Design, implementation and evaluation of Raspberry Pi based parking monitoring system
Roadmap

• Aim and Challenge
• Design
• Prototype making
• Experiment
• Conclusion and Future Work
Aim

- Parking Monitor System (Raspberry Pi 3b and 4b)
- Compute images locally
- To protect cars and passengers privacy (Physically put blurry Filter in front of the camera, rather than using software method)
Challenge

• Heavy computation task in a small platform

![Server](https://zhuanlan.zhihu.com/p/55260207)

• Unstable environment in experiment (temperature, sunlight, power…)

• Blurry input image

![Blurry input image](https://zhuanlan.zhihu.com/p/55260207)
Design

• To recognize cars in input image
• Mixture of Gaussian

Why? 1. The requirement of background frame is not so strict. 2. Also work for blurry input.

How? Model each background pixel by a mixture of K Gaussian distributions (K = 3 to 5).
Design

- Mixture of Gaussian to implement Background subtraction (Base on OpenCV [1])
Design

• Blur the picture (to protect privacy)
Luminance Proportion

- Headlights and taillights destroy the background model is established
- Obtain the light intensity of the whole picture and smooth them

Before

After
Prototype Making
Experiment
Simple Demo
Conclusion and Future Work

• Work well during the day. But there will be a certain error rate (not high) when it is in the dark mode and very blurry filter

• It can also improve the overall work efficiency (Long term stress testing is also required)
Reference

[1] https://docs.opencv.org/ref/2.4/df/d5e/classcv_1_1ocl_1_1MOG2.html


Thank you!