

Simulation and comparison of automotive shock absorbers

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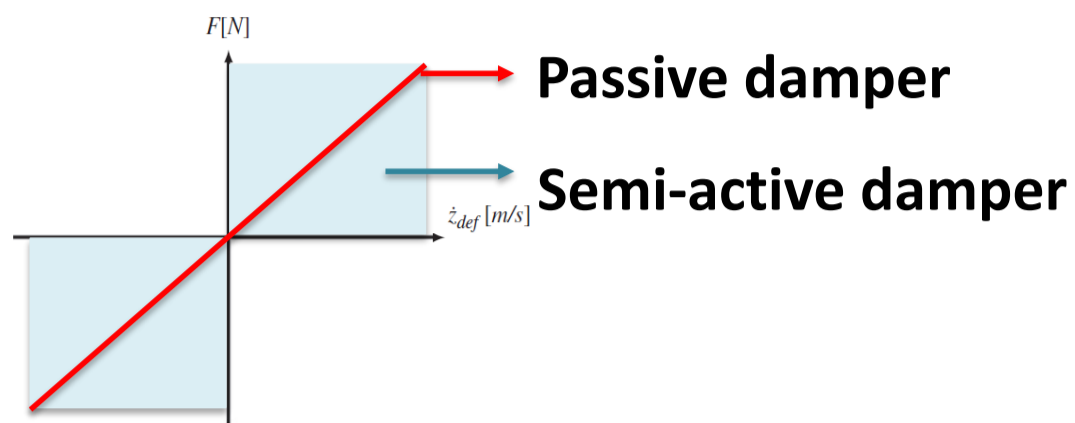
Automotive shock absorbers

→ Passive shock absorber

- Fixed damping characteristics

→ Semi-active shock absorbers

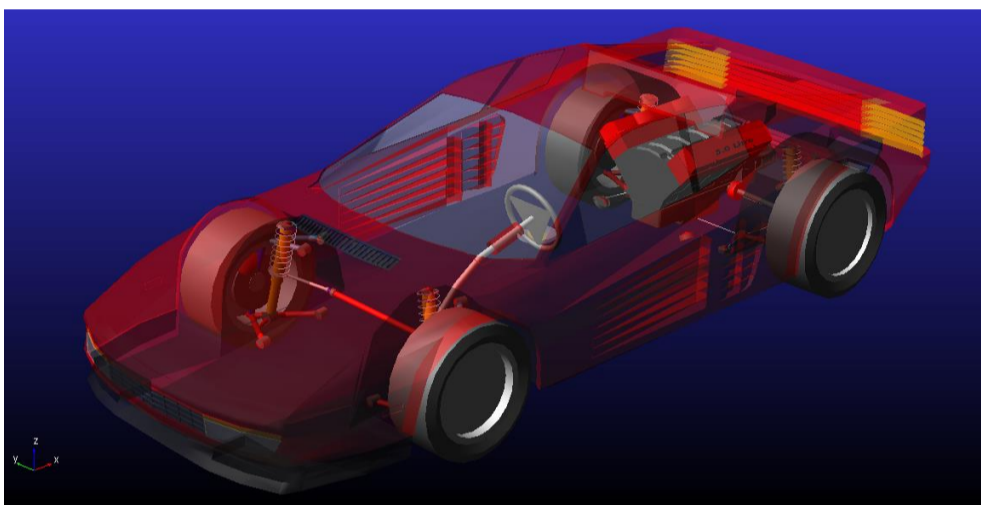
- Variable damping characteristics



Types of semi-active shock absorber

- Electrohydraulic
 - Varies orifice
- Electrorheological
 - Generates electric field
- Magnetorheological
 - Generates magnetic field

1. Defining a vehicle



2. Defining roads

I. Country road

Typical country road, with a highly uneven road surface.

II. ISO Lane change

Severe double lane change maneuver.

III. City road

Typical city road, with obstacles as for example speed bumps and potholes.

3. Simulation criteria

Criteria based on main function shock absorber:

→ Safety

- City & country road: Normal forces of wheels exerted on road
- ISO Lane change: Roll angle of vehicle

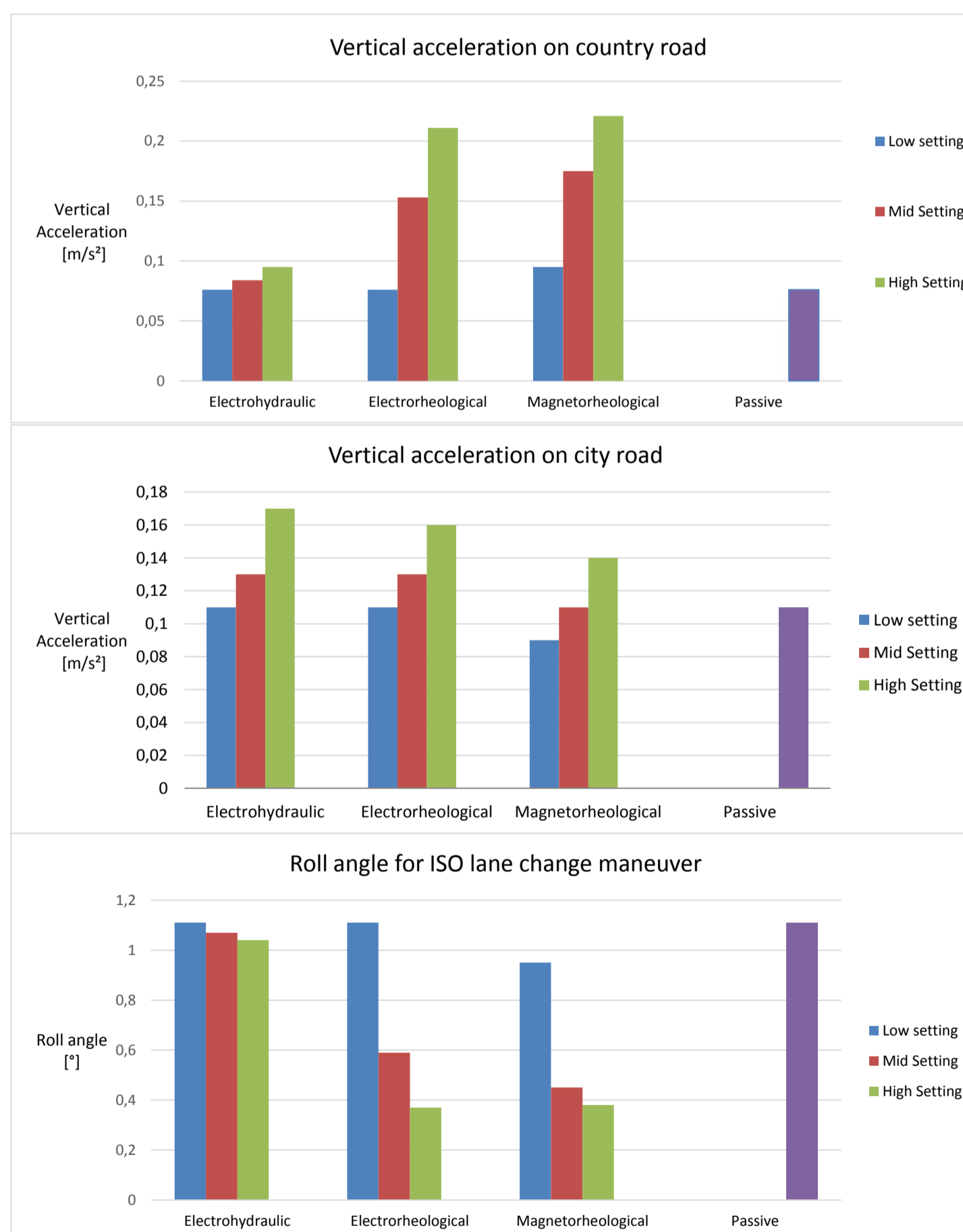
→ Comfort

- City & country road: Vertical acceleration chassis
- ISO Lane change: Lateral acceleration

Objective

- As semi-active shock absorbers have variable damping, do they offer improved performances compared to passive shock absorbers?

4. Results



Country road:
Semi-active shock absorbers offer similar performances when tuned good, bad tuning may cause inferior performances.

City road:
Semi-active shock absorbers offer better performances when tuned good, incorrect tuning may lead to inferior performances.

ISO lane change maneuver:
Semi-active shock absorbers offer better performances when tuned good, inappropriate tuning still offers better performances.

Conclusion

- When a semi-active shock absorber is well set for a type of road, the performances will be similar or better than the passive shock absorber. However, when the wrong setting is set for the shock absorber, the performances may become inferior.

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