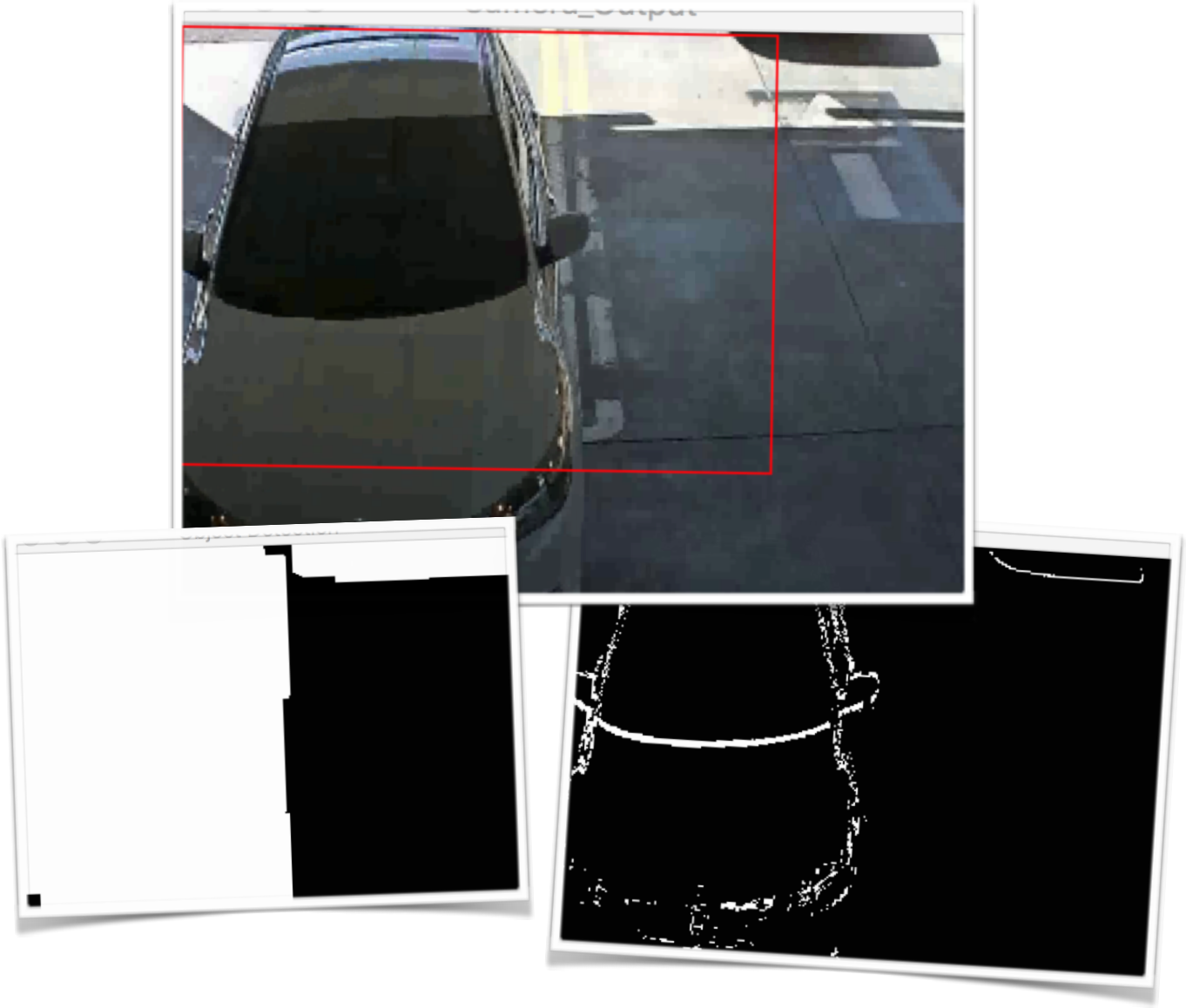
Project 3

Computer Vision



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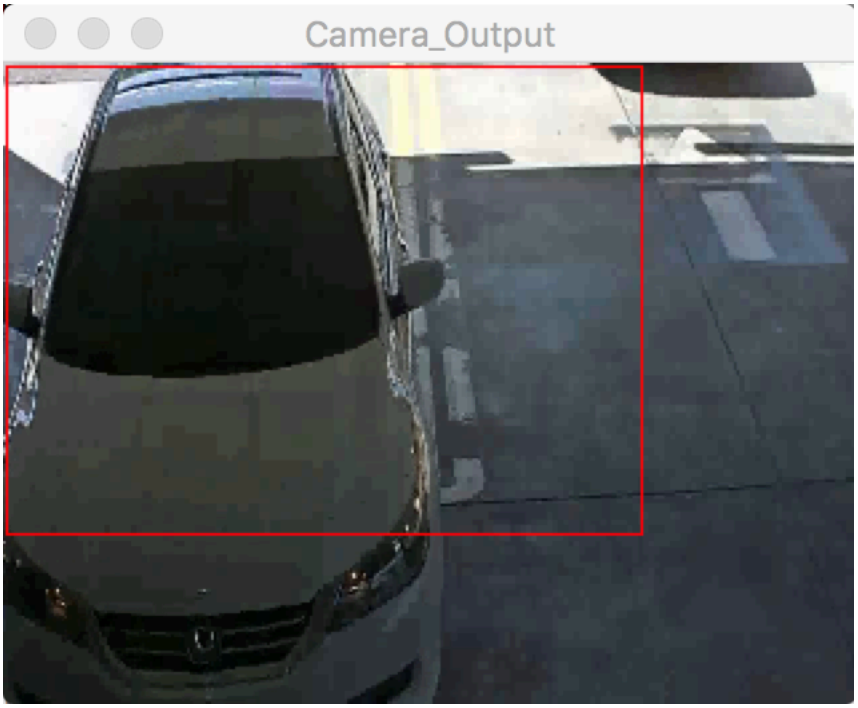
Introduction:

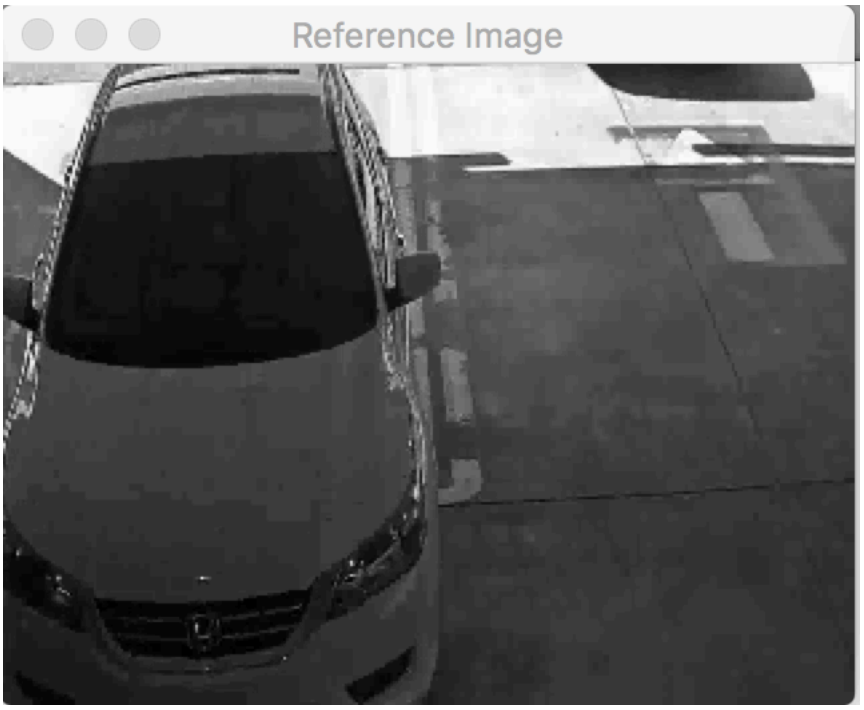
In this project we had to process a video and detect cars. In this we have tried to count the number of cars, get the shape of the car (small car or big car) and predict the color of the car. Detecting and tracking objects is a big part of computer vision and has many applications.

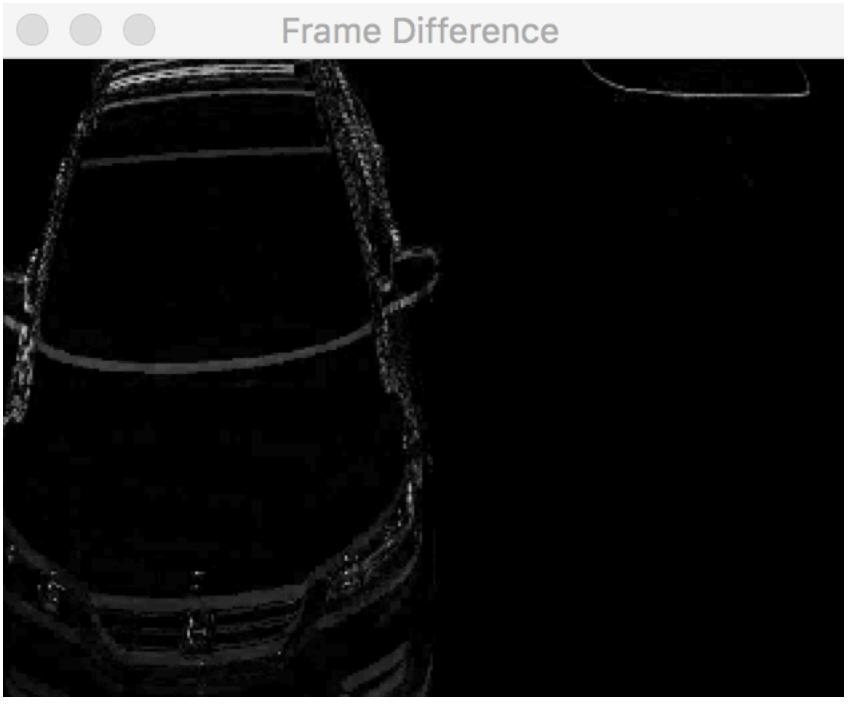
Algorithm:

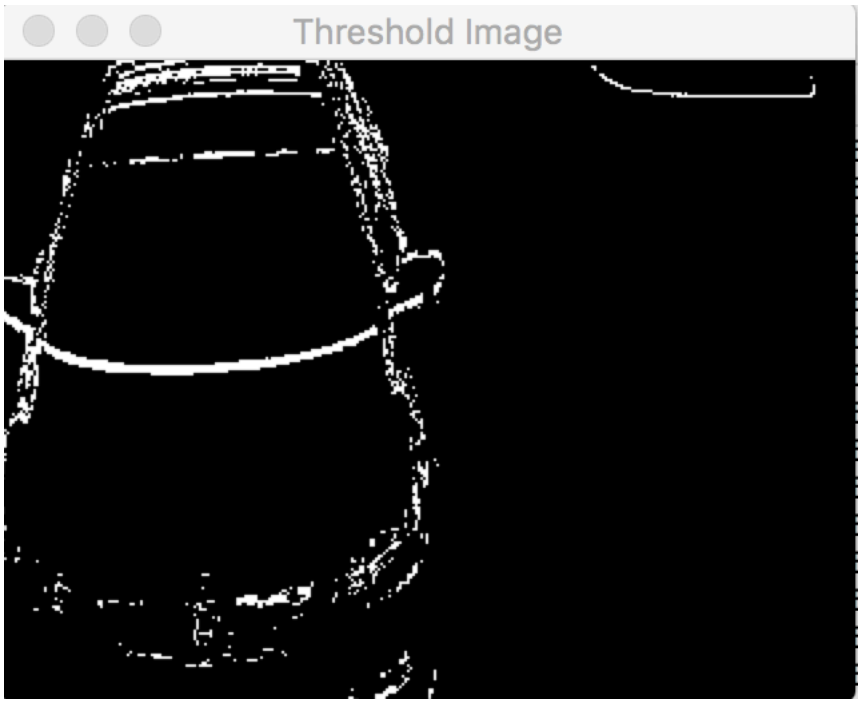
In our approach we decided to detect the motion of the cars. We tried background subtraction by taking a the first frame as the fixed frame, but as the time progresses there is a change in intensity of the light and this change in intensity was also detected as a car.

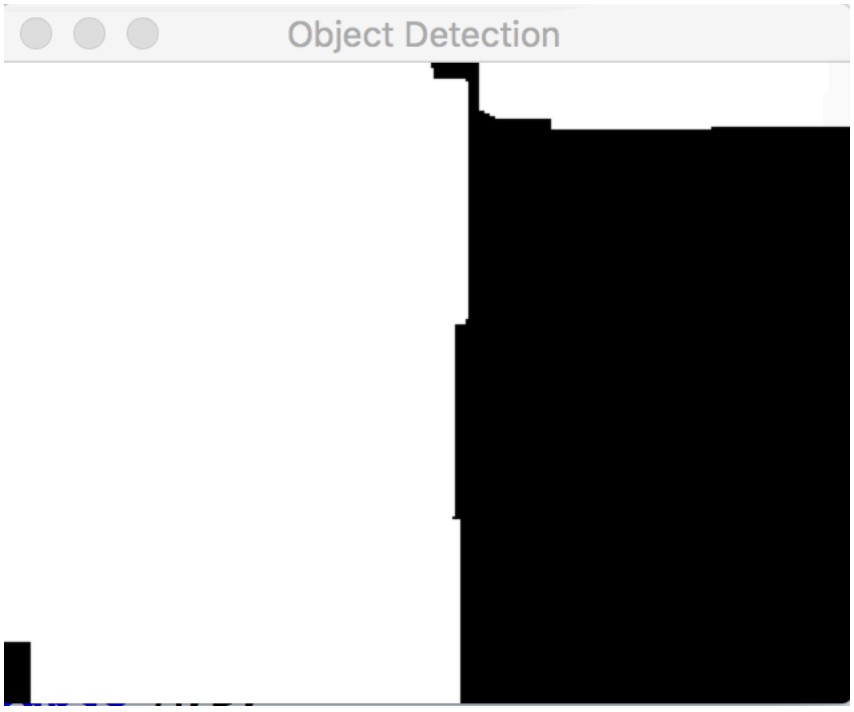
For detecting the motion of the car, we take difference between two consecutive frames (frame difference frame). The difference is a gray scale image, which we threshold and convert to binary (threshold frame). Then using imfill algorithm, by which we will fill the contours with white (object detection frame). We then detect the number of contours in the image, if the area of the contours is greater than a threshold value then it is a car (Camera_output frame). To avoid false detection by noise, we have a minimum number of frames for which the car should be present. When the area of the car in the frame is maximum, we store the full resolution image as well as the image showing which car has been detected.




Reference Image


Frame Difference


Threshold Image


Object Detection

Challenges:

Color:
We tried many techniques to get the color of the vehicle but none of them seemed to work. We tried taking the color of the centroid when the car was in the center, but in most cases the centroid came on the windscreen. We tried taking the color of the bottom but detected the car grill. Also, color result varies with number of runs. Therefore, we are also printing the RGB values.

Counting:

1. If the car speed was too low and the car was more than 50% outside the view of the camera, many times it was missed.
2. If the car come, stops and moves again sometimes if was detected again.

Results:

On sample-1.mkv

Counting: 20/20 (all counted)
Classification: 19 small cars, 1 big car

Output:

```
[→  Debug git:(master) ✗ ./CVProject1 sample-1.mov

 58
 Vehiclecount 1  , type Small car, color blue ,  Color (Blue, Red, Green) (101  ,100  ,99  )

 Vehiclecount 2  , type Small car, color black ,  Color (Blue, Red, Green) (41  ,44  ,41  )

 Vehiclecount 3  , type Small car, color black ,  Color (Blue, Red, Green) (71  ,72  ,72  )

 Vehiclecount 4  , type Small car, color black ,  Color (Blue, Red, Green) (50  ,62  ,51  )

 Vehiclecount 5  , type Small car, color white ,  Color (Blue, Red, Green) (100  ,100  ,100  )

 Vehiclecount 6  , type Small car, color black ,  Color (Blue, Red, Green) (83  ,85  ,84  )

 Vehiclecount 7  , type Small car, color white ,  Color (Blue, Red, Green) (112  ,108  ,116  )

 Vehiclecount 8  , type Small car, color white ,  Color (Blue, Red, Green) (101  ,101  ,102  )

 Vehiclecount 9  , type Small car, color black ,  Color (Blue, Red, Green) (66  ,64  ,67  )

 Vehiclecount 10  , type Small car, color blue ,  Color (Blue, Red, Green) (86  ,93  ,87  )

 Vehiclecount 11  , type Small car, color black ,  Color (Blue, Red, Green) (55  ,55  ,55  )

 Vehiclecount 12  , type Small car, color white ,  Color (Blue, Red, Green) (111  ,109  ,113  )

 Vehiclecount 13  , type Big Car, color blue ,  Color (Blue, Red, Green) (81  ,87  ,84  )

 Vehiclecount 14  , type Small car, color black ,  Color (Blue, Red, Green) (67  ,74  ,79  )

 Vehiclecount 15  , type Small car, color white ,  Color (Blue, Red, Green) (121  ,114  ,116  )

 Vehiclecount 16  , type Small car, color white ,  Color (Blue, Red, Green) (113  ,115  ,120  )

 Vehiclecount 17  , type Small car, color white ,  Color (Blue, Red, Green) (107  ,107  ,111  )

 Vehiclecount 18  , type Small car, color black ,  Color (Blue, Red, Green) (38  ,41  ,44  )

 Vehiclecount 19  , type Small car, color white ,  Color (Blue, Red, Green) (103  ,100  ,101  )

 Vehiclecount 20  , type Small car, color white ,  Color (Blue, Red, Green) (146  ,142  ,145  )
```

On sample-2.mkv

Counting: 17 cars detected (2 cars counted twice and 2 cars missed)
Classification: 17 small cars.