

# Design of an Adaptive Emergency Braking System on Collision Distance with Different Brake Levels

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# SUMMARY

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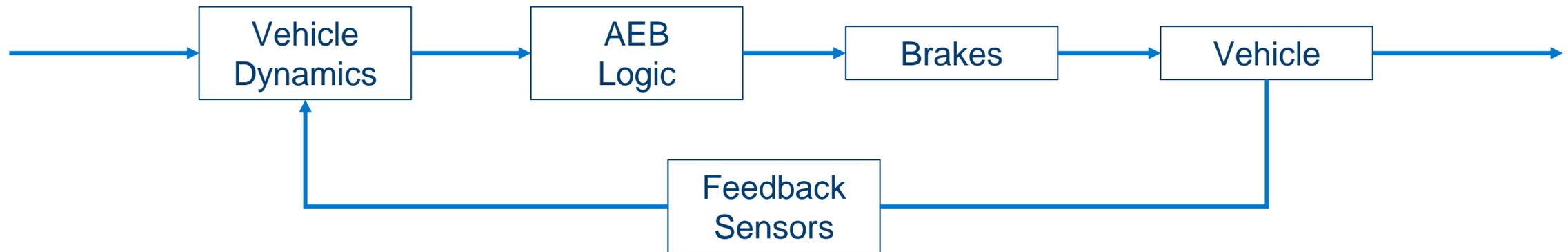
# 1. INTRODUCTION

- **Autonomous Emergency Braking (AEB)** is an advanced driver-assistance system (ADAS) that monitors the road ahead using sensors, such as camera and radar to detect imminent collisions, and then automatically applies the brakes if the driver fails to respond, aiming to prevent or reduce the severity of crashes without requiring driver intervention



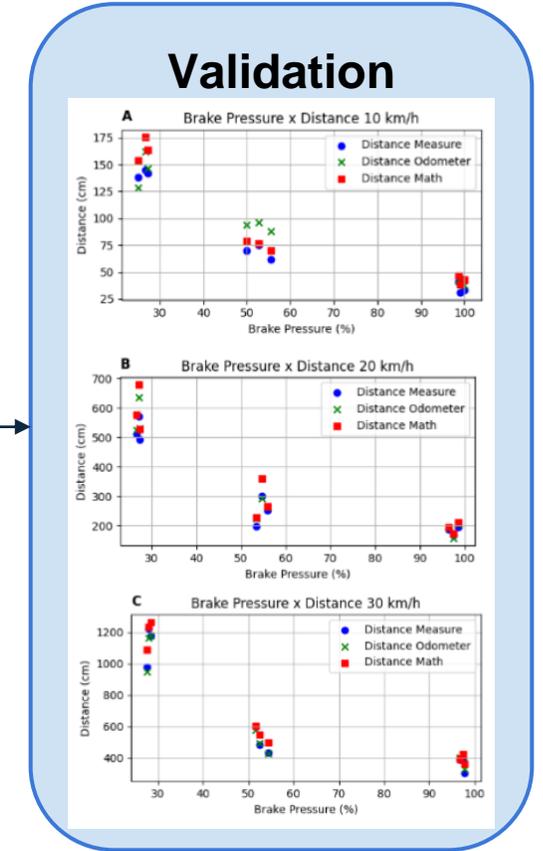
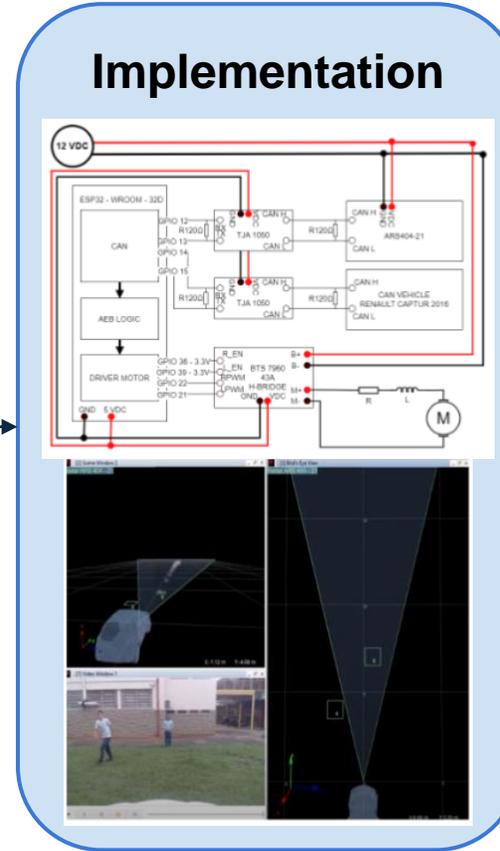
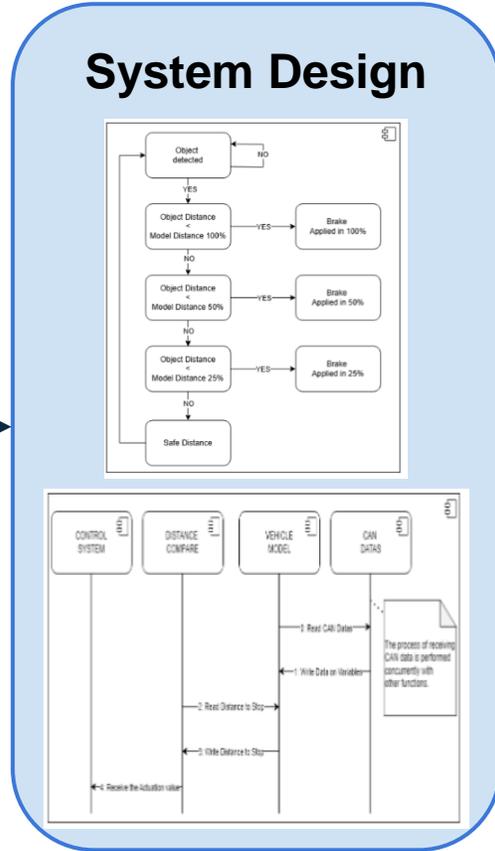
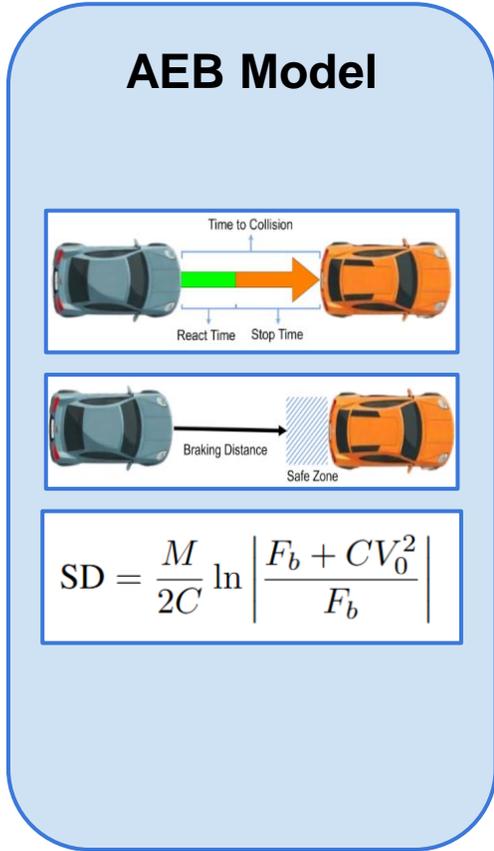
## 2. OBJECTIVE

- As the demand for Autonomous Emergency Braking (AEB) systems grows to help prevent collisions, their effectiveness increasingly depends on accurate obstacle detection and the real-time integration of vehicle dynamics data, ensuring that braking decisions are based on both what sensors see and how the car is currently behaving.



- Our goal is to design a new strategy to predict potential collisions using collision distance metrics accurately.

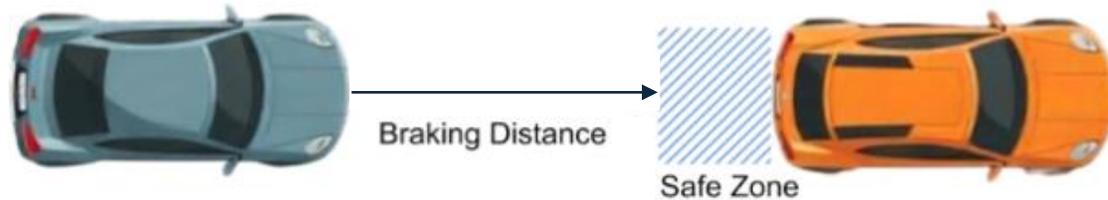
# 3. METHODOLOGY



## 4. AEB MODEL

Model developed using vehicle dynamics:

- ✓ Vehicle physical properties;
- ✓ Extracted data: Stopping Distance.



$$SD = \frac{M}{2C} \ln \left| \frac{F_b + CV_0^2}{F_b} \right|$$

SD - Stopping Distance

M - Mass of the vehicle

C - Aerodynamic drag coefficient

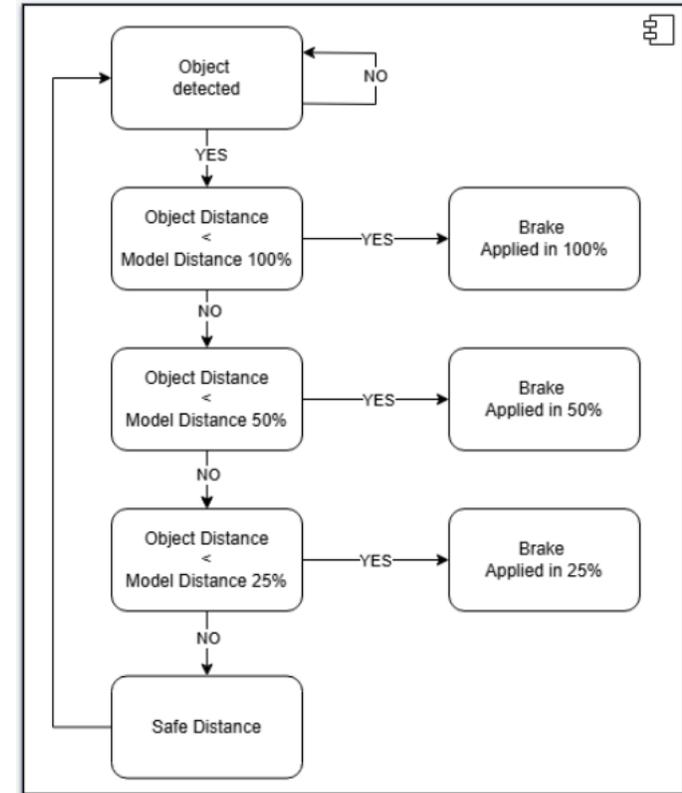
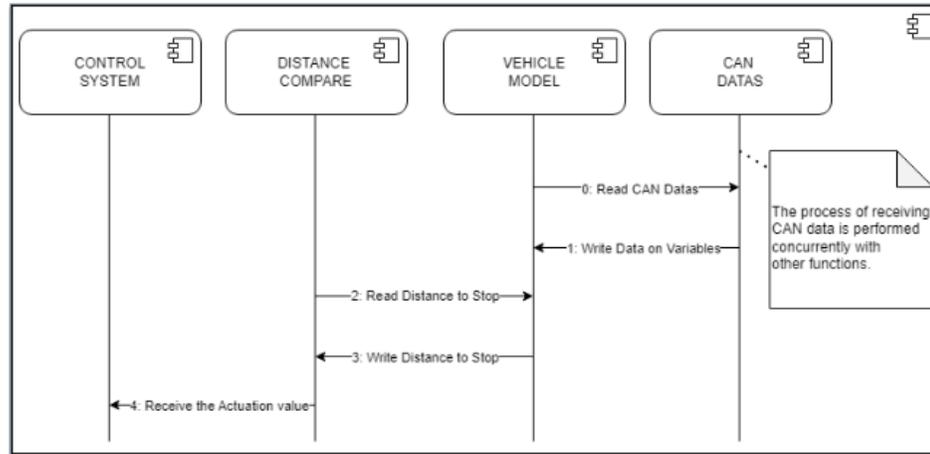
F<sub>b</sub> - Braking force

V - Initial velocity

# 5. SYSTEM DESING

System operation details:

- ✓ Interaction between software and hardware.
- ✓ Operation in parallel processing.

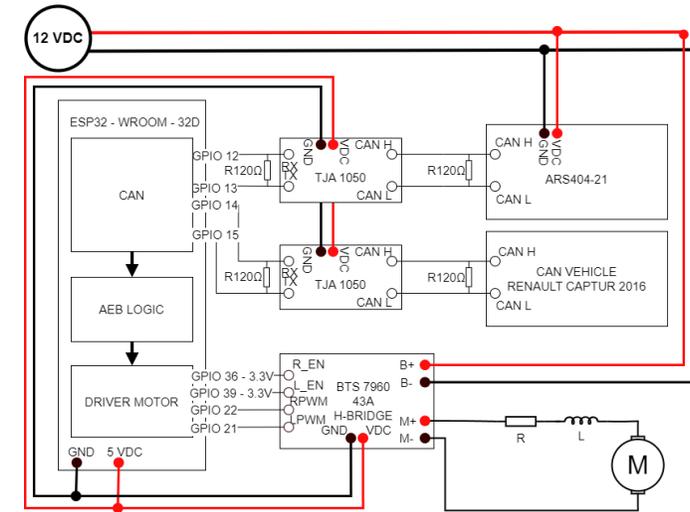
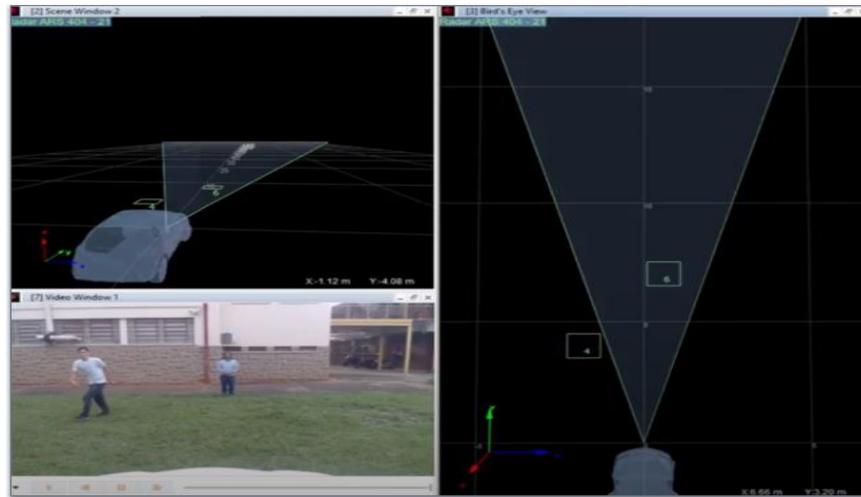


Objective: Detail the system's operation at the system level.

# 6. IMPLEMENTATION

Hardware and Software Implementation:

- ✓ Development of embedded hardware.
- ✓ Implementation of software for collision detection and prevention.

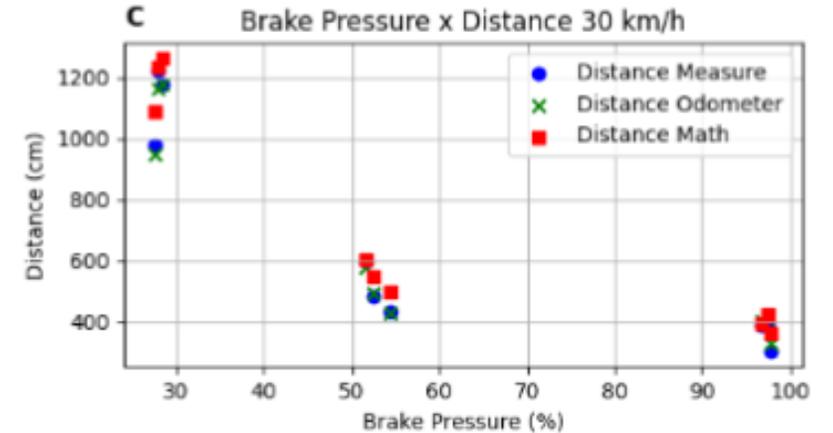
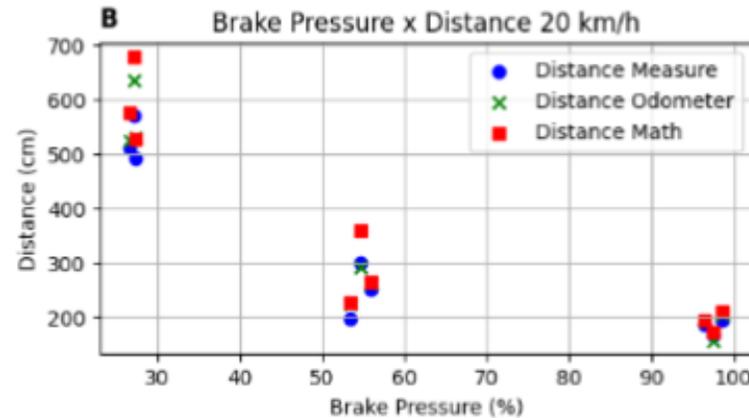
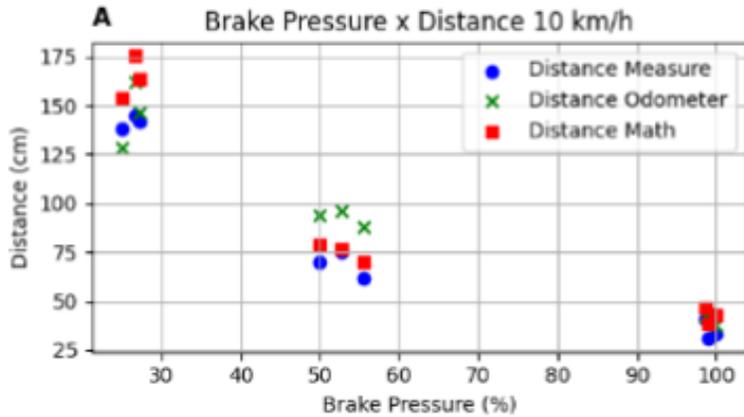


Objective: Develop an object detection system for collision prevention.

# 7. VALIDATION

Validation on hardware and Software:

- ✓ Perform test in real environment.
- ✓ Compare the results with measure and math datas.



Objective: Measure the accuracy of the mathematical model by comparing it with real-world results.

## 8. CONCLUSION

The validated model has been effective for collision distance in real vehicle.

### Future Work:

- ✓ Apply strategies for different types of vehicles;
- ✓ Scalability to more complex models with more variables;
- ✓ Integration of multiple sensors for detection;
- ✓ Tests for different scenarios.

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# REAL VEHICLES FOR TESTS



Renault CAPTUR, Jeep Renegade, and DAF Truck

# Q&A

