

Tire Pressure Monitoring

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D1

Three Point estimates in Minutes

Task No.	Best Case	Likely Case	Worst Case
D1	10	25	40
D2	60	80	160
D3	80	150	200
D4	40	80	160
D5	30	70	150
D6	50	100	160
D7	40	70	120
D8	30	50	120
D9	40	60	100
D10	30	60	120
D11	40	60	100
D12*	40	70	100
D13*	20	40	60
D14*	30	50	70
Sum (min)	540	965	1660
Sum (hours)	9	16,08	27,67
Result (min)	1010		
Result (hours)	16,83		

D2

Given the formulas

$$R_{RR} = W + R_{RL}$$

and

$$\frac{V_x}{V_y} = \frac{R_x}{R_y}$$

and velocities for all the wheels during the entire duration of the test data one can determine the curve radiuses easily as such:

$$R_{RL} = \frac{W}{\frac{V_{RR}}{V_{RL}} - 1}$$

$$R_{RR} = \frac{R_{RL} \cdot V_{RR}}{V_{RL}}$$

$$R_{FR} = \frac{R_{RL} \cdot V_{FR}}{V_{RL}}$$

$$R_{FL} = \frac{R_{RL} \cdot V_{FL}}{V_{RL}}$$

(See findRadius.m)

Result:

radiuses

D3

D4

If the difference between the maximum distance and the minimum distance is greater then 0.5% the system will detect tire pressure drop.

D5

The m and c parameters of the given random number generator are the upper and lower limit for the values generated. An initial value has to be chosen and functions as seed.

%randomNumberGenerator.m

```
function [dataset] = randomNumberGenerator(a, min, max, seed, n)
% Generator random test data for D5
% seed = X(0)
% n = length
% a,c,m according to formula of task D5

% Preallocate return array
dataset = zeros(1, n);
% Set seed
dataset(1) = seed;

for i = 2:1:n
    dataset(i) = mod(round((a * dataset(i-1) + min)), round(max))
```

```
        %fprintf('%d * %d + %d) mod %d\n',a,dataset(i-1),c,round(max))  
end
```

By varying this seed, random data for the wheel velocities can be generated by only varying the seed.

```
% Generate own tire velocity data for testing using randomNumberGenerator()  
% Will generate data up to 80 km/h per wheel
```

```
vrl_rand = randomNumberGenerator(5, 3, 80, 1, 56093)  
vrr_rand = randomNumberGenerator(5, 3, 80, 2, 56093)  
vfl_rand = randomNumberGenerator(5, 3, 80, 3, 56093)  
vfr_rand = randomNumberGenerator(5, 3, 80, 4, 56093)
```