UNIVERSITI TUNKU ABDUL RAHMAN

AUTOMATED TRAFFIC COUNTING DATA COLLECTION AND ANALYSIS

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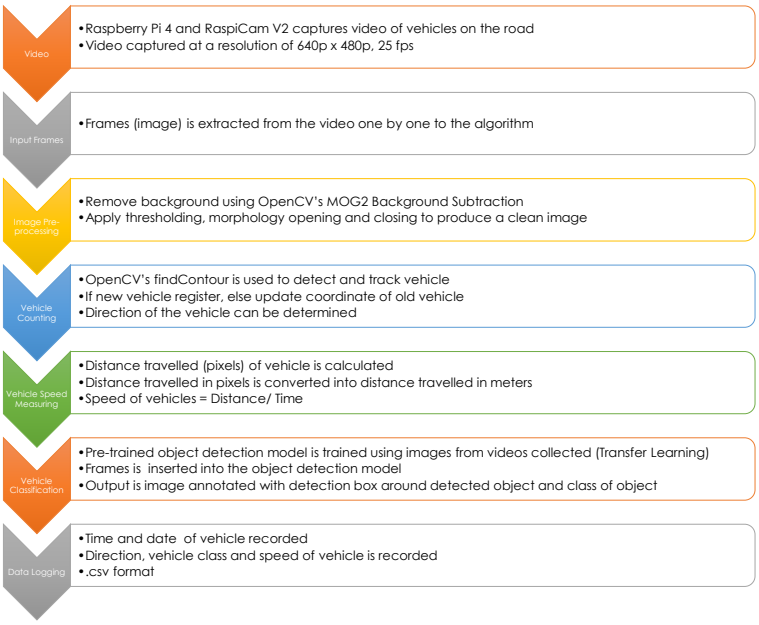
INTRODUCTION

- The increase in vehicles purchased by households over the years cause a high volume of vehicles on the road has caused traffic congestion.
- Traffic data collection analysis to extract traffic information which would be useful for evaluating the quality of transportation and improve traffic control.
- This project proposed an automated traffic counting data collection and analysis algorithm that is able to use computer vision:
  - » to **count** vehicles
  - » to measure the **speed** of vehicles
  - » to **classify** vehicles into different categories using the power of deep learning and AI.

METHODOLOGY



OBJECTIVES

- To capture good quality **video** recording of vehicles on the road.
- To detect, track and **count** the vehicles in the video.
- To calculate the **speed** of every vehicle passing in the video.
- To **classify** the vehicles in the video into cars, motorcycles using AI.

CONCLUSION

The project fulfills the objectives stated. Vehicle counting, speed measurement and vehicle classification achieves high accuracy and above when scene is well lit. When the scene is totally dark, vehicle counting still performs decently, while classification performs poorly. The algorithm is able to collect different types of data useful for traffic analysis.

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RESULTS AND DISCUSSION

Vehicle Counting

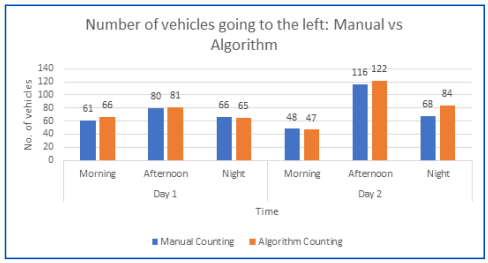

Figure 1: Bar chart of actual number of vehicles vs number of vehicles counted by algorithm

Day	Time	Manual Counting	Algorithm counting	Accuracy (%)
1	Morning	220	235	93.18181818
1	Afternoon	252	261	96.42857
1	Night	160	161	99.375
2	Morning	118	118	100
2	Afternoon	184	194	94.56521739
2	Night	126	162	71.42857143

Figure 2: table of actual number of vehicles vs number of vehicles counted by algorithm with accuracy

Vehicle Classification

Day	Time	Actual Cars	Predicted Cars	Accuracy (%)
1	Morning	171	156	91.22807018
1	Afternoon	121	103	96.42857
1	Night	124	77	62.09677419
2	Morning	172	163	94.76744186
2	Afternoon	85	81	95.29411765
2	Night	91	28	30.76923077

Figure 3: Table of actual number of cars vs number of cars classified by the object detection model

Day	Time	Actual Motorcycles	Predicted Motorcycles	Accuracy (%)
1	Morning	49	40	81.63265306
1	Afternoon	40	38	95
1	Night	58	10	17.24137931
2	Morning	57	41	71.92982456
2	Afternoon	33	33	100
2	Night	34	5	14.70588235

Figure 4: Table of actual number of motorcycles vs number of motorcycles classified by the object detection model

Data Logging

Year	Month	Day	Time	ObjectID	Direction	Vehicle Class	Speed(km/h)
2022	4	3	17:24:32	0	Right	car	26.33
2022	4	3	17:24:38	1	Right	car	29.09
2022	4	3	17:24:43	2	Right	car	33.76
2022	4	3	17:24:53	3	Right	car	22.25
2022	4	3	17:24:56	4	Right	car	19.24
2022	4	3	17:24:59	5	Right	car	17.32
2022	4	3	17:25:02	6	Right	car	14.19
2022	4	3	17:25:06	7	Right	car	22.93
2022	4	3	17:25:11	8	Right	car	15.18
2022	4	3	17:25:16	10	Right	car	28.17
2022	4	3	17:25:20	11	Right	car	19.52
2022	4	3	17:25:55	12	Right	car	37.87
2022	4	3	17:26:01	13	Left	car	52.65
2022	4	3	17:26:03	14	Right	motorcycle	29.13
2022	4	3	17:26:07	15	Right	car	36.24
2022	4	3	17:26:09	17	Left	motorcycle	33.64
2022	4	3	17:26:20	18	Right	car	31.85
2022	4	3	17:26:33	19	Left	car	21.21
2022	4	3	17:26:44	21	Left	car	64.98

Figure 5: Data collected by the software

The algorithm is tested using 6 videos recorded at different times. The video in the morning and afternoon are brightly lit. In the first night there is still some light in the sky, while in the second night the scene is totally dark with one road lamp illuminating the road. Vehicle counting, speed measurement and vehicle classification achieves high accuracy of 90% and above when scene is well lit. When the scene is totally dark, vehicle counting accuracy drops to around 60% to 76%, while classification accuracy ranges from 30% to 60% for cars and 14% to 17% for motorcycles. The algorithm is able to record the date, time, direction, type of vehicle and speed of vehicles that pass by.