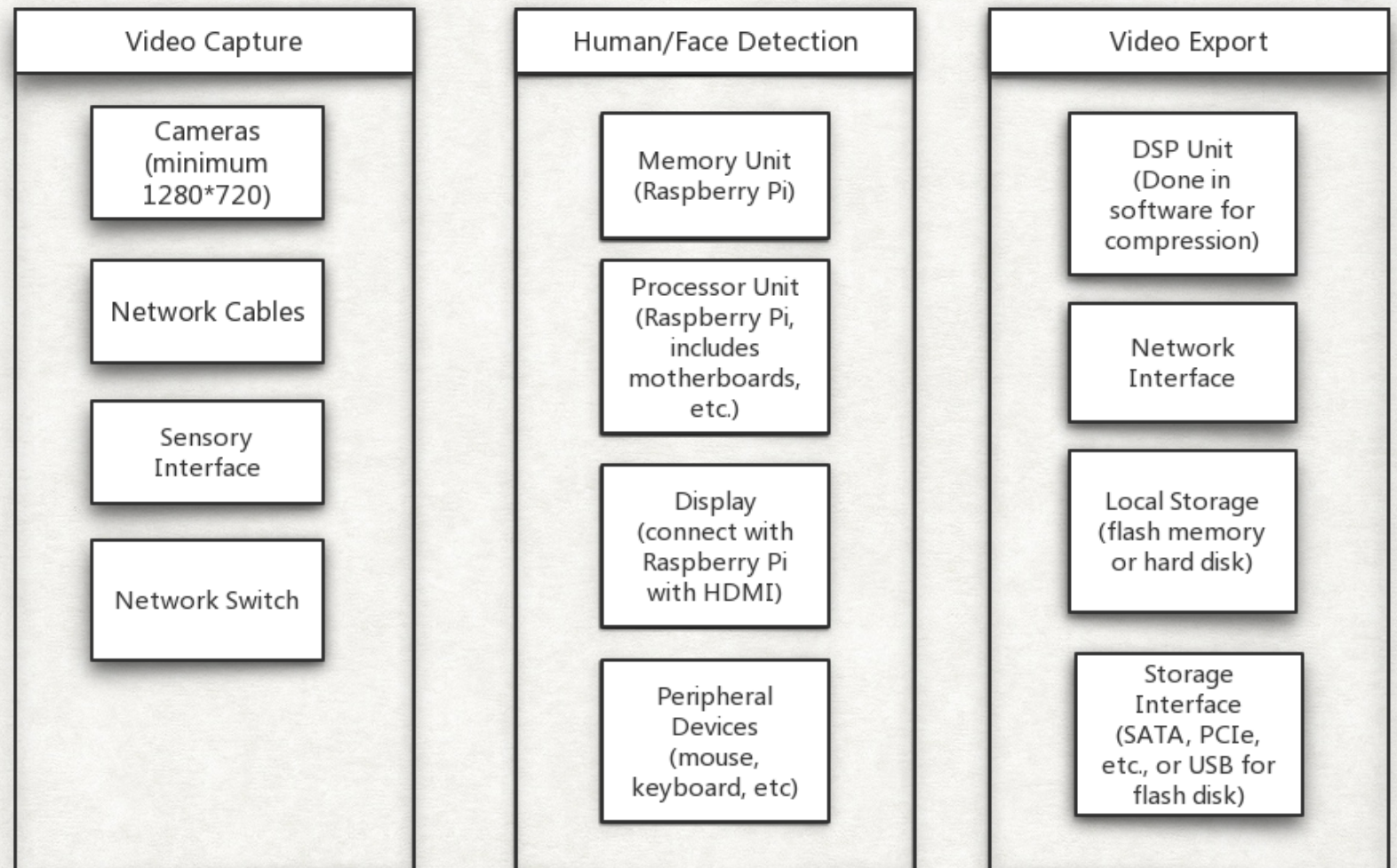
# Software System Design (Cont'd)

- Generator Mode
  - To save memory spaces
  - All frames are captured on-demand so that no one needs buffer (Video Exporter may need for video writing)
- Resource-Safe
  - All OpenCV interfaces are wrapped so that when GC recycles the wrappers, the OpenCV resources will guaranteed to be safely released
- Easy-to-Extend
  - Any new features can be wrapped in Process and launched



# Hardware System

- Split into three major sections
- Raspberry Pi has most of the computation modules
- Camera connection can be changed to wireless





# Introduction to the Security Camera Market

- Market Growing Rapidly
  - The domestic market was estimated to be \$73 billion during 2011, and was expected to reach \$86 billion by 2014
  - Video surveillance system is one of the fastest growing part
  - Need for a home surveillance system due to heightened perceived threat of theft, criminal activity and terrorism



# Introduction to the Security Camera Market (Cont'd)

- Our features
  - High-Quality Resolution (can be up to 1080p)
  - Wired Camera: For better security (can be changed to wireless)
  - Energy Saving
  - Low Price



# Preliminary Cost Estimation

Raspberry Pi Model 2B	Memory & Processor	\$16	Miuzei
Security AHD Camera 1080P	Camera	$\$20 \times 8 = \$160$	Kadymay/OEM
7-inch LCD LED Monitor	Display	\$46	ZGYNK
WS-C3560-8PC Network Switches	Network Switch	\$120	Cisco
Cat5e Network Cable	Network Cable	\$62	HY Cable
2.5" USB Portable 2TB External HDD	Hard Drive	\$43	Tasnme
Waterproof Mouse/ Keyboard Combo	Peripheral Devices	\$3	Lordway



# Preliminary Cost Estimation (Cont'd)

- The total cost from the table above is \$348
- However, this is price for the prototype, the price for massive production can be down to \$280
- Sale Price:
  - The price for competitors is around \$400 (on Amazon)
  - If we sale it for \$400, the benefit will be \$120