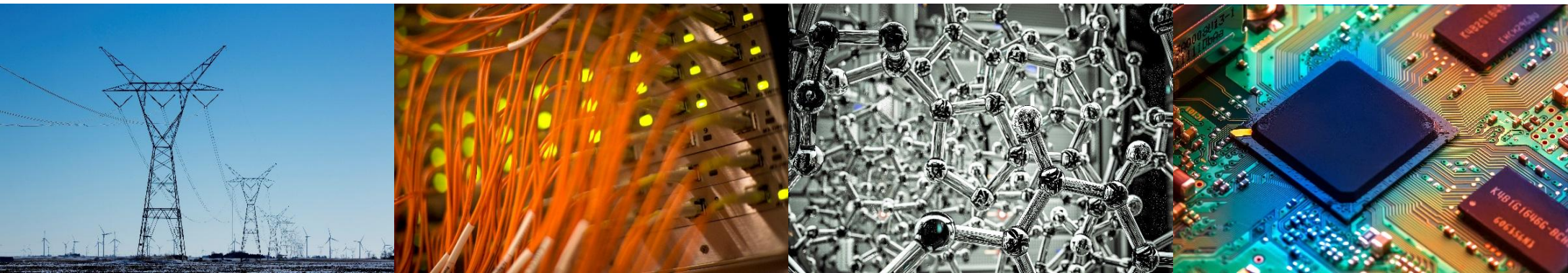


# Automatic Parking Monitoring and Assistance for city of Champaign

Team 17

By: Christopher Santoso, Bo Wang, Ximin Lin

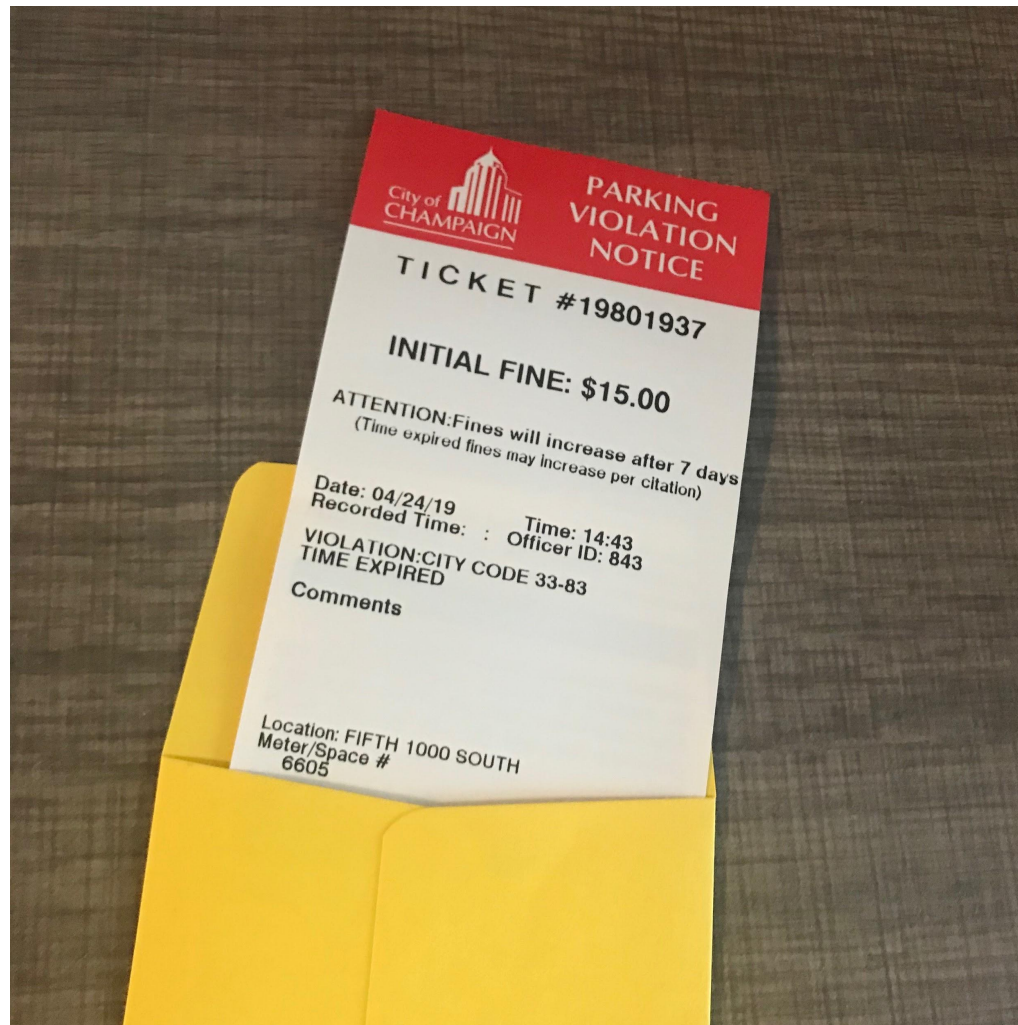


**I ILLINOIS**

Electrical & Computer Engineering

COLLEGE OF ENGINEERING

# No one would be happy with a ticket



# Problems of existing parking system

1. Inflexible parking length choice
2. Inefficient supervision
3. Not convenient to pay

# Objective

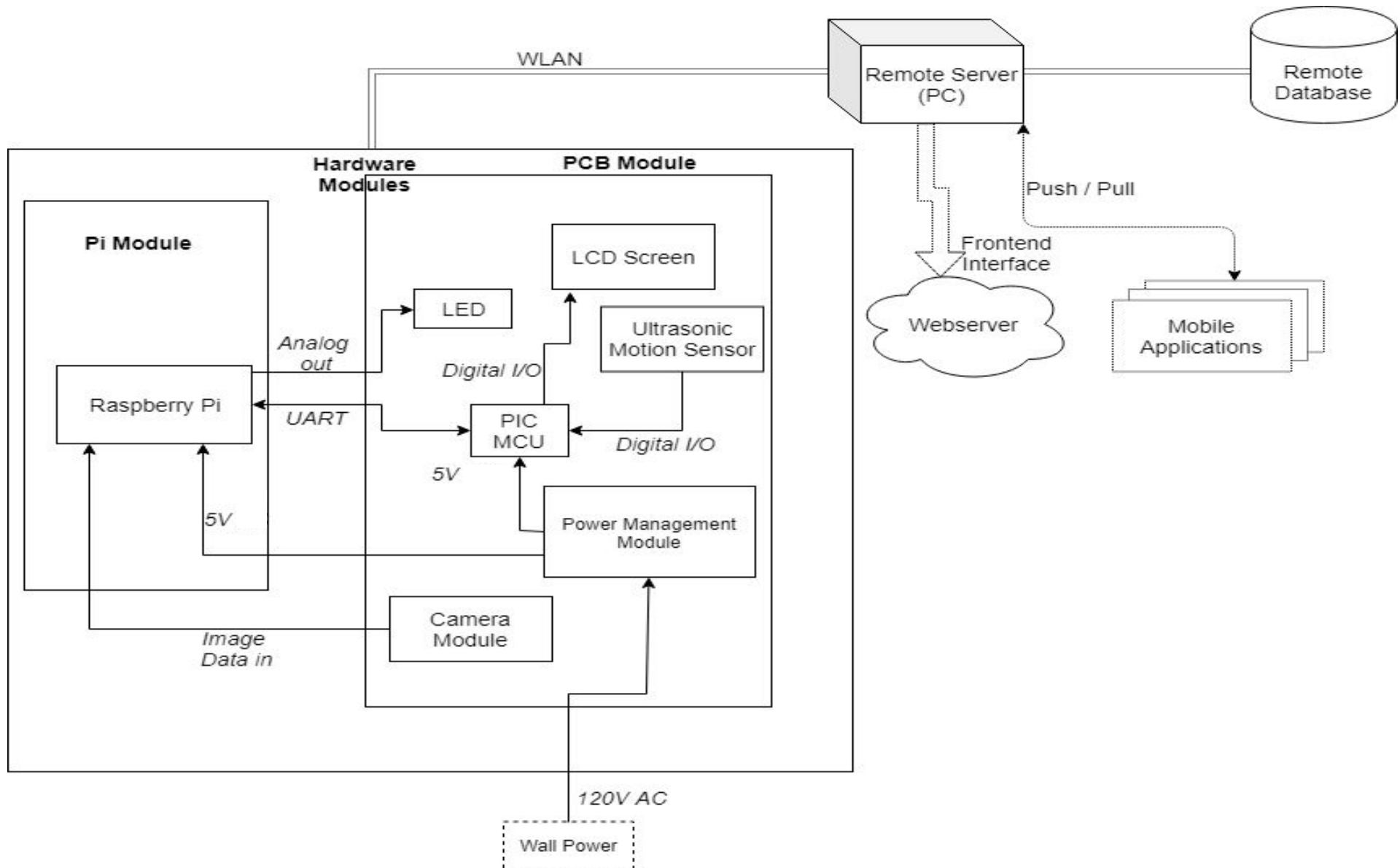
1. No operation needed on phone or meter while parking
2. Reasonable parking fee calculation
3. Timely notification to parking department about any kind of violation.



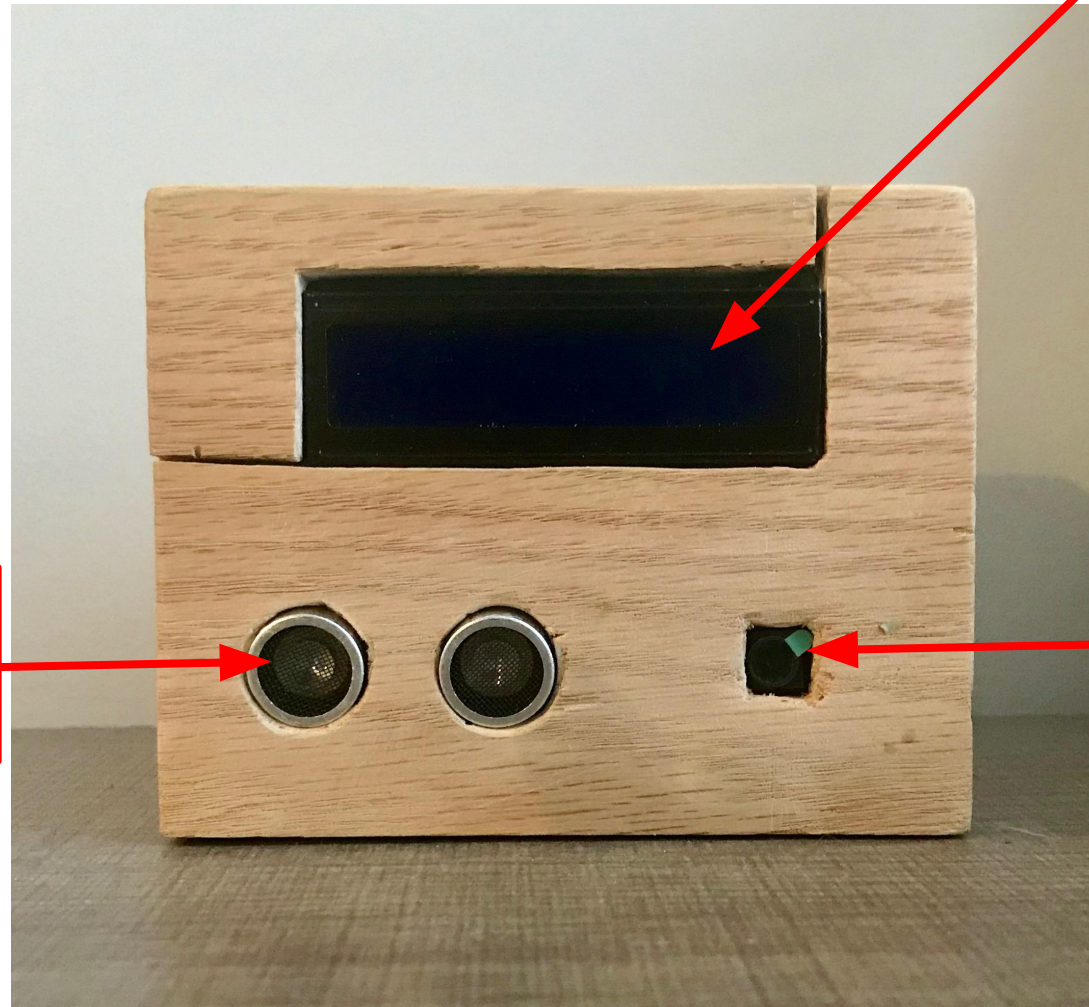
# Then we come up with...



# Internal Block Diagram



# Hardware components



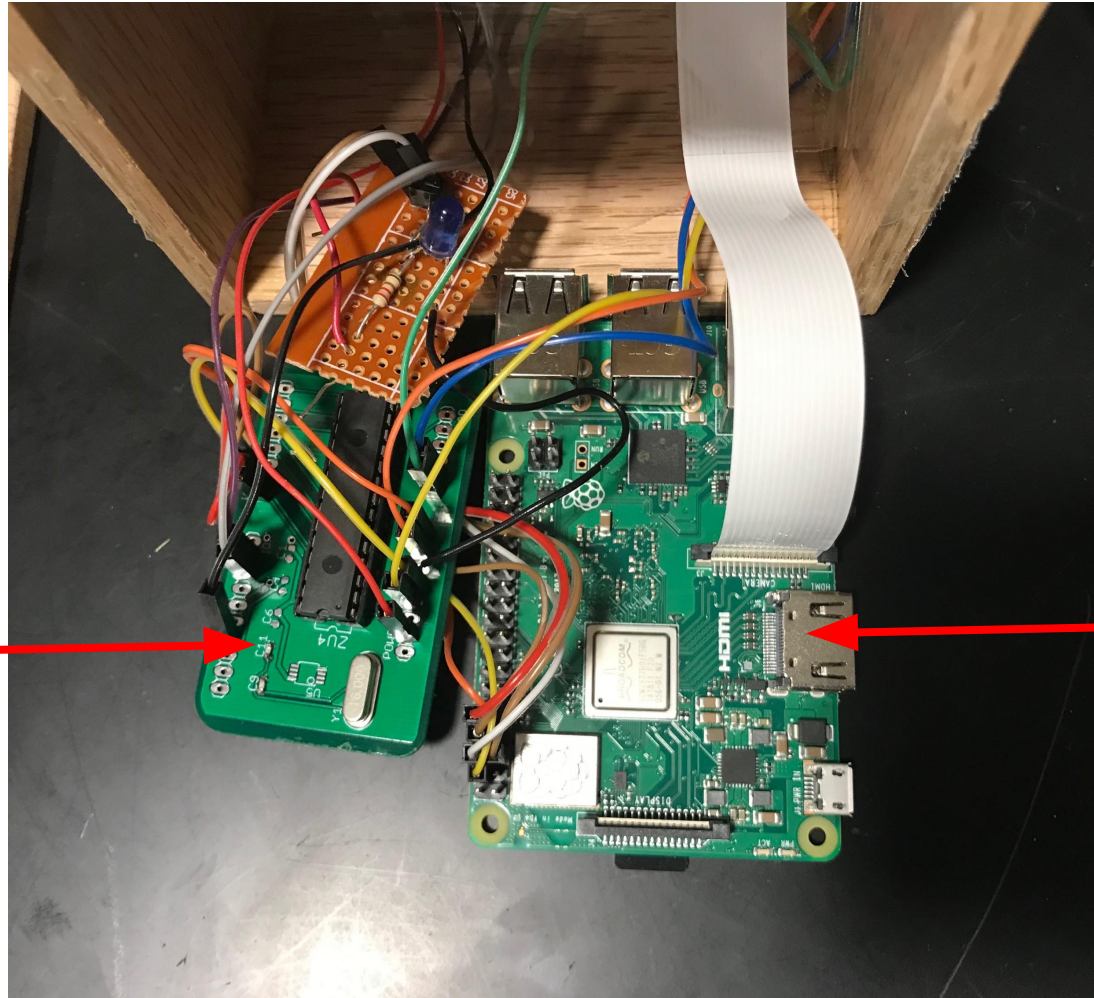
LCD screen

Ultrasonic  
sensor

Pi camera



# Hardware components

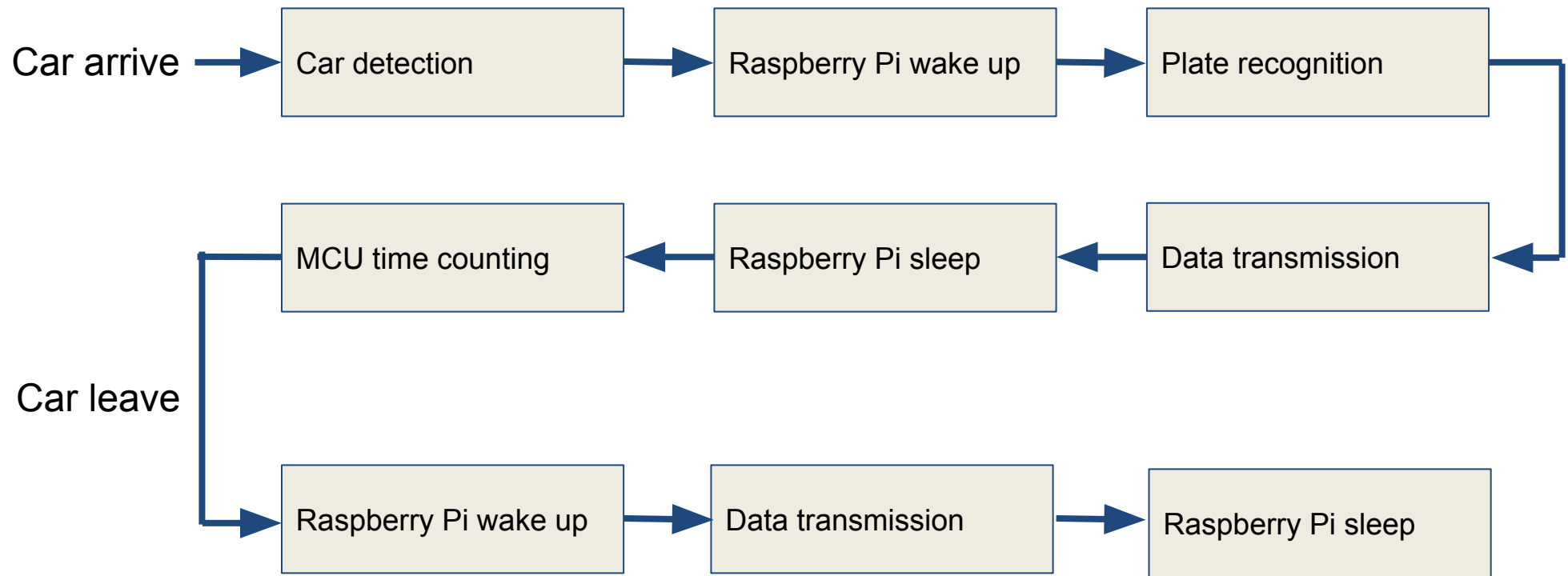


PCB & MCU

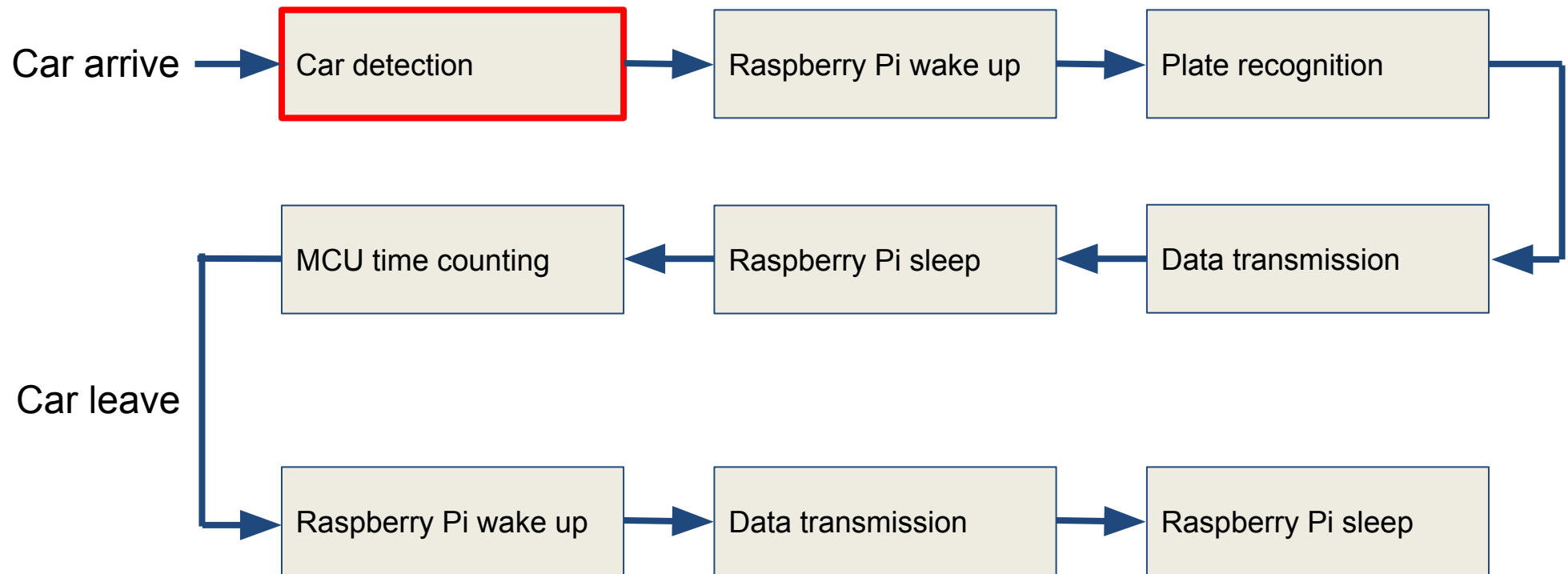
Raspberry Pi



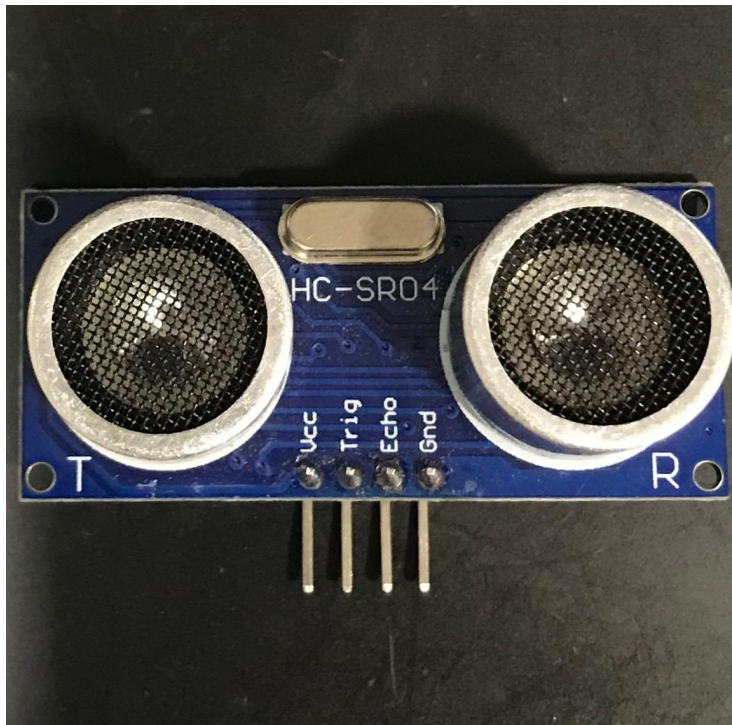
# Workflow of smart parking meter



# Design details



# Ultrasonic sensor

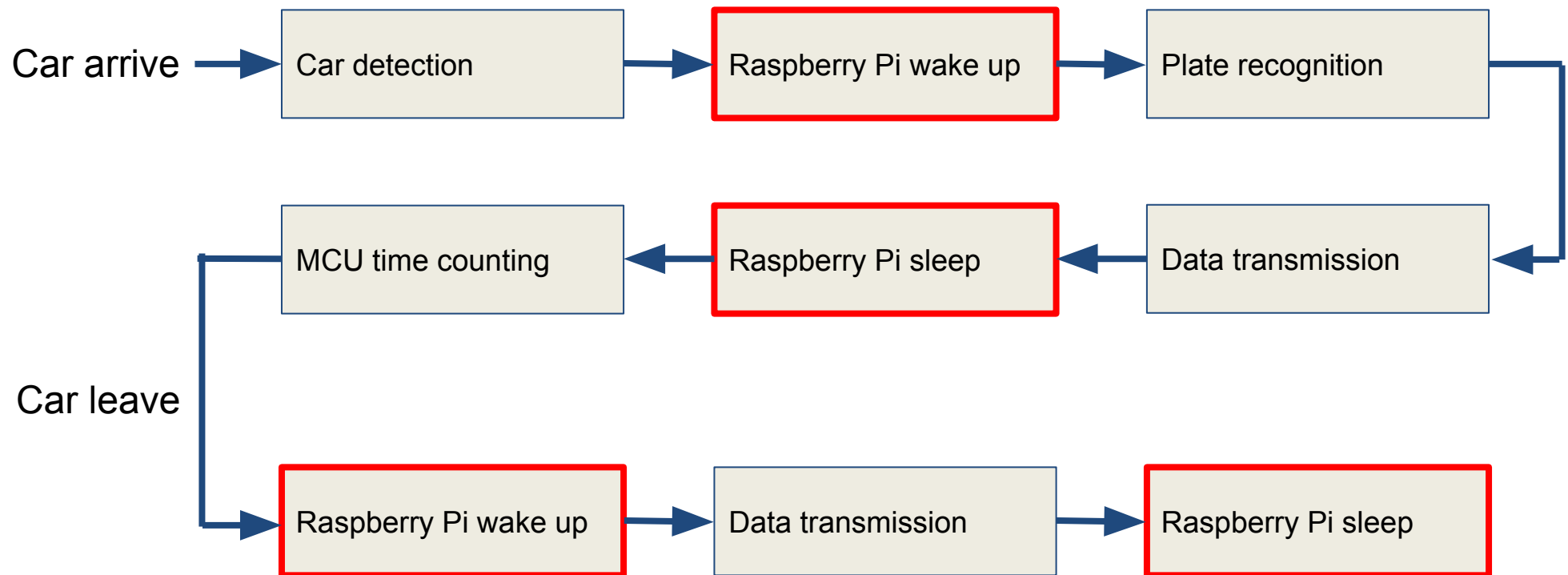


Distance = Signal interval / sound speed

Car parking criteria:

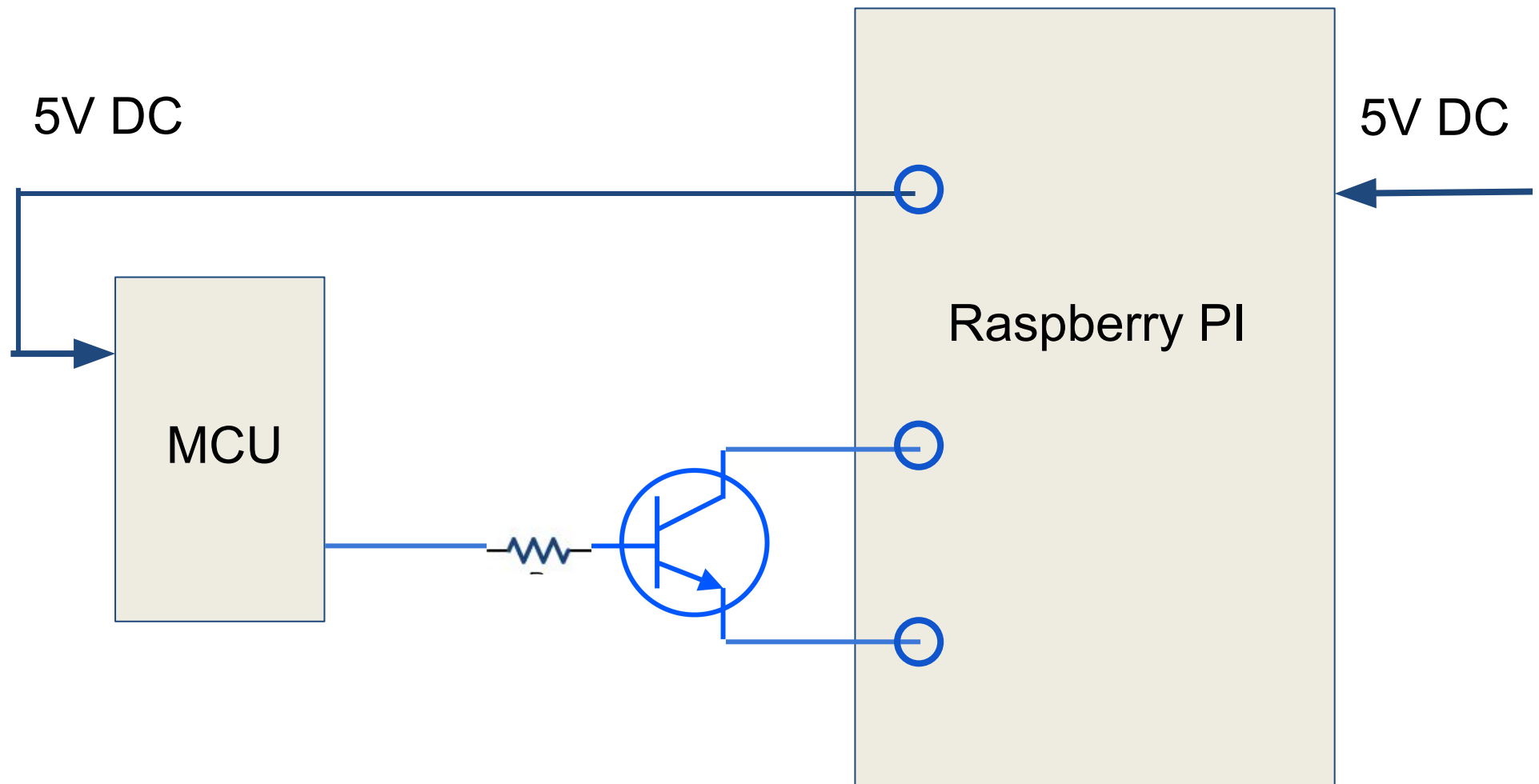
Ultrasonic sensor detected an object  
stay in the range of 0.2m to 0.6m.

# Design details

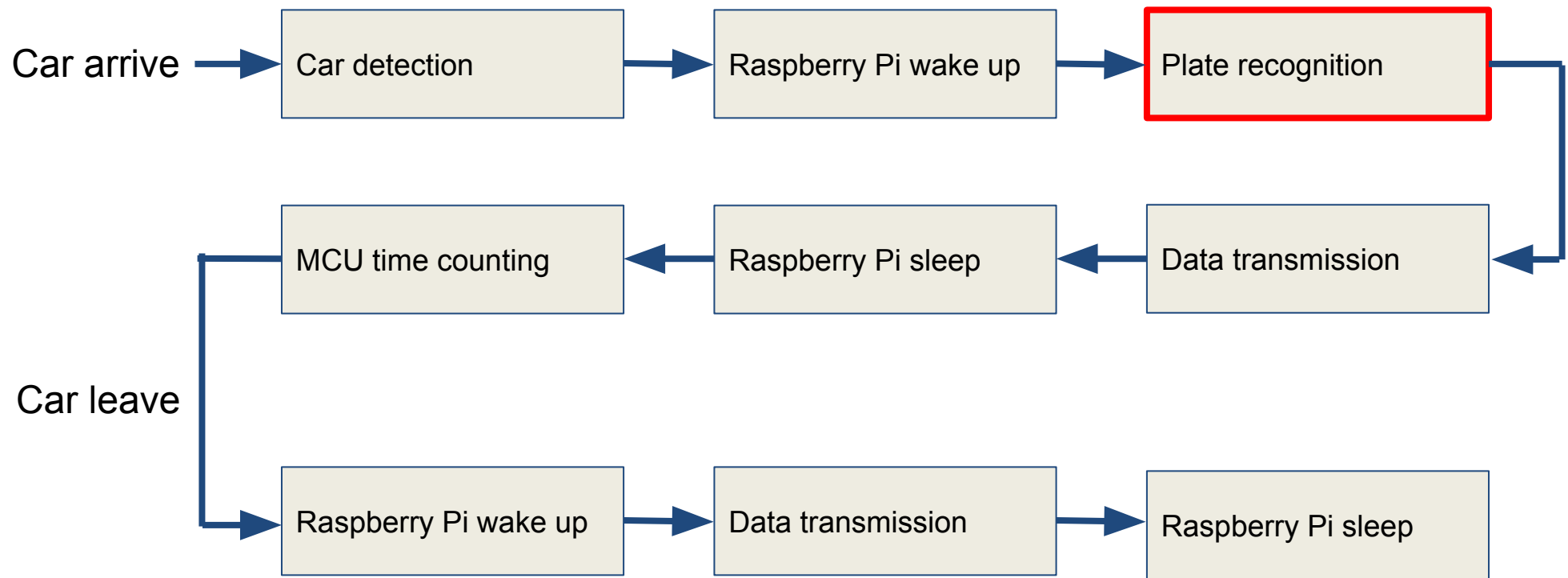




# Raspberry Pi control



# Design details



# Plate Number Recognition



# Algorithm workflow



plate segmentation



character segmentation

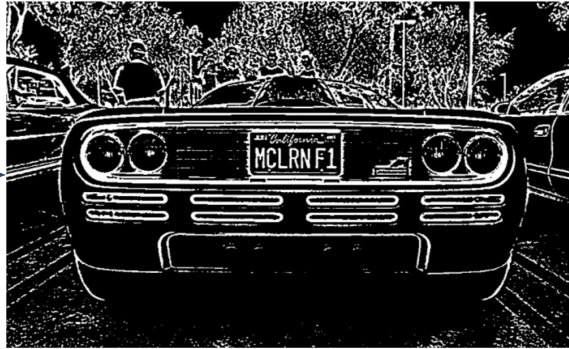


character recognition





# Plate segmentation



preprocessed binary image



contour image

candidate plates

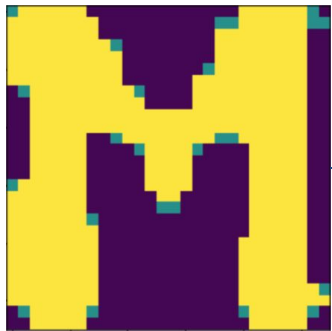


possible characters

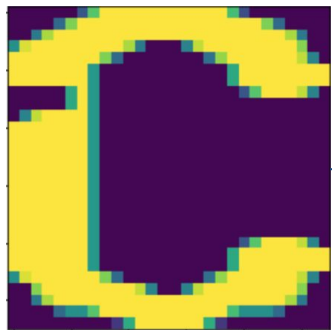
# Character segmentation



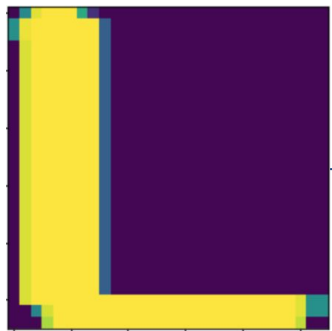
# Character recognition



M



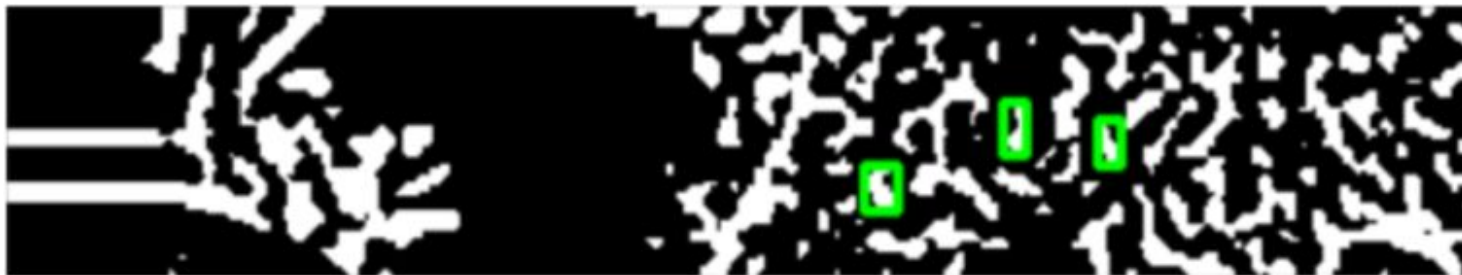
C



L

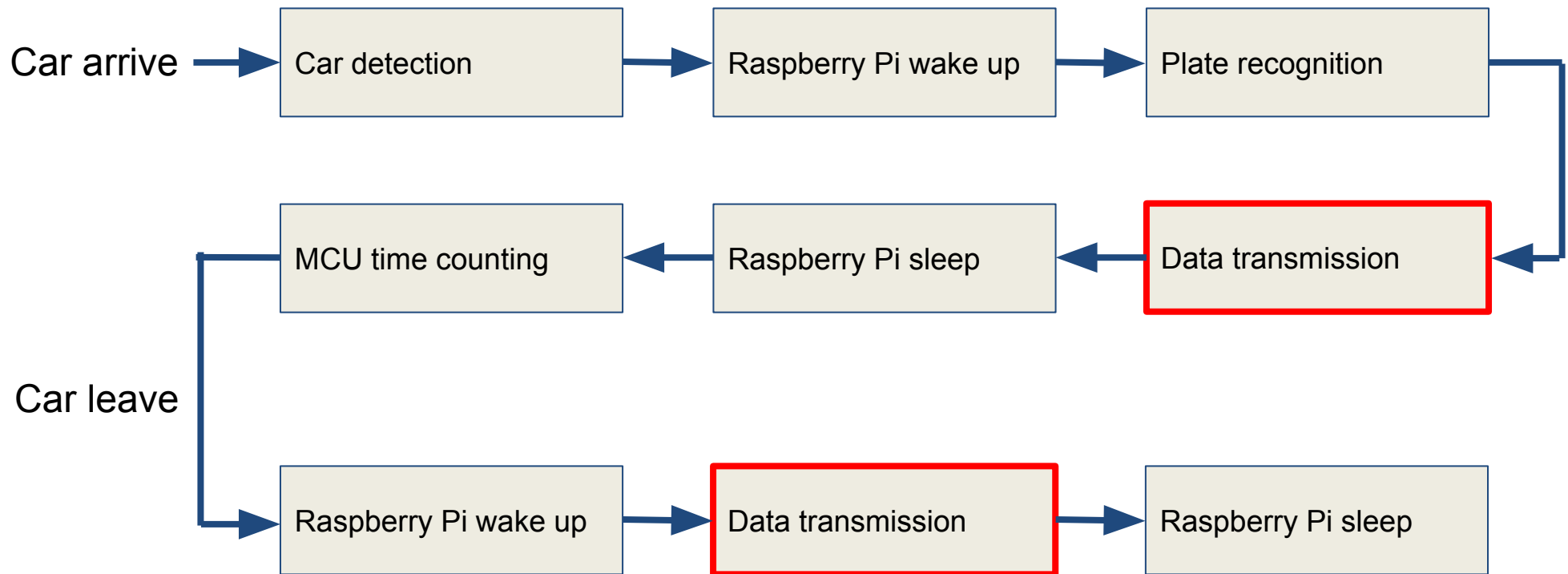


# Filter candidate plates



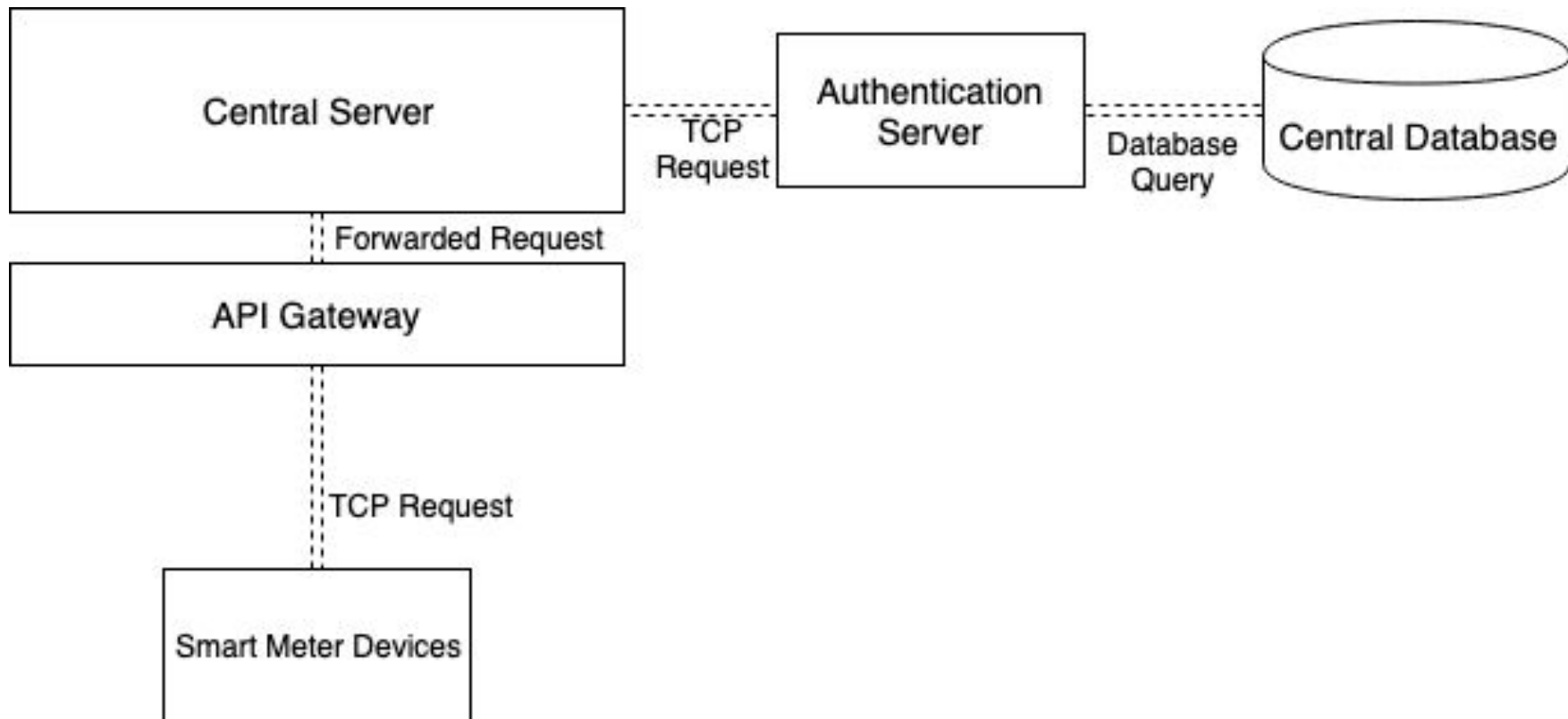


# Client-Server Communication



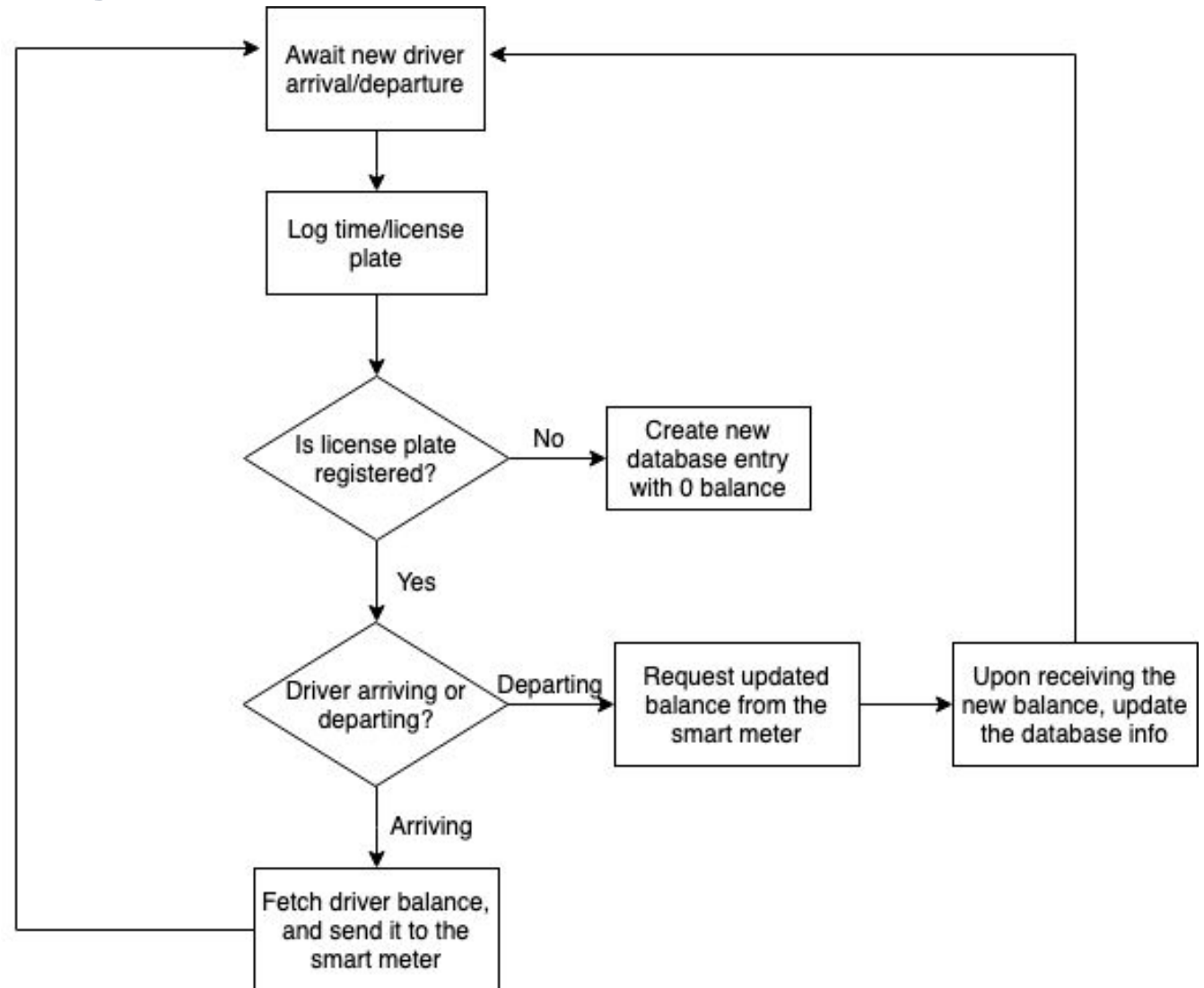
# Software design

*Top-level data flow of the entire data transmission system.*



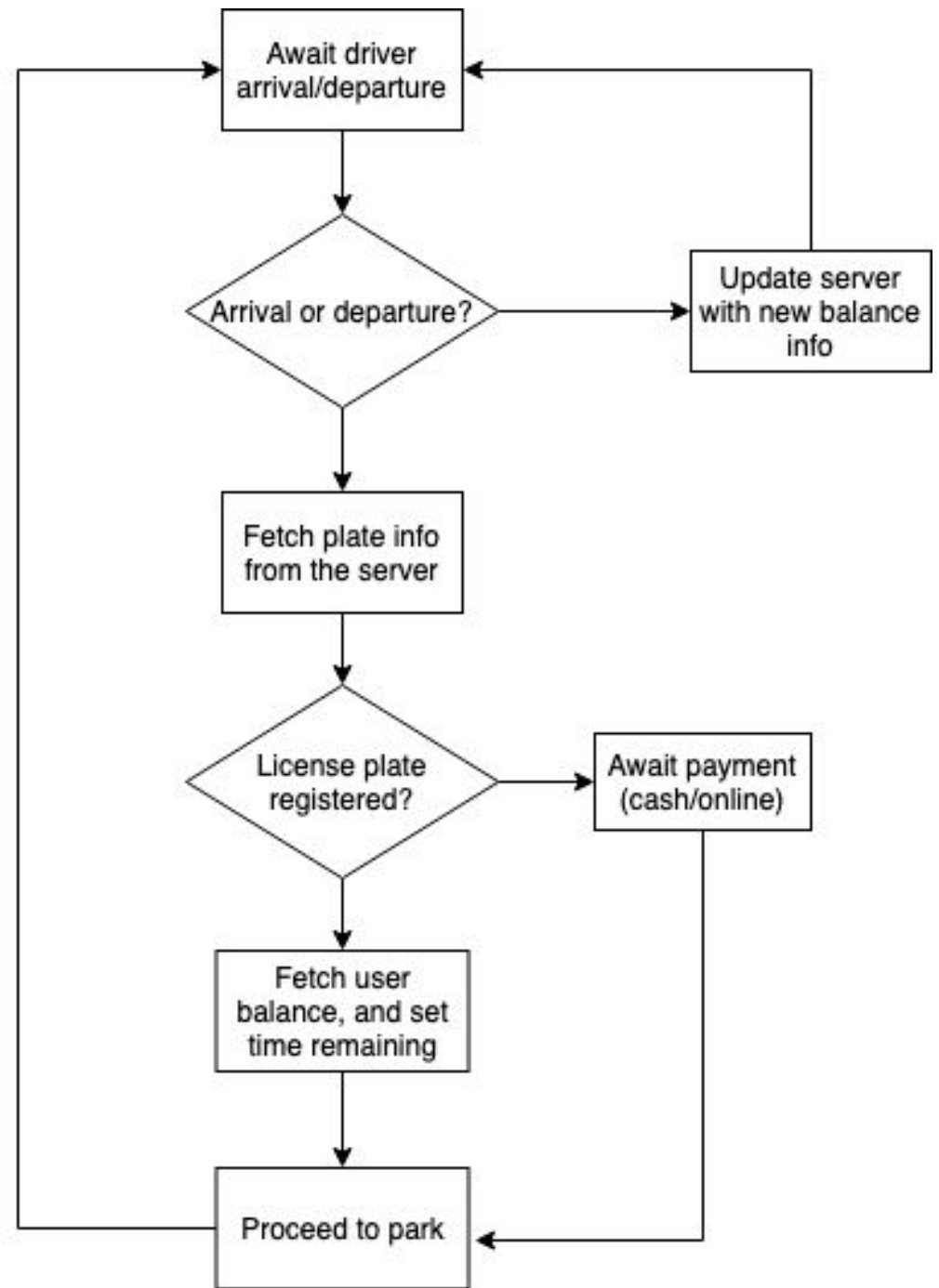
# Software design

*Flow of data on  
the server side*



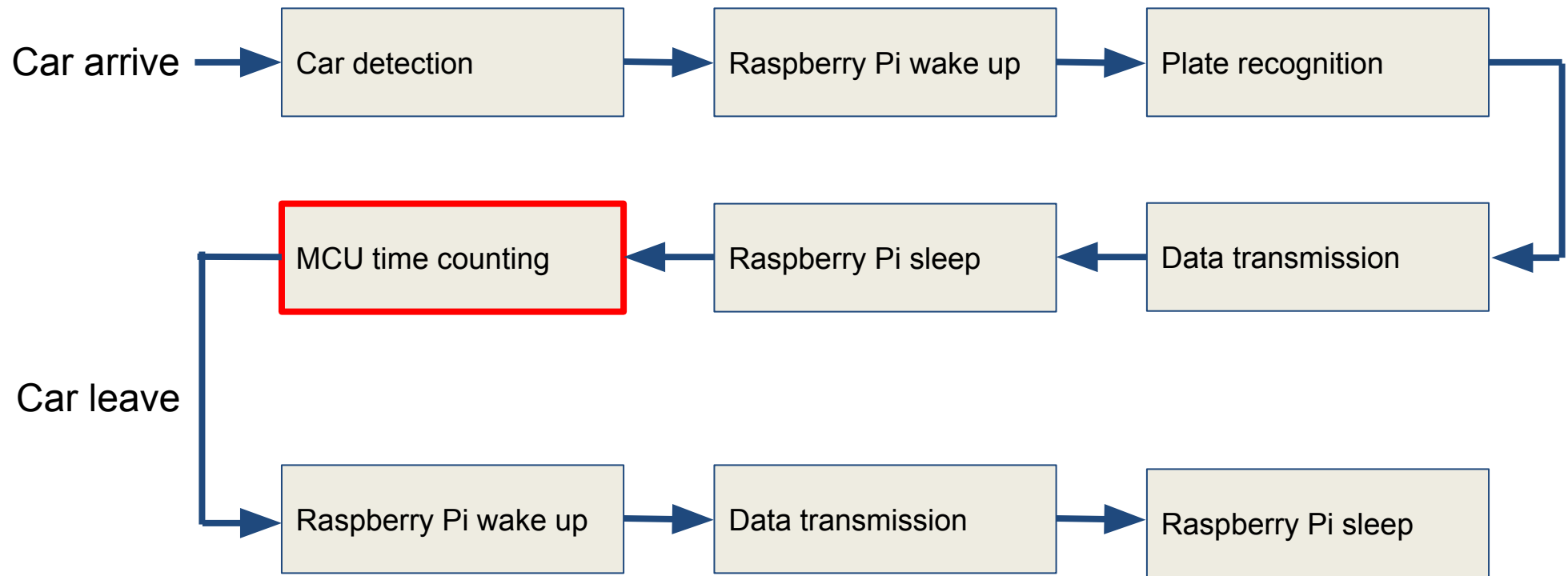
# Web Server design

*Software logic flow on the meter/client side*

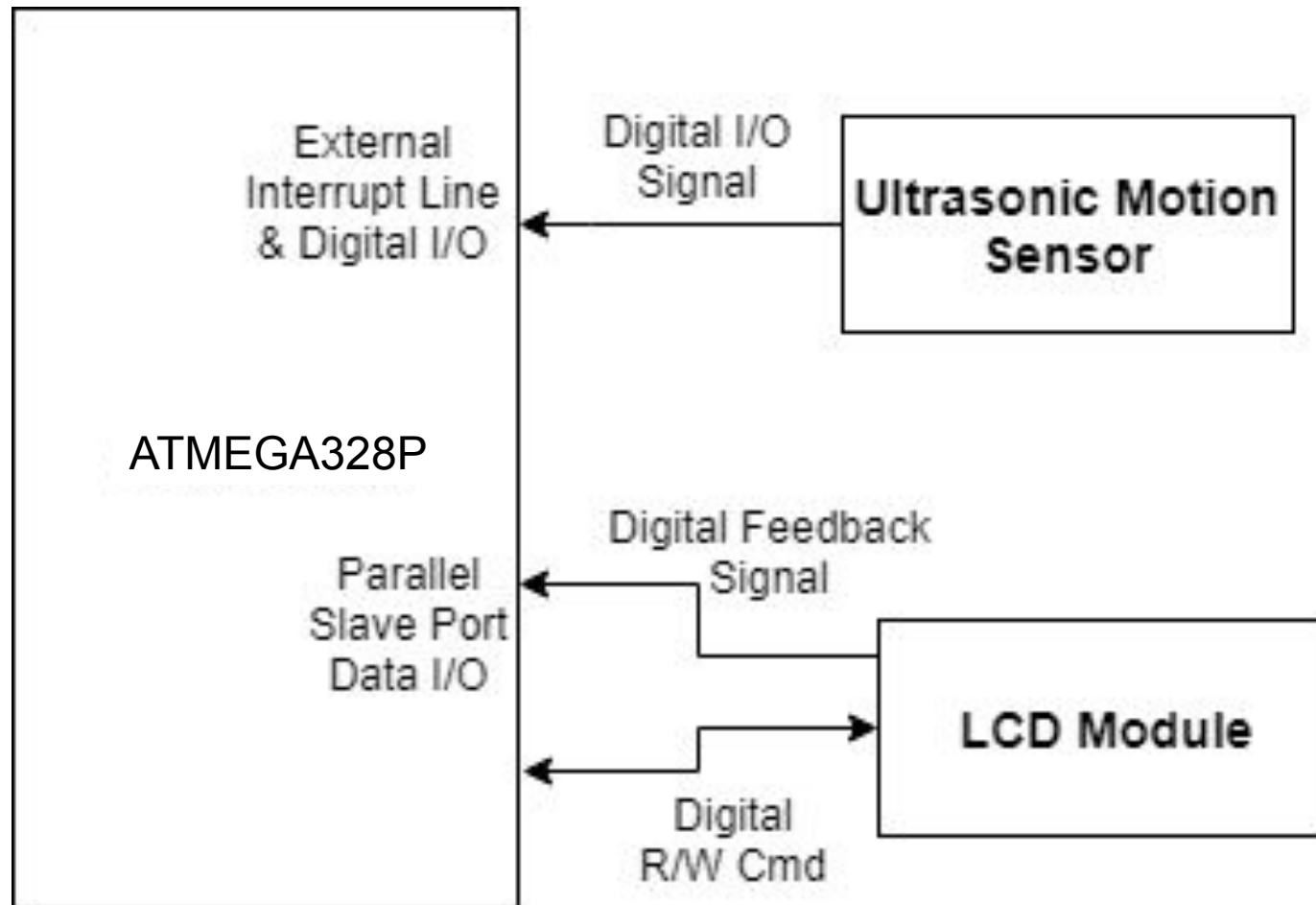




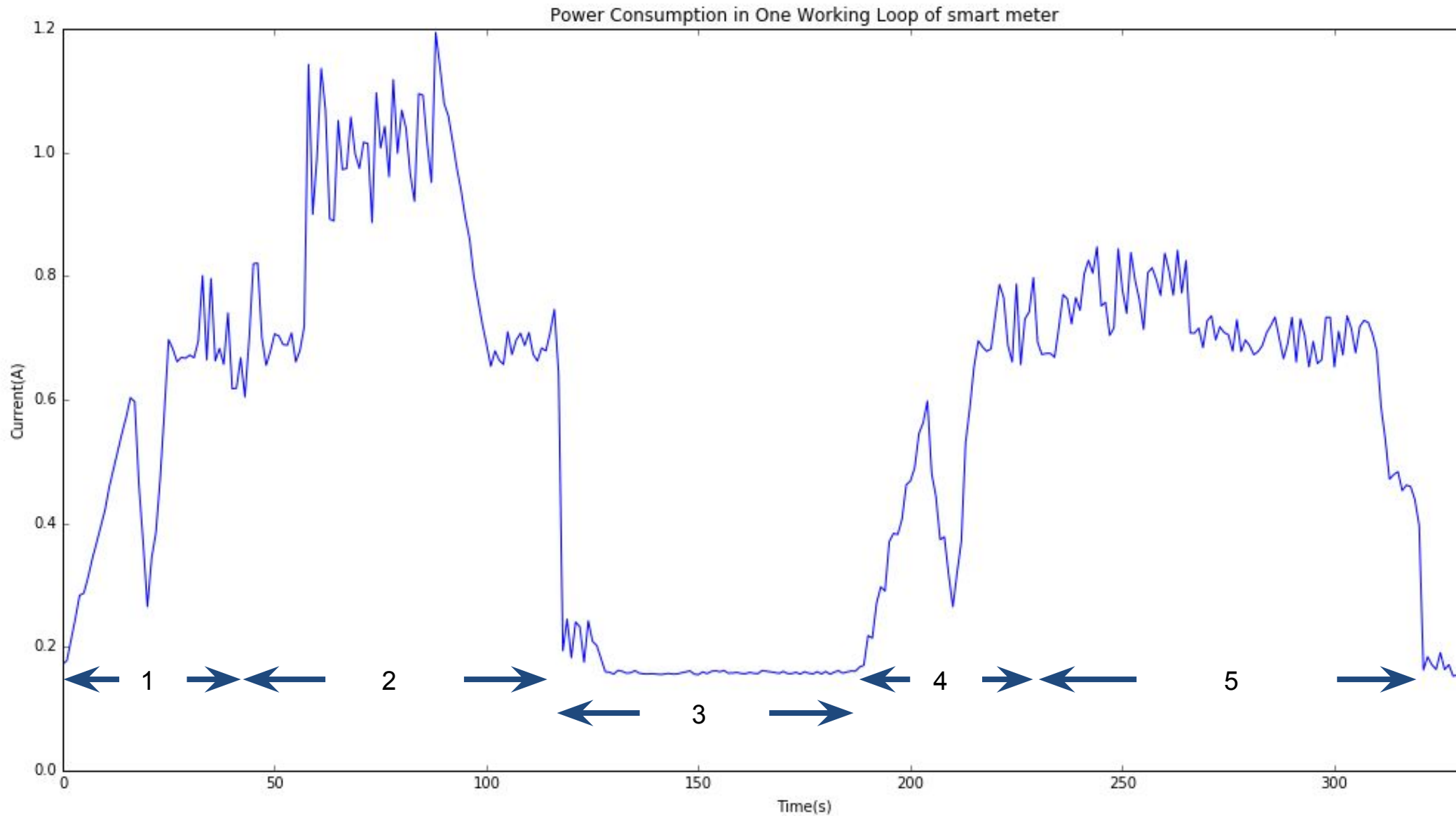
# Design details



# Micro-controller & LCD

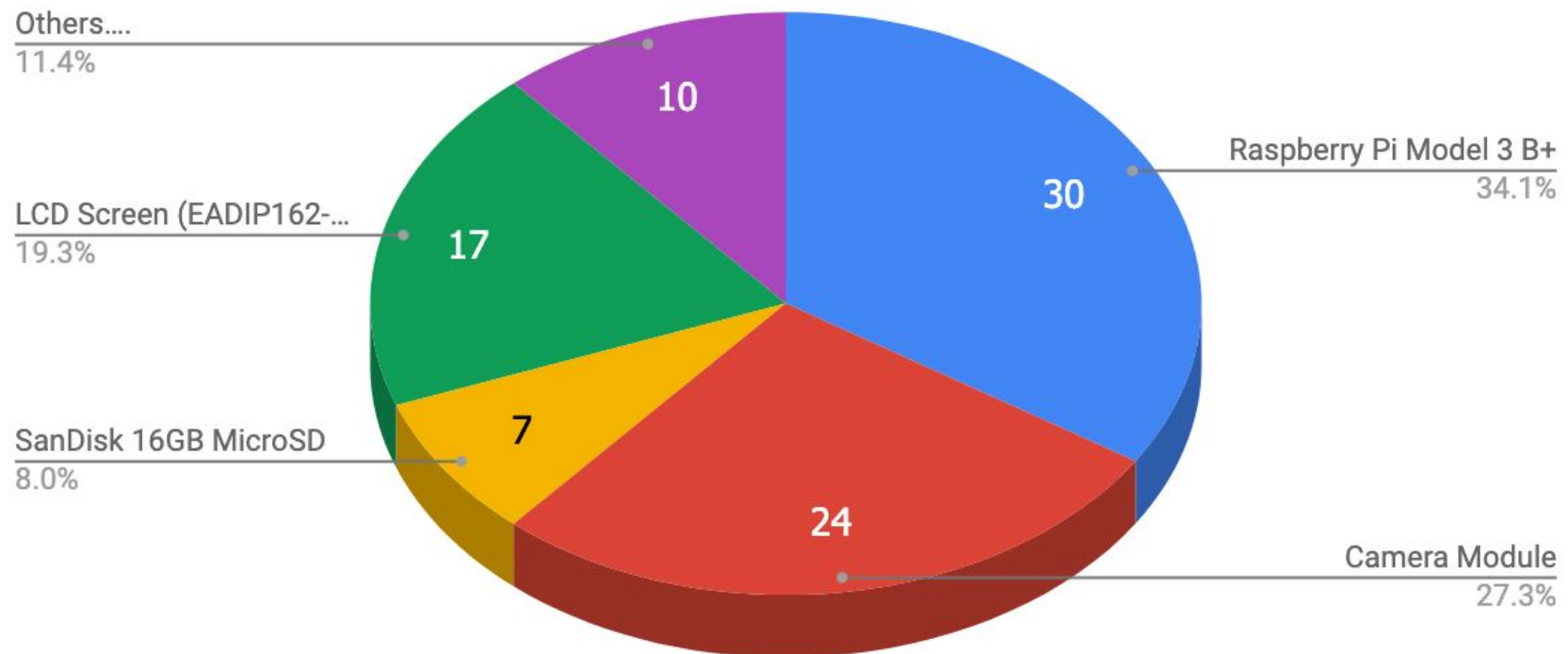


# Power Analysis



# Cost

Points scored



**total: \$88**

# Future Work

- Integrate sensor to measure the position of the car in the spot to determine whether it parks outside the spot.
- Integrate flash light to enable taking photos during the night.
- Integrate methods to inform the driver if any violations happen.
- Add stage where one car immediately park in before raspberry pi goes to sleep.

# References

1. <https://github.com/openalpr/openalpr>
2. [https://github.com/MicrocontrollersAndMore/OpenCV\\_3\\_License\\_Plate\\_Recognition\\_Python](https://github.com/MicrocontrollersAndMore/OpenCV_3_License_Plate_Recognition_Python)



**Thanks for watching !!!!**

**Any Questions?**