**Logo

Description automatically generatedAIN SAHMS UNIVERSITY**

**FACULTY OF ENGINEERING**

**Senior2 Mechatronics Engineering program**

**Spring 2025**

**MCT445 – Mechatronics in Automotive Application**

**Lab (2)**

|  |  |
| --- | --- |
| **Name** | **Hossam Ahmed Mohamed Selem** |
| **ID** | **2001830** |

# Introduction

* Braking is a critical function in vehicle dynamics, directly impacting safety, stability, and performance. Traditional **manual braking** relies on the driver’s force applied through the pedal, which is amplified by a brake booster before reaching the master cylinder. However, manual braking has limitations, including **inconsistent braking force**, **delayed response time**, and **driver fatigue**. To overcome these challenges, **control systems** such as the **Proportional-Integral (PI) Controller** are implemented to regulate brake pressure more efficiently.
* A **PI controller** is widely used in automotive braking systems due to its ability to **reduce steady-state error** and **improve system stability**. By automatically adjusting the braking force based on feedback from the system, the PI controller provides **smoother and more consistent braking performance** compared to manual braking. This report examines the **effectiveness of a PI controller in controlling brake pressure** compared to conventional manual braking. Through simulation and analysis, we evaluate the **response time, braking efficiency, and pressure stability** in both cases to determine the advantages and potential drawbacks of using a PI-controlled braking system.

# System Model

A diagram of a diagram

AI-generated content may be incorrect.

## Control

A diagram of a system

AI-generated content may be incorrect.

## Master Braking

A diagram of a circuit

AI-generated content may be incorrect.

## Vehicle Model

A diagram of a computer

AI-generated content may be incorrect.

# Results

## Manual Braking

A screenshot of a graph

AI-generated content may be incorrect.

Distance = 97 m

Stopping time = 5.8 sec

## PI Braking

A screenshot of a graph

AI-generated content may be incorrect.

Distance = 73.9 m

Stopping time = 4 sec

# Control Parameters

* P = 3.504;
* I = 0.001;

# Work link

<https://github.com/hossam-selem/Automotive/tree/0c055befbc782d5ccbd695f853d49636cb371367/lab2>