LDWS II

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OVERVIEW

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PROJECT DESCRIPTION

The objective of our project is to improve on the current technology of the Lane Departure Warning System (LDWS) by focusing on independence from lane markings.

BACKGROUND

- The alarming increase in number of accidents that occur as a result of cars deviating out of their lanes, has led to the development of a system that is able to prevent accidents of this nature through lane deviation monitoring and alerting.

- Statistics have shown that the 1.2million accidents that were reported in 2004 was reduced by about 23,200, due to the introduction of the Lane Departure Warning System, LDWS, by *Iteris* under the sponsorship of Nissan.

CURRENT STATE OF TECHNOLOGY

- **Technology**
  - Camera-based LDWS
- **Major Component**
  - Camera and an image processing unit.
- **Method**
  - Dependent on camera line of vision.
- **Weakness**
  - Camera is prone to adverse environmental conditions such as fog, severe rain and snow.

CURRENT STATE OF TECHNOLOGY contd.

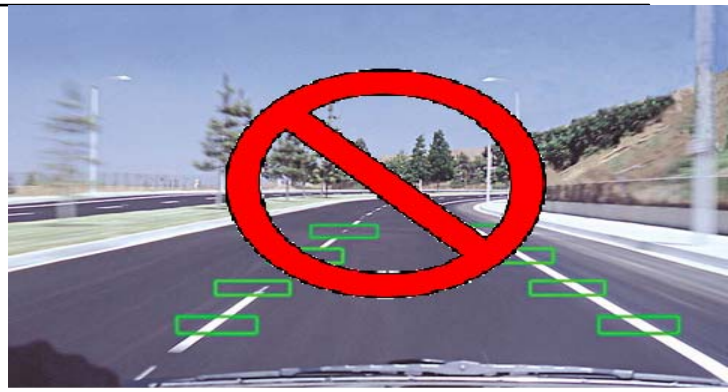
- **Technology**
  - Sensor-based LDWS

- **Major Component**
  - Sensors located underneath bumper

- **Method**
  - Dependent on lane markings on the road.

- **Weakness**
  - It is susceptible to damage due to the location of the sensors.
  - Sensors are unable to detect lane markings when lanes are covered in snow, mud or dirt.
  - Response time of driver

PERFORMANCE CRITERION



Our approach to the LDWS requires:

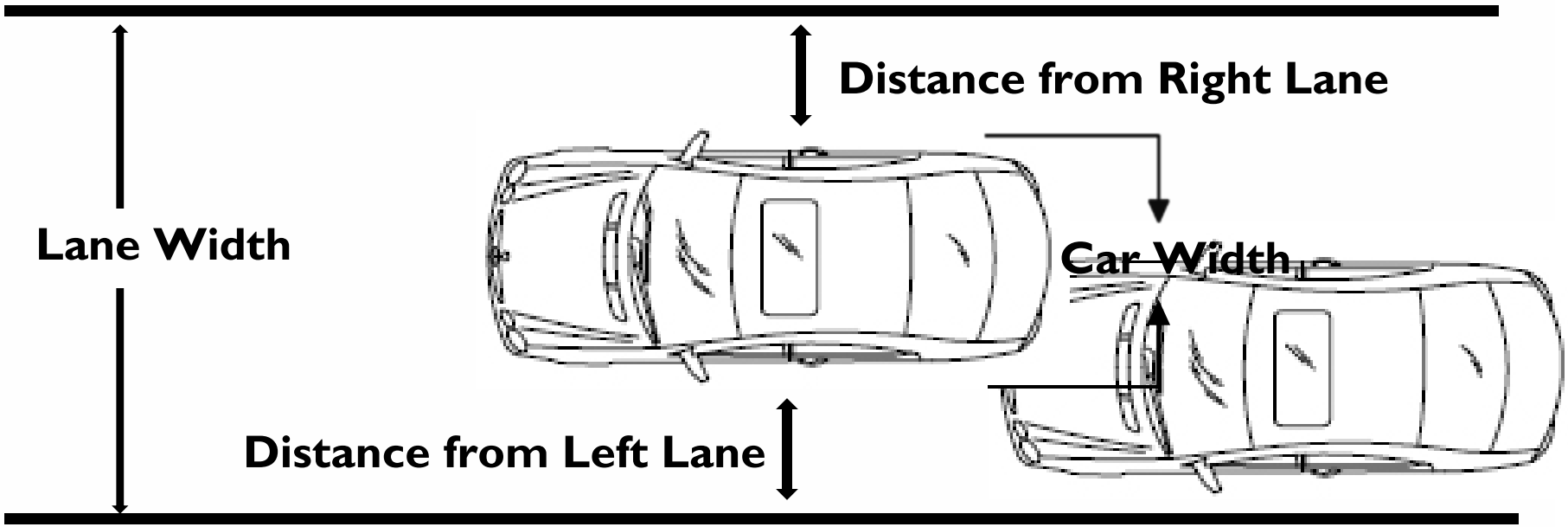
- No physical lane detection.
- Notify driver of impending lane departure.
- Deactivate warning when turn signal is active.
- Have a response time of 0.05seconds.
- Function effectively in all weather conditions.
- Deactivate system when vehicle speed is less than 10mph.
- Power consumption should be negligible

- Should meet the following SAE standards:
- J1455, “Joint SAE/ TMC Recommended Environmental
- Practices for Electronic Equipment Design”
- J1113, “Electromagnetic Compatibility Measurement
- Procedures and Limits for Vehicle Components”

SOLUTION ANALYSES

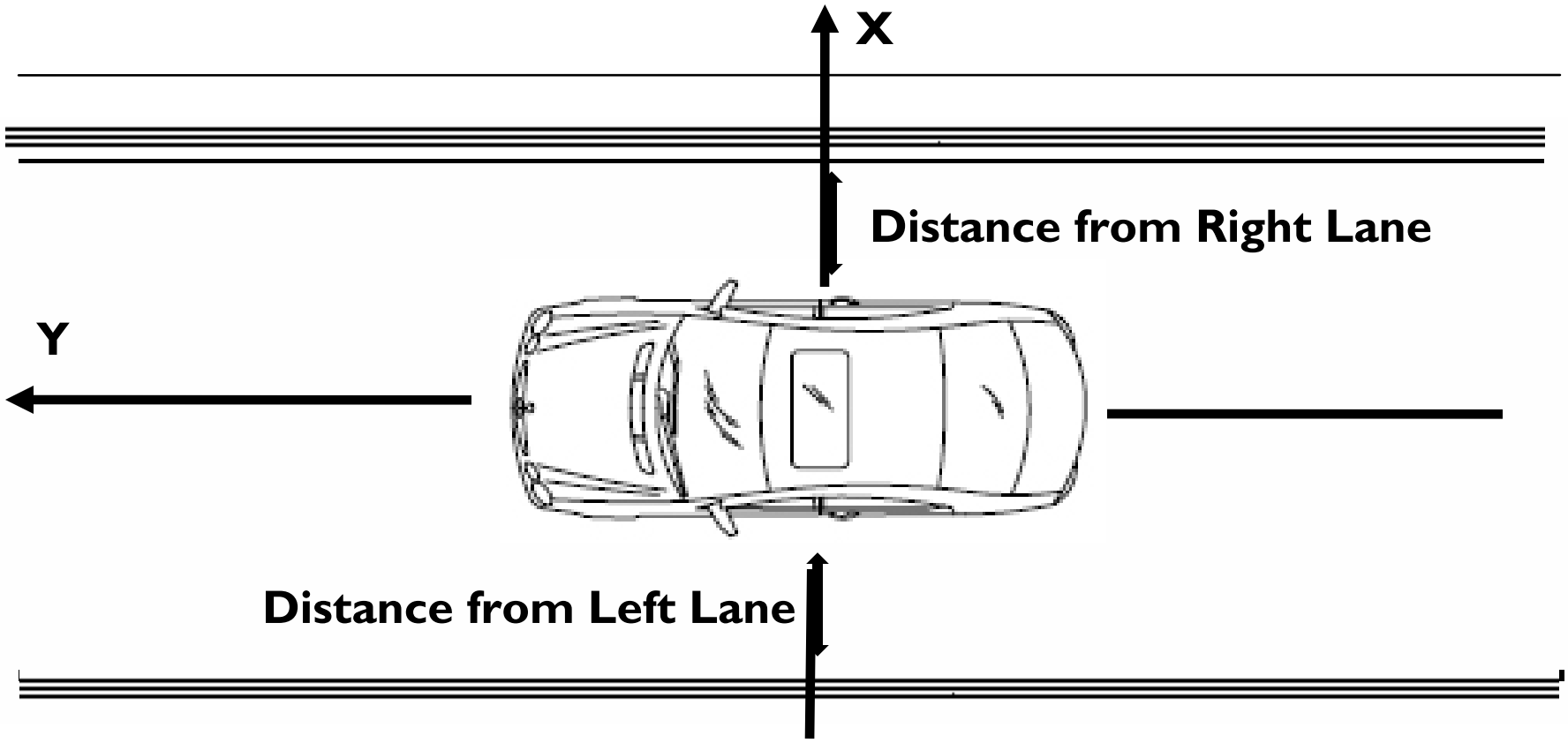
Comparison category	Single Camera Technology	Infra red Sensor Technology	Dual Side Camera Technology	Virtual Lane Markings
Method of Lane Detection	A camera situated at the rear-view mirror of the vehicle, allowing it to capture the images of the lane markings on the road	Infrared sensors that are placed at the bottom of the vehicles bumper. This enables the sensors to identify the lane markings.	Two cameras, each positioned at the side of the vehicle, at mid length.	Creates virtual lanes, which mirror actual lanes, using road lane width and width of the vehicle.
Dependent on Lane Markings	Yes	Yes	Yes	No
Susceptible to Damage	No	Yes	Yes	No
Restricted by the Weather	Yes	Yes	Yes	No
Forward-looking System	Yes	No	Yes	Yes

Solution Approach

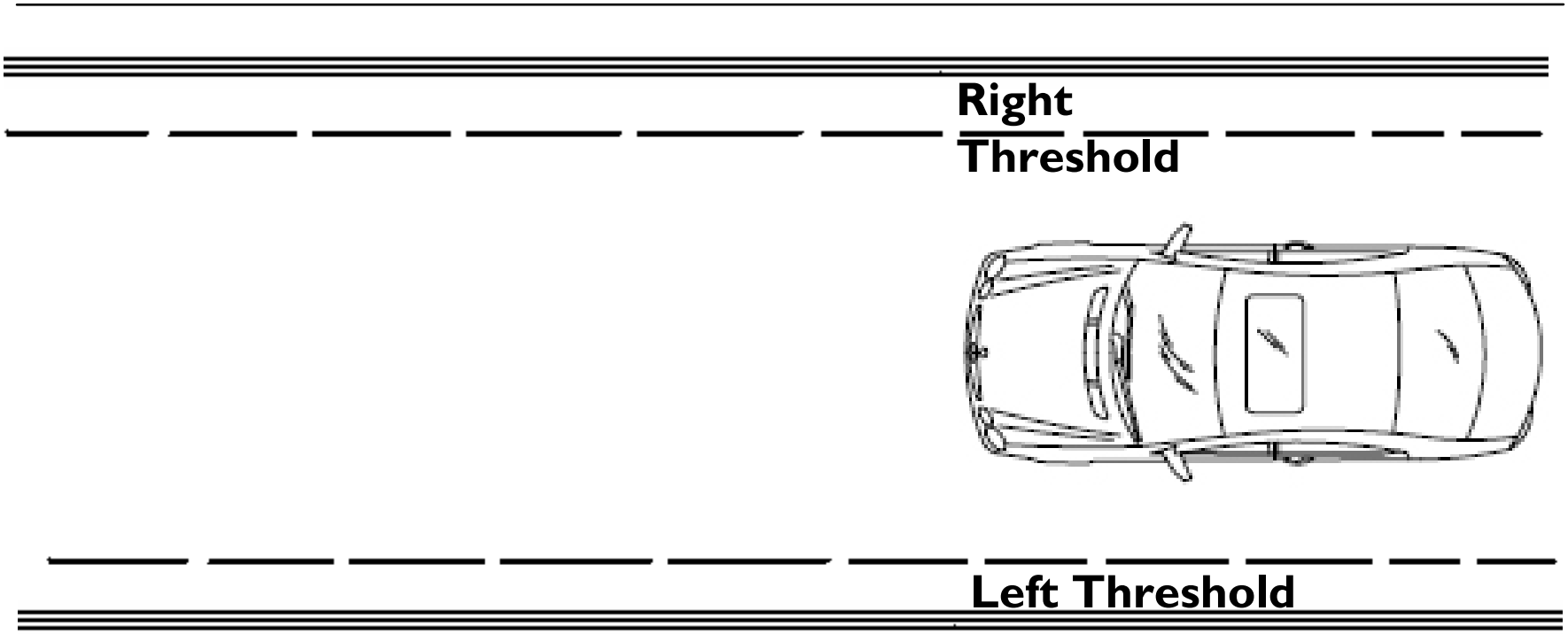


Car is not centered in the lane

Solution Approach

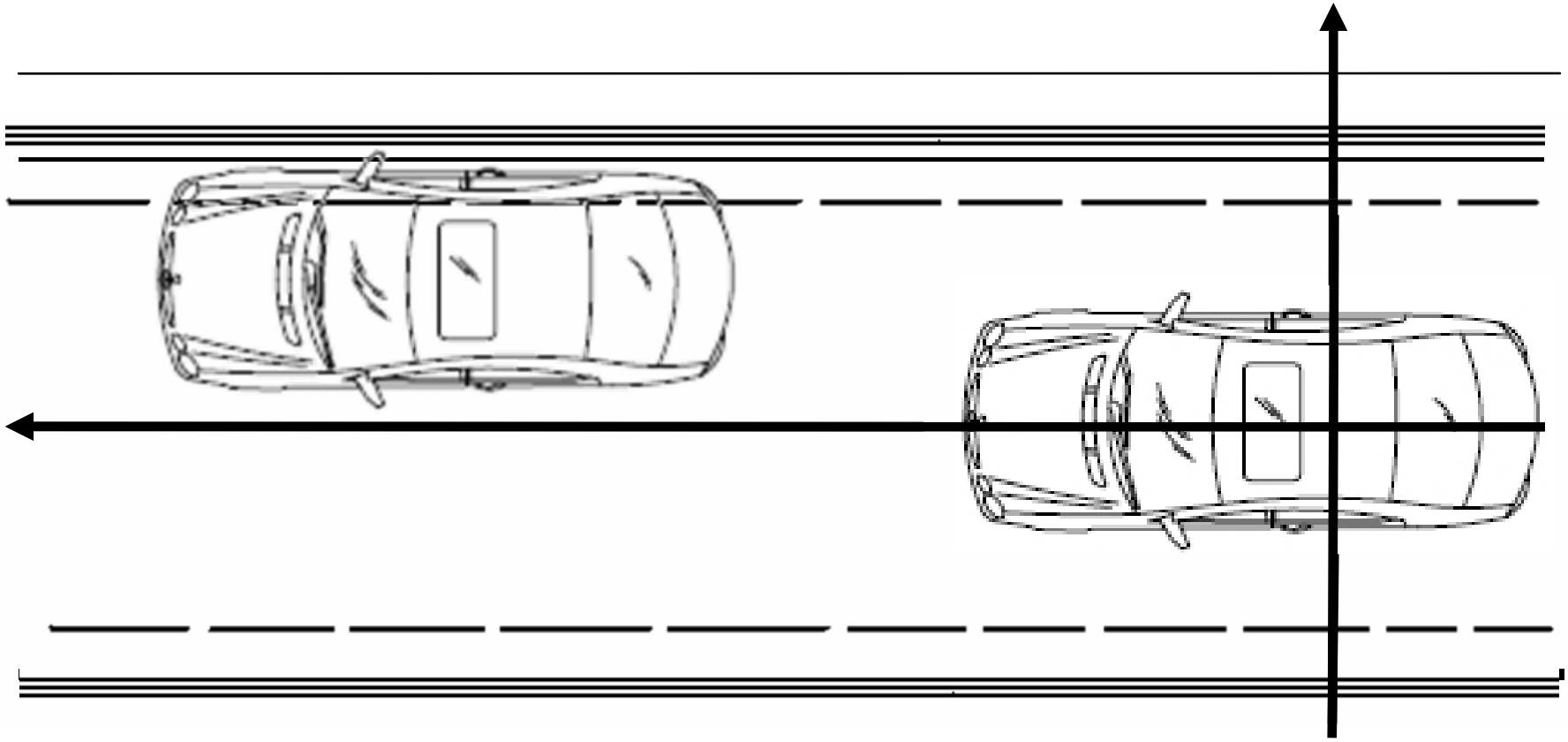


Solution Approach



System is forward-looking

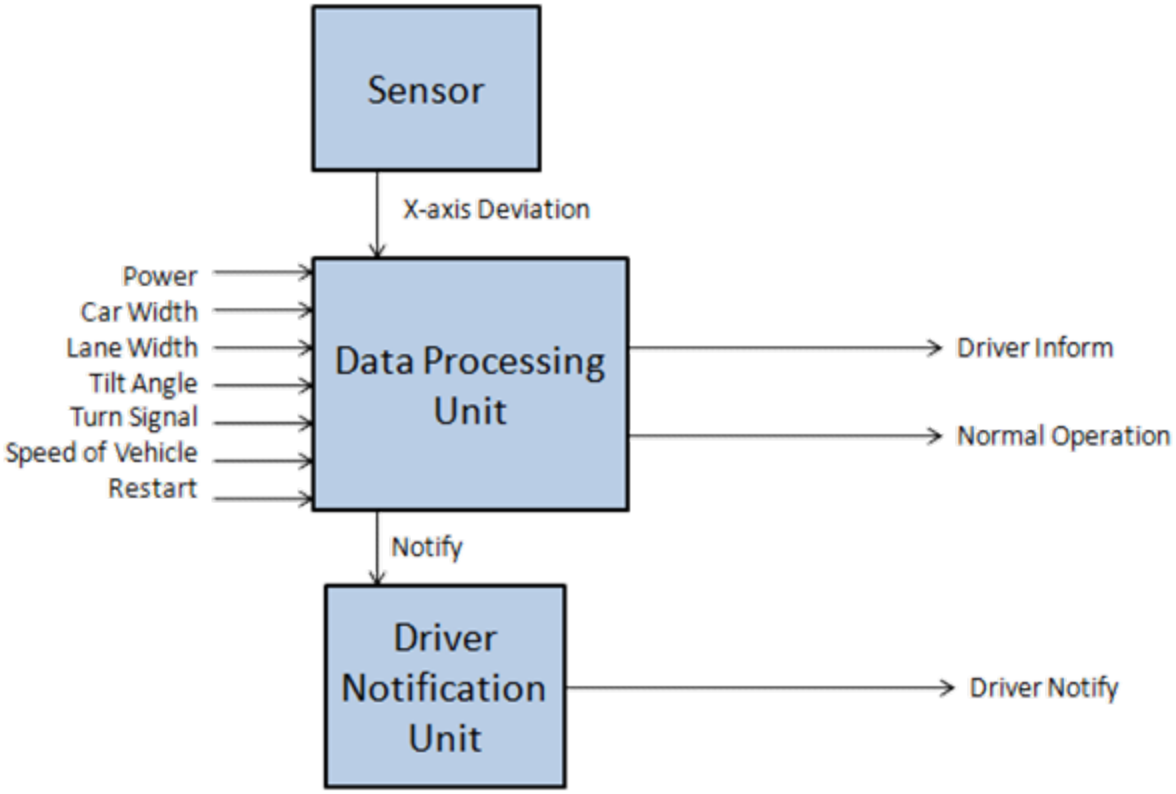
Solution Approach Recap



Driver is notified of unintended lane departure

Top Design Selection

Second Level Block Diagram



COMPARISON: DATA PROCESSING UNIT

Criteria	Weight	PIC Chip		FPGA	
Performance	0.15	8	**1.2**	8	**1.2**
Design	0.30	9	**2.7**	8	**2.4**
Cost	0.30	10	**3.0**	8	**2.4**
Compiler	0.15	8	**1.2**	9	**1.4**
Interface	0.10	8	**0.8**	9	**0.9**
Total	0.15		**8.9**		**8.3**

EVALUATION RESULT

- Result of extensive testing of C code
- Result of extensive testing of SPI (Accelerometer – PIC communication)

CONCLUSION

We strongly believe we have designed an effective Lane Departure Warning System that could be used in preventing road accidents due to unintended lane departure.

ACKNOWLEDGEMENT

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Questions

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