Introduction to Automotive Report
Lab 1: Braking System

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Brake System:

The braking systems consists of several components:

- Pedal:

  Human force is applied on the pedal and is amplified mechanically.

- Servo unit (Booster):

  It adds an additional force to the force coming from the pedal to assist the human, the servo force added depends on ratio between the human force applied over the maximum human force possible, and this force is due to the pressure difference as one side of the diaphragm is vacuumed while the other side is at atmospheric pressure multiplied by the area of the booster.

- Master cylinder:

  The force outputted from the pedal and servo unit is then applied on the master tandem cylinder to pressurize the brake fluid into the brake pipes and hoses.

- Disc brakes:

  A disc is mounted on the axis of the wheel and a caliper is installed on it, the pressurized brake fluid pushes the piston in the caliper which will push the brake pads against the disc causing frictional torque and frictional force which will decelerate the wheel.
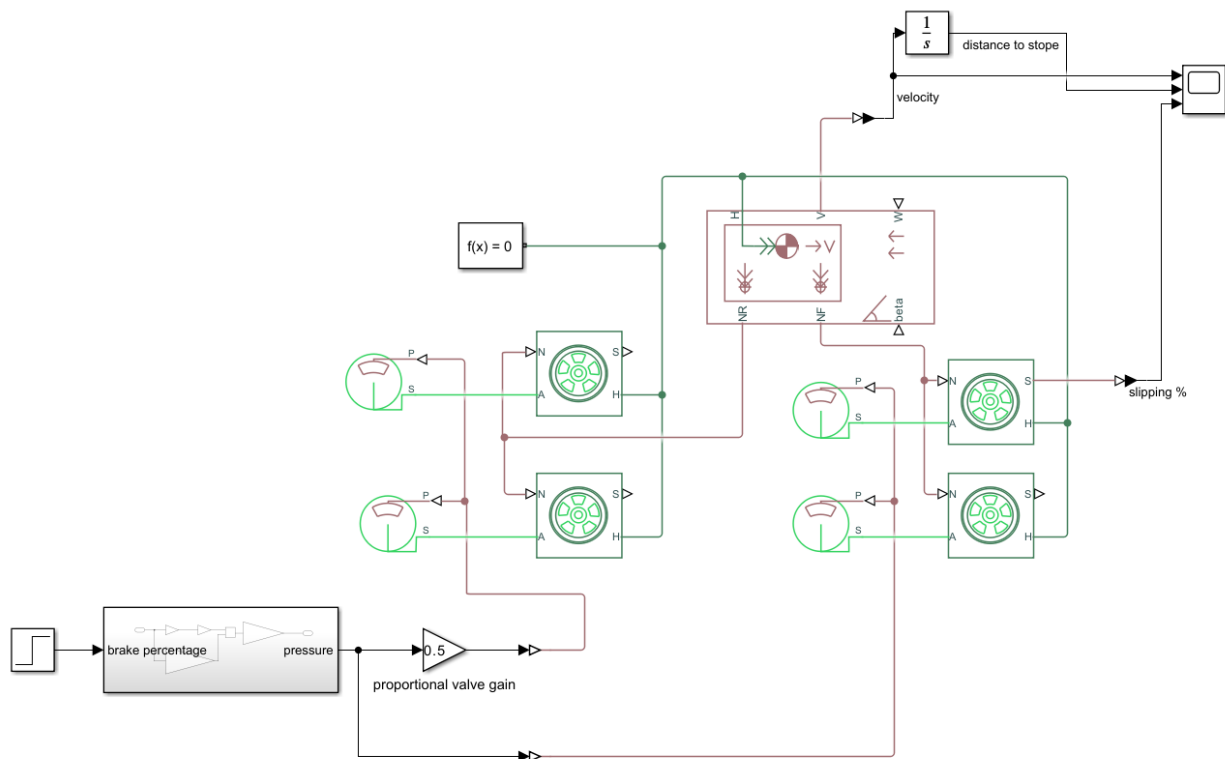
MATLAB Snippets:
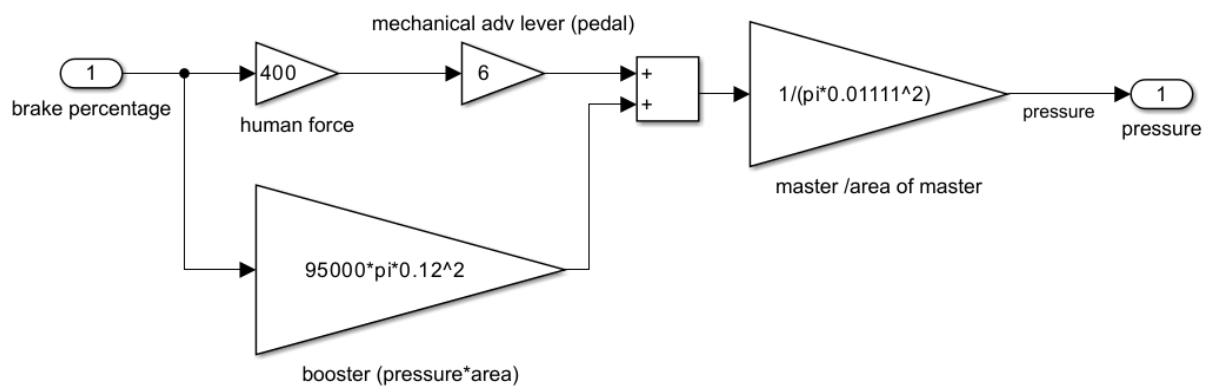

Figure 1 Braking System Model

Figure 2 Pressure Line

Block Parameters: Vehicle Body			✕

Vehicle Body ☑ Auto Apply ❓

Settings | Description

NAME	VALUE		∧
∨ **Main**			
∨ Mass	1100	kg	∨
Configurability	Compile-time		∨
> Number of wheels per axle	2		
> Horizontal distance from CG to front axle	1.7	m	∨
> Horizontal distance from CG to rear axle	1.94	m	∨
> CG height above ground	0.5	m	∨
Externally-defined additional mass	Off		∨
> Gravitational acceleration	9.81	m/s^2	∨
Negative normal force warning	Off		∨
∨ **Drag**			
> Frontal area	3	m^2	∨
> Drag coefficient	0.34		
> Air density	1.18	kg/m^3	∨
> **Pitch**			
∨ **Initial Targets**			
∨ ☑ Velocity			
Priority	High		∨
Value	100	kph	∨
> **Nominal Values**			∨

Figure 3 Vehicle Body Settings

Figure 4 Tire Settings

Figure 5 Disc Brake Settings

Results:
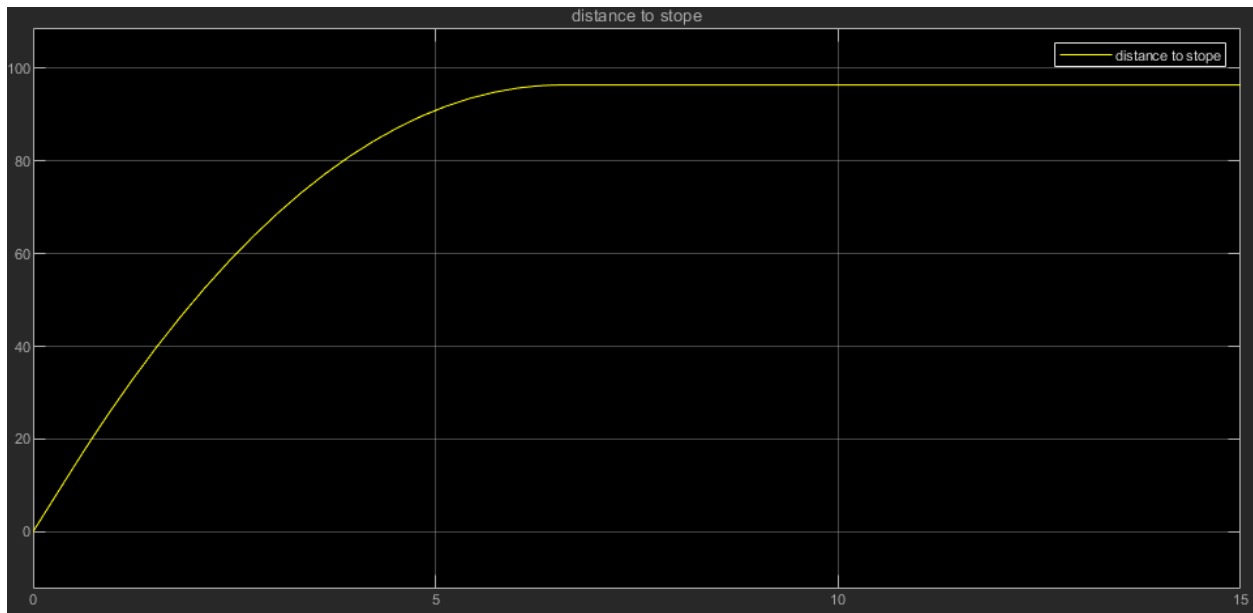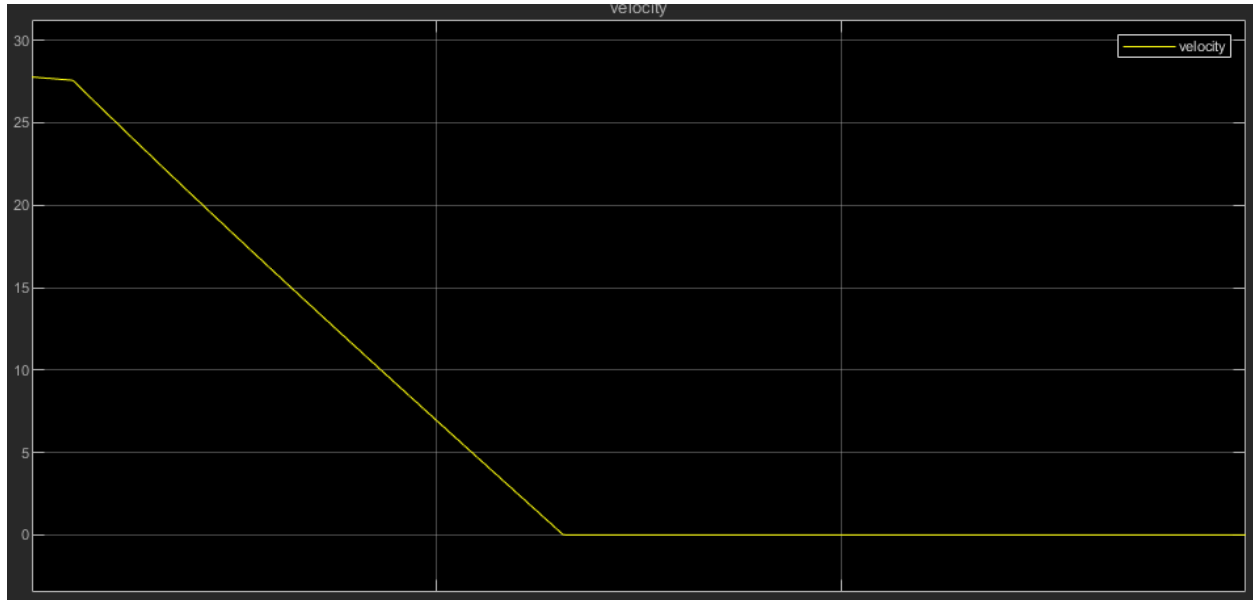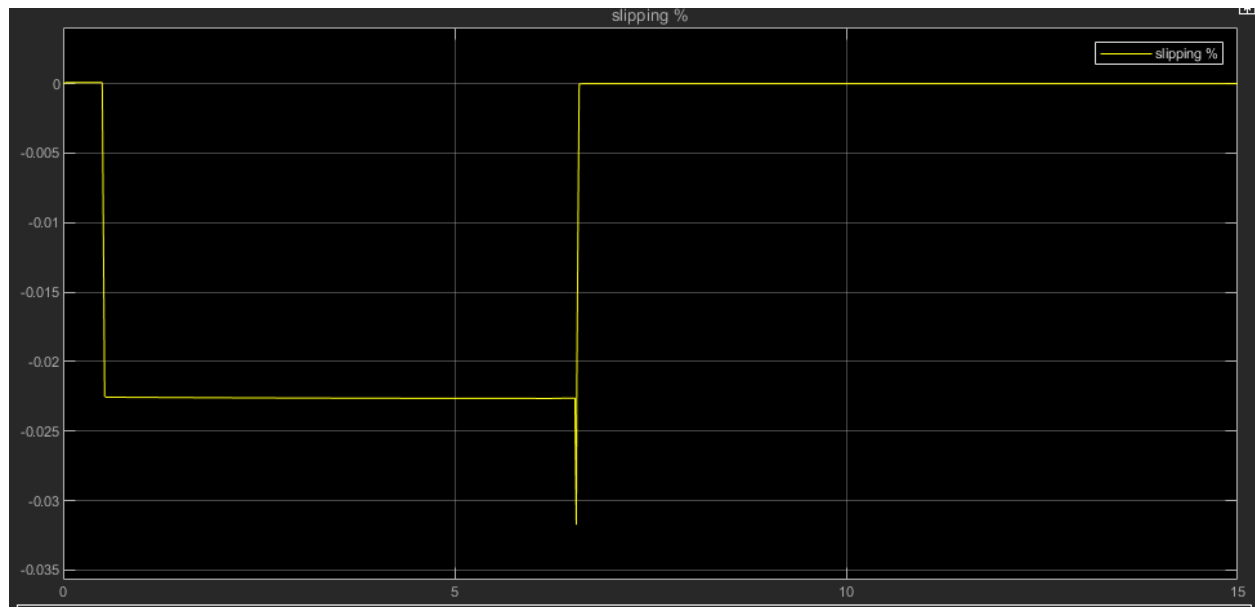
slipping %

Comments:

- No slipping occurs as the slipping% did not reach -1.
- The vehicle will take approximately 7 seconds to come to rest after the brakes are applied.