

# Mechatronic Control of an Acceleration and Braking System



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## Mechatronics Engineering Project

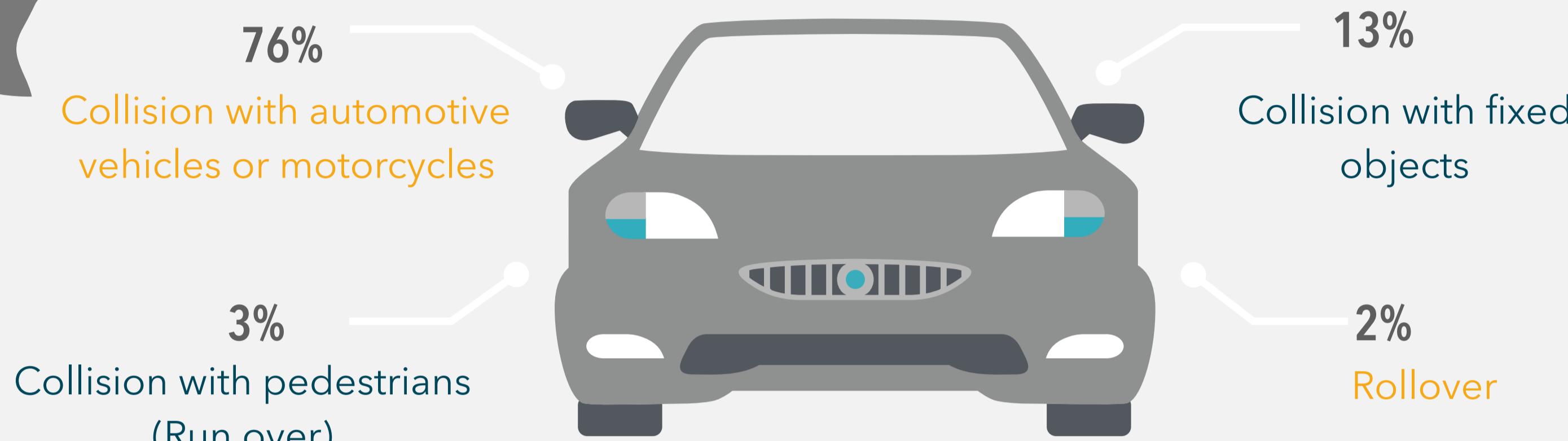
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## PROBLEM STATEMENT



of the 360,051 car accidents registered by INEGI on 2016 are caused by the driver, from which:



SOURCE: INEGI, Consulta de: Accidentes de tránsito, Por: Causa del accidente, Según: Año de ocurrencia. 2016.

## OBJECTIVES

Design, construct and implement a mechatronic system capable of remotely controlling the necessary actuators for driving a vehicle (steering wheel, braking and acceleration pedals)

- Implementation of a control system for a self-driving mode within a controlled area.
- Improvement of the steering wheel mechatronic system, developed by previous teams.
- Design of power electronics for the acceleration and braking system.
- Data Dashboard implementation for the remote control of the acceleration and braking actuators.

## DEVELOPMENT

### STEERING SYSTEM

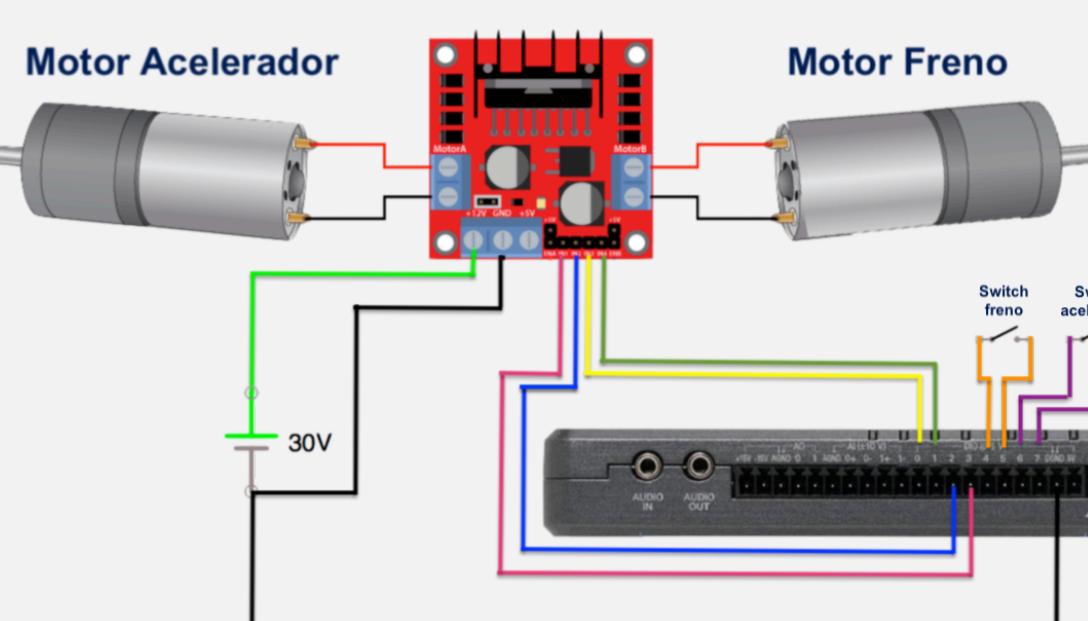


Mechanical adjustment of the past system, to correct failures

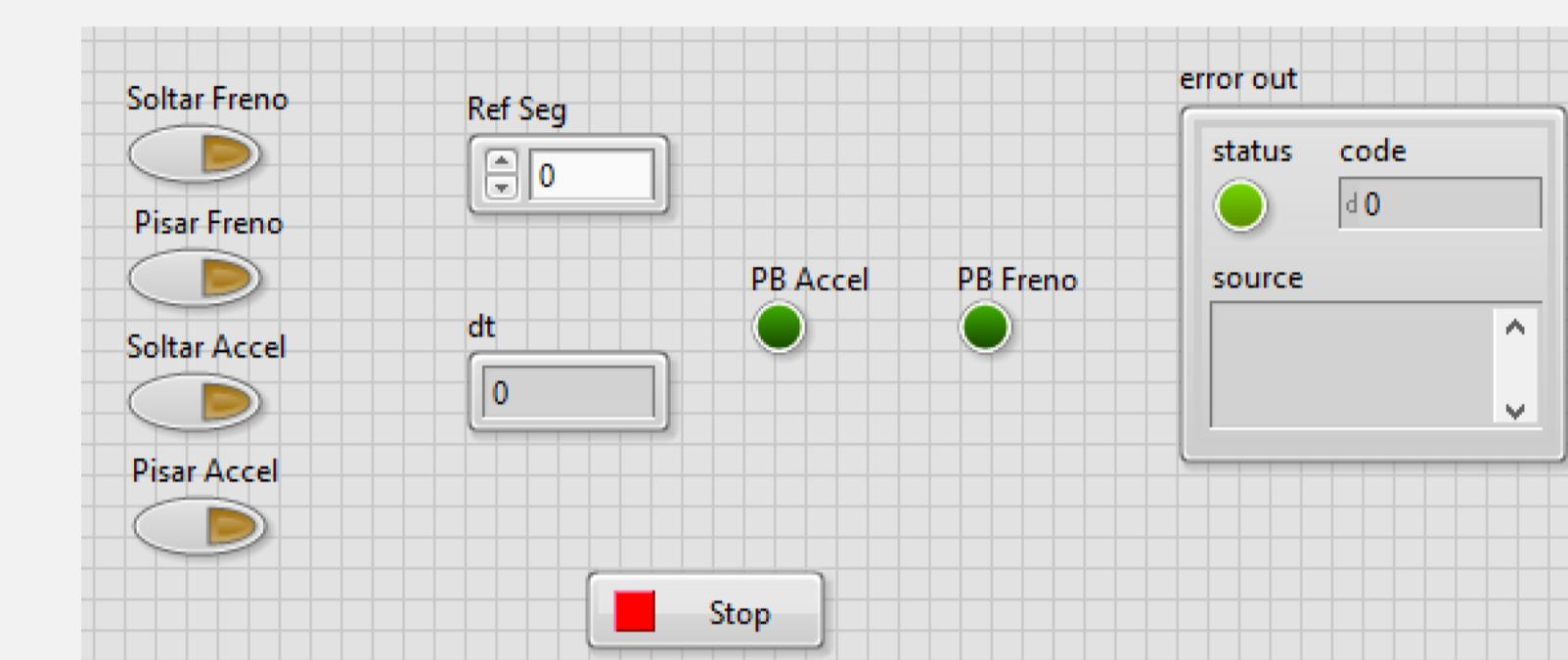
- Welding of a new gear train
- Alignment between the motor axis and its gear train
- Alignment between the motor gear train and the steering wheel



## FINAL CIRCUIT

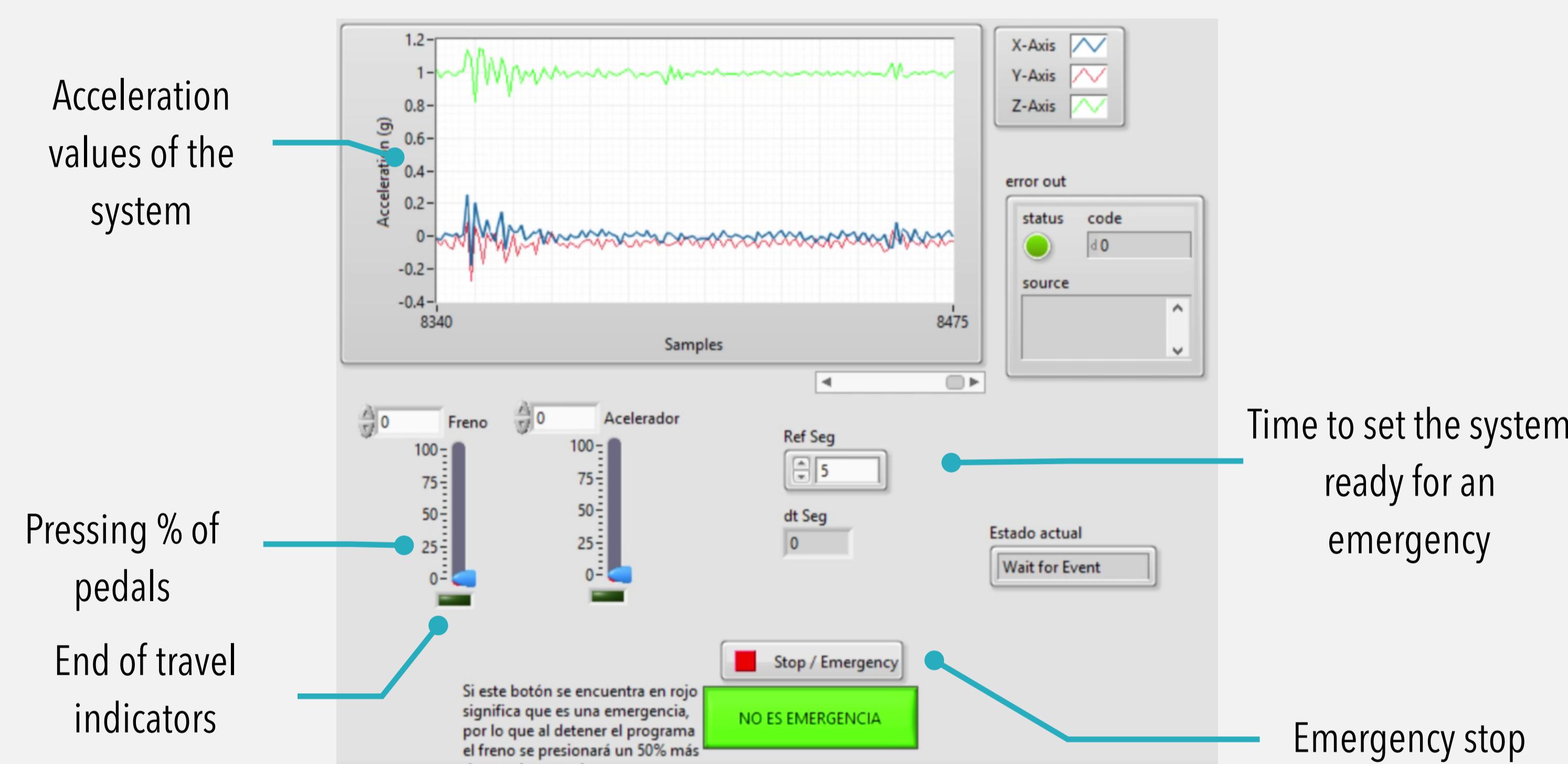


## SYSTEM TESTING



Throughout these tests we could determine the time values for the total travel of the nut. Thus, we were able to determine the acceleration and braking percentage for each pedal.

## FRONT PANEL



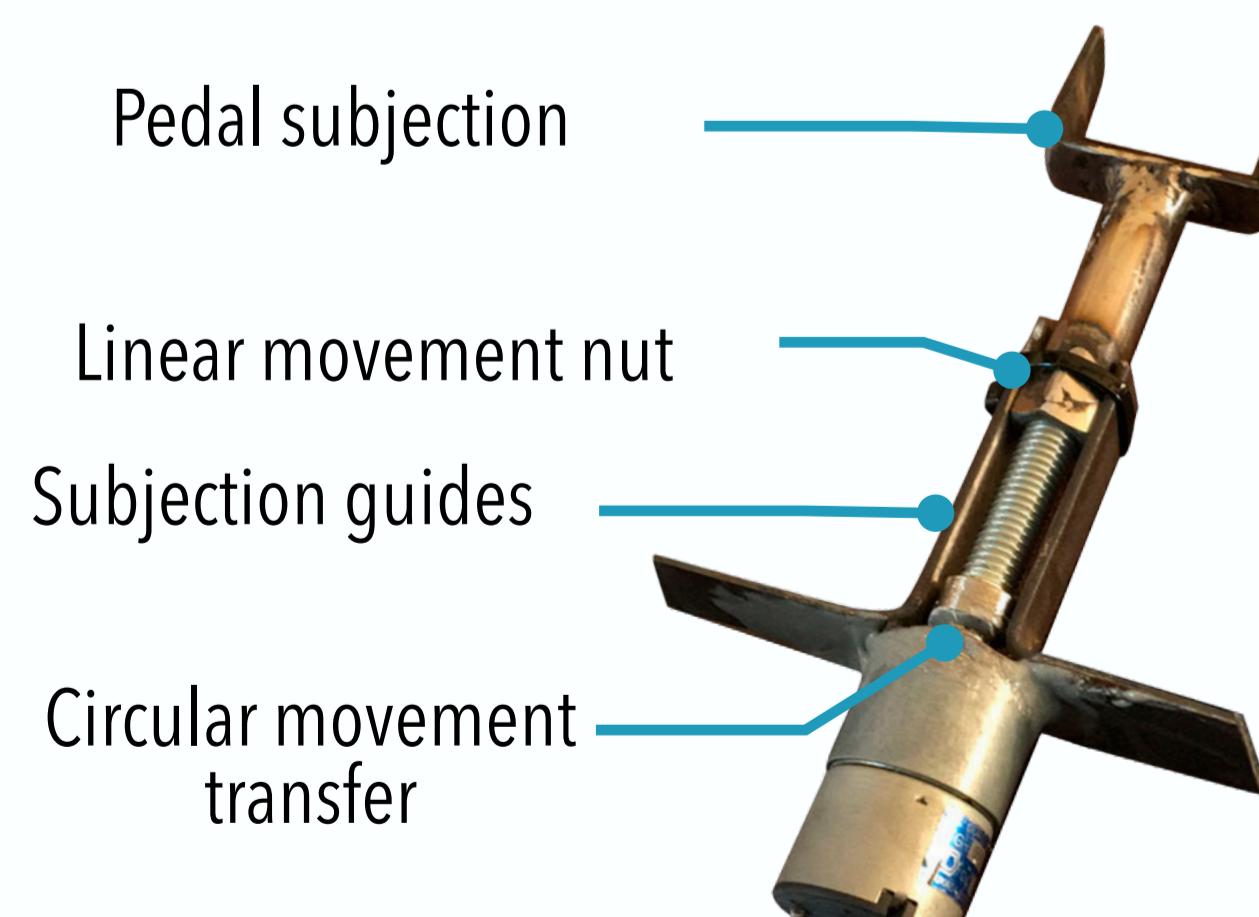
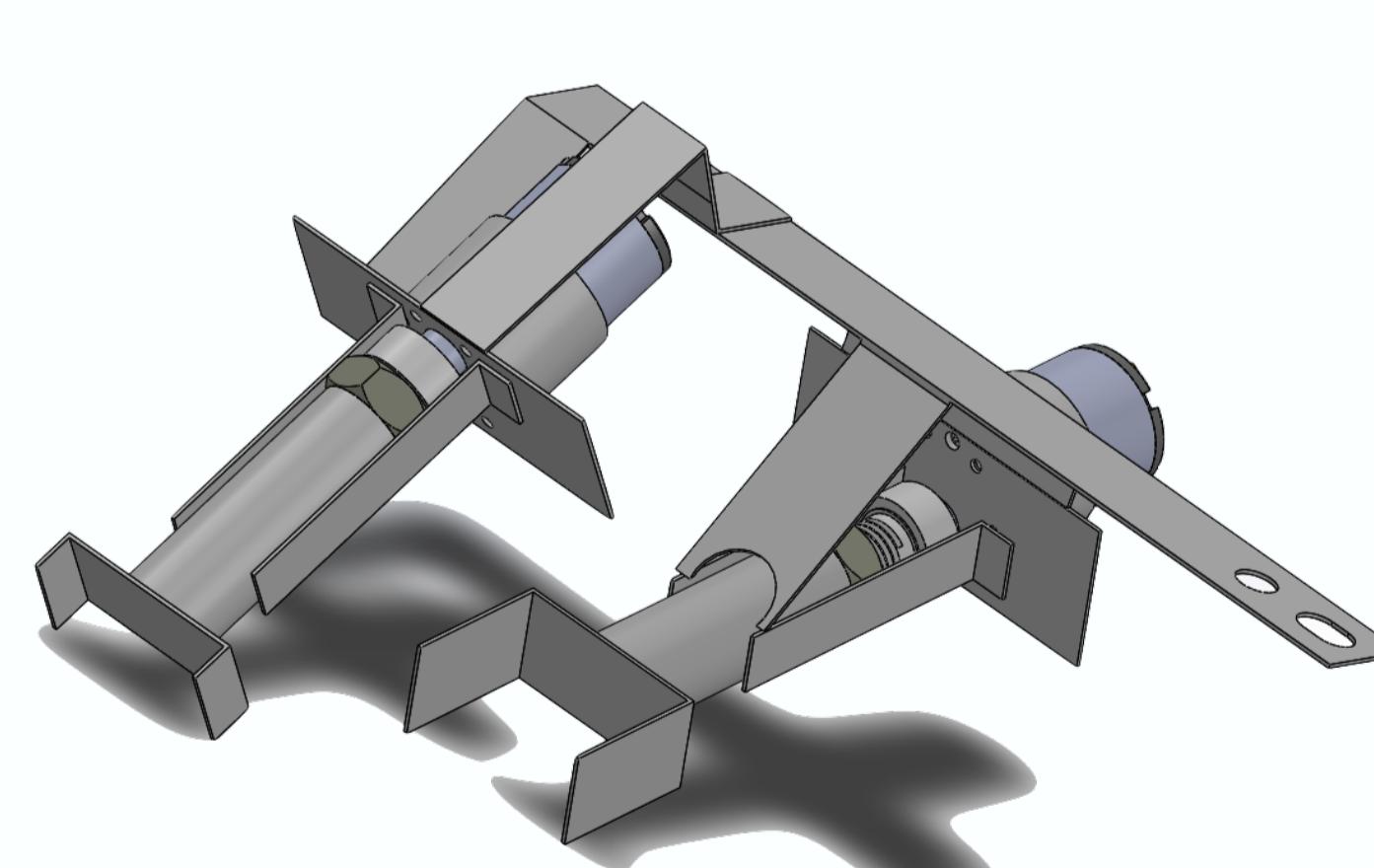
## ACCELERATION AND BRAKING SYSTEM

### 1. Proposal selection

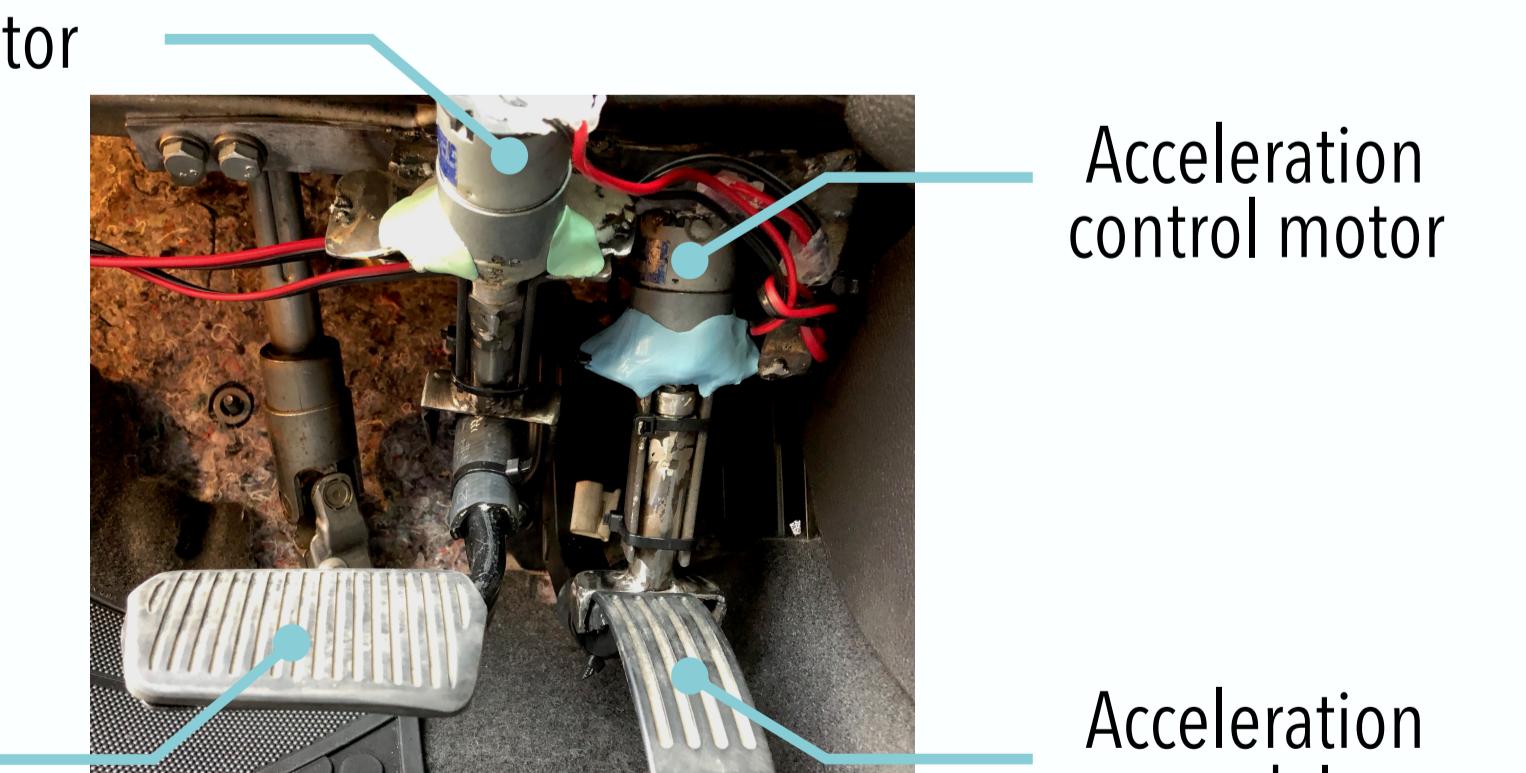
| Propuesta        | Factibilidad | Tiempo de Diseño | Costo | Tiempo de desarrollo | Facilidad de instalación | Seguridad | Simultaneidad de uso |
|------------------|--------------|------------------|-------|----------------------|--------------------------|-----------|----------------------|
| Riel             | o            | Δ-               | o     | Δ+                   | Δ                        | x         | Δ                    |
| Brazos           | x            | Δ-               | Δ-    | Δ                    | Δ+                       | Δ+        | x                    |
| Pistón Invertido | o            | Δ+               | o     | o                    | x                        | Δ+        | Δ+                   |

Legend:  
o: Acceptable (Go)  
Δ+: Change required, nearly acceptable.  
Δ: Change required, acceptable.  
Δ-: Change required, nearly unacceptable.  
x: Not acceptable.

### 2. Physical model



Brake control motor



## CONCLUSIONS



The objectives set were accomplished. We were able to create and implement an autonomous acceleration and braking system that could be remotely controlled.

The use of mechanical linear actuators (motor and bolt) allowed us to have a precise position control of the actuator at all time, which was very effective for the acceleration pedal.

We propose that for future works, a hydraulic piston or an ACME bolt is used for the braking pedal, to increase the force and reduce the braking time.