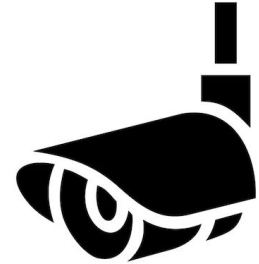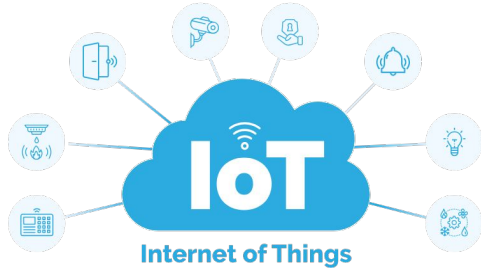THE GEORGE
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MAE 6291– Final project presentation

Autonomous 6 Axis Face Tracking

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Department of Mechanical and Aerospace Engineering

Motivation and Steps Taken

Low Cost, modular, open-source approach for IoT automation and Security

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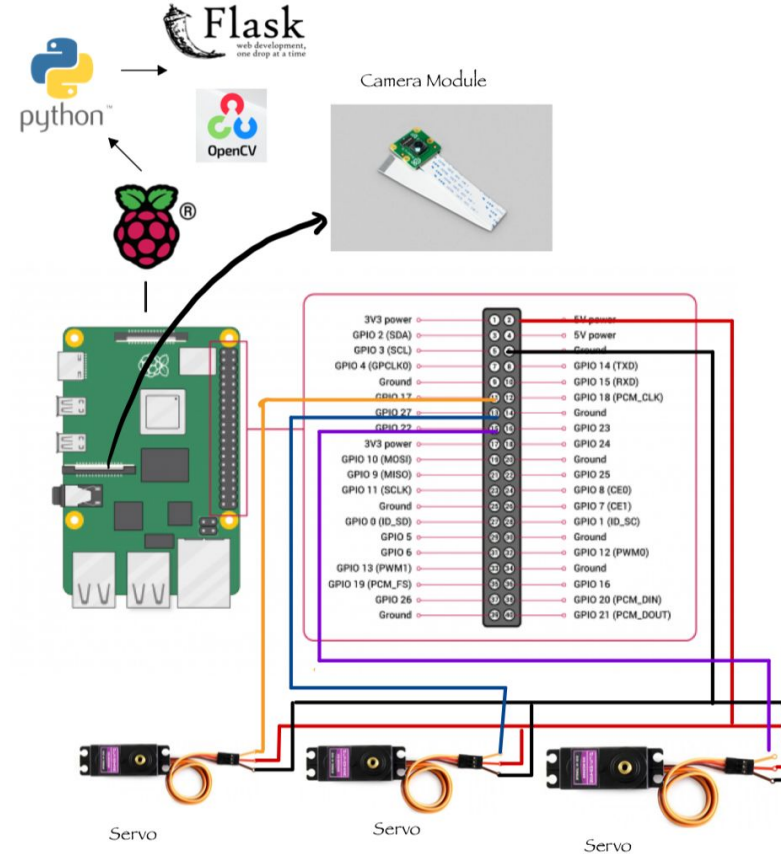System Prototype and Implementation of Hardware / Python Code

→

Live Demonstration, and testing for further analysis and future applications

Hardware Integration and Control System

Materials and hardware used:

1. Raspberry Pi 4 Model B
2. Python + Flask + OpenCV
3. Raspberry Pi Camera Module
4. 3x servos
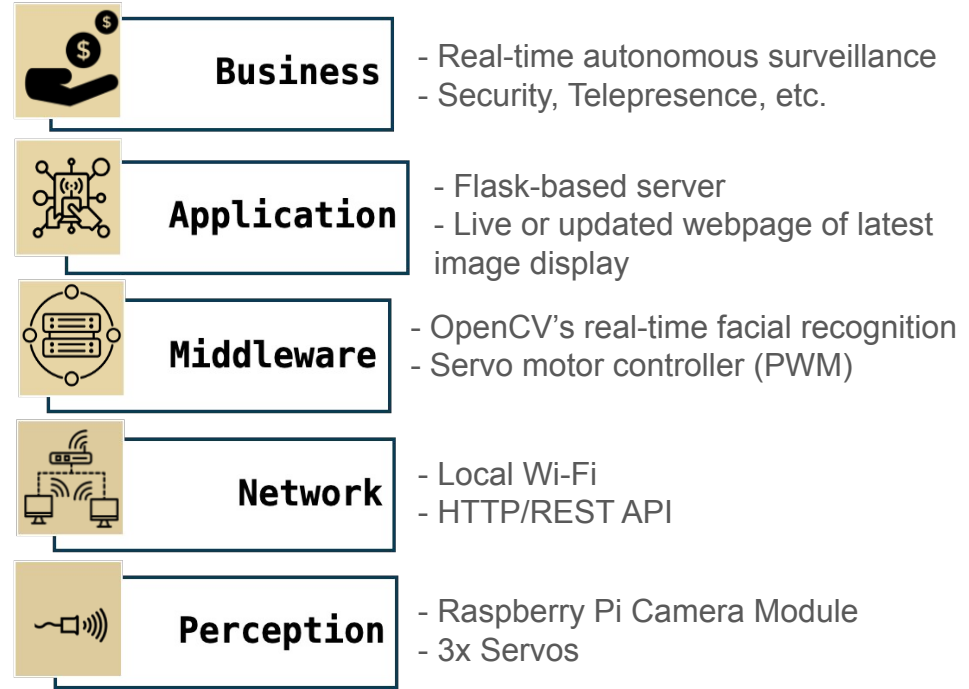5. 3D Printed Mount

Schematics

Source: Dr. Kartik Bulusu & Amazon

Model Correlation and Connections

Our "thing" - An Autonomous 6 Axis Gimbal with Face Tracking

- Completely self contained
- Fits within a small housing
- Has a computer inside
- Has firmware and software
- Connects to other things
- Computes in real time
- System at the edge (processing, tracking, and recognizing faces internally; website hosting)

Business
- Real-time autonomous surveillance
- Security, Telepresence, etc.

Application
- Flask-based server
- Live or updated webpage of latest image display

Middleware
- OpenCV's real-time facial recognition
- Servo motor controller (PWM)

Network
- Local Wi-Fi
- HTTP/REST API

Perception
- Raspberry Pi Camera Module
- 3x Servos

Conclusions and Moving Forward

In conclusion, we successfully developed a low-cost, modular, and open-source framework for IoT security automation. The device utilizes OpenCV for facial detection and integrates servo mechanisms to enable real-time facial tracking. This technology has a broad range of potential applications and represents a significant contribution to security solutions, particularly in the context of emerging challenges posed by generative AI and deep fakes.

Prototype Completion	4/21

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Demonstration & Analysis	4/23

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POTENTIAL ADDITIONS

- 3rd Servo and Self Balancing
- Display Data on app
- LASER
- Security Use

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