

Vehicle Speed Analysis from Black Box

Digital Forensic Section CIFS



Case Study

Purpose



To analyze the vehicle speed from black box.



Case Study

Case Background

Case Type: Traffic Accident

Location: Songkhla Province

Time of an incident: Daytime

Briefly: There was a collision between a pickup car and a motorcycle. The motorcycle driver was killed in this accident. The investigator sent a memory card from pickup car's black box to Digital Forensic Section for analysis the speed of the car.

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$$V = S/T$$

V = Velocity (m/s)

S = Distance (m)

T = Duration (s)

Methods and Analysis

- Calculate hash values of files
- Calculate the speed from details show on the display.
- Calculate the speed from files metadata.

HASH value comparison (SHA-1)

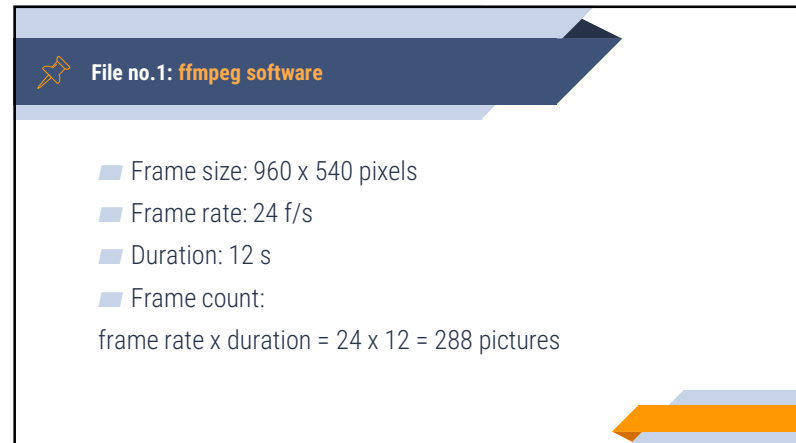
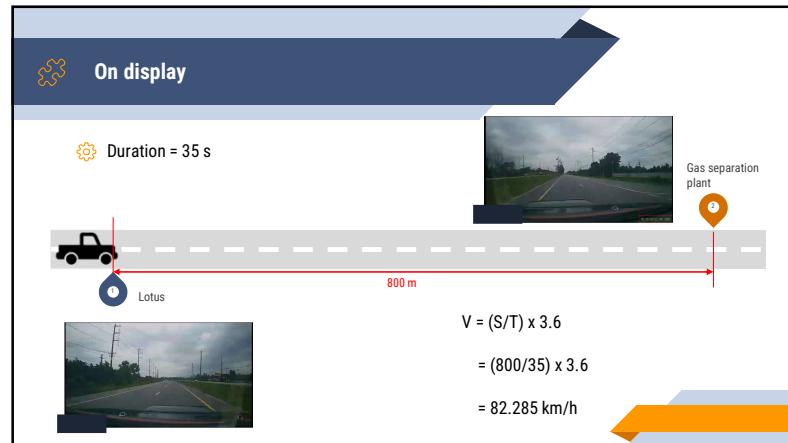
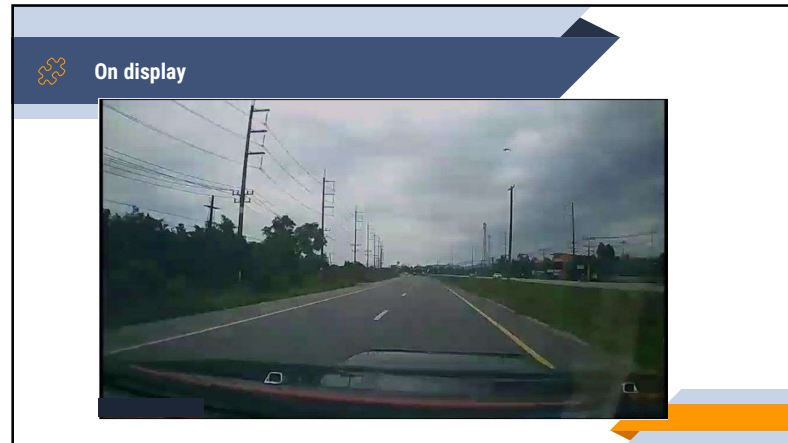
- the Hash values of the two files did not match. Therefore, they are not exactly the same file.

1


Calculate hash values of files

2

Calculate the speed from
details show on the display.



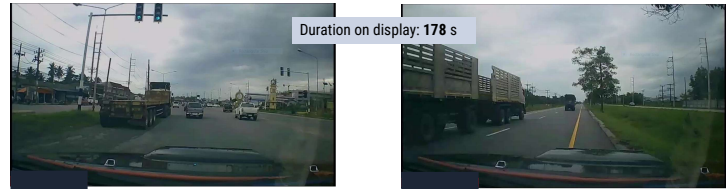
File no.1



Duration on display: 180 s

Video speed up =	Duration on display	=	180	=	15 times
	Duration of metadata		12		

File no.2



Duration on display: 178 s

Video speed up =	Duration on display	=	178	~	3.02 times
	Duration of metadata		59		

File no.2: ffmpeg software

- Frame size: 1920 x 1080 pixels
- Frame rate: 23.98 f/s
- Duration: 59.84 s
- Frame count: frame rate x duration = 1434.9632 pictures

Comparison table of matadata

	672833568.482257.mp4	vidio.mp4
Frame size (pixels)	960 x 540	1920 x 1080
Frame rate (f/s)	24	23.98
Duration (s)	12	59.84
Frame count (pictures)	288	1434
Video speed up (times)	15	3.02



Conclusions

- Calculate from duration on display, the velocity is **82.285 km/h** as same as calculate from frame rate and metadata in each file.
- The configuration of Black Box has **no affect on** movement between referent points.

Calculation (Metadata)

	File no. 1	File no. 2
S	800 m	800 m
T	Fram count = 57 frames Frame rate = 24 f/s Video speed up = 15 times $T = (57/24) \times 15 \sim 35$ s	Fram count = 281 frames Frame rate = 23.98 f/s Video speed up = 3.02 times $T = (281/23.98) \times 3.02 \sim 35$ s
V	82.285 km/h	82.285 km/h

Comments

- The distance measured from the scene must be accurate in order for the analyst results to be as close to reality as possible.
- The date and time show on display do not match the picture displayed. It does not affect the speed calculation but it may be noted that, the camera recorder settings do not match the recorded event.

