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車輛影像自動檢測系統

林昱成 (Yu-Chen Lin), Ph.D.
Davidlin@itri.org.tw

Safety Sensing & Control Department
Intelligent Mobility Technology Division
Mechanical and Systems Research Laboratories
Industrial Technology Research Institute

2014/04/30

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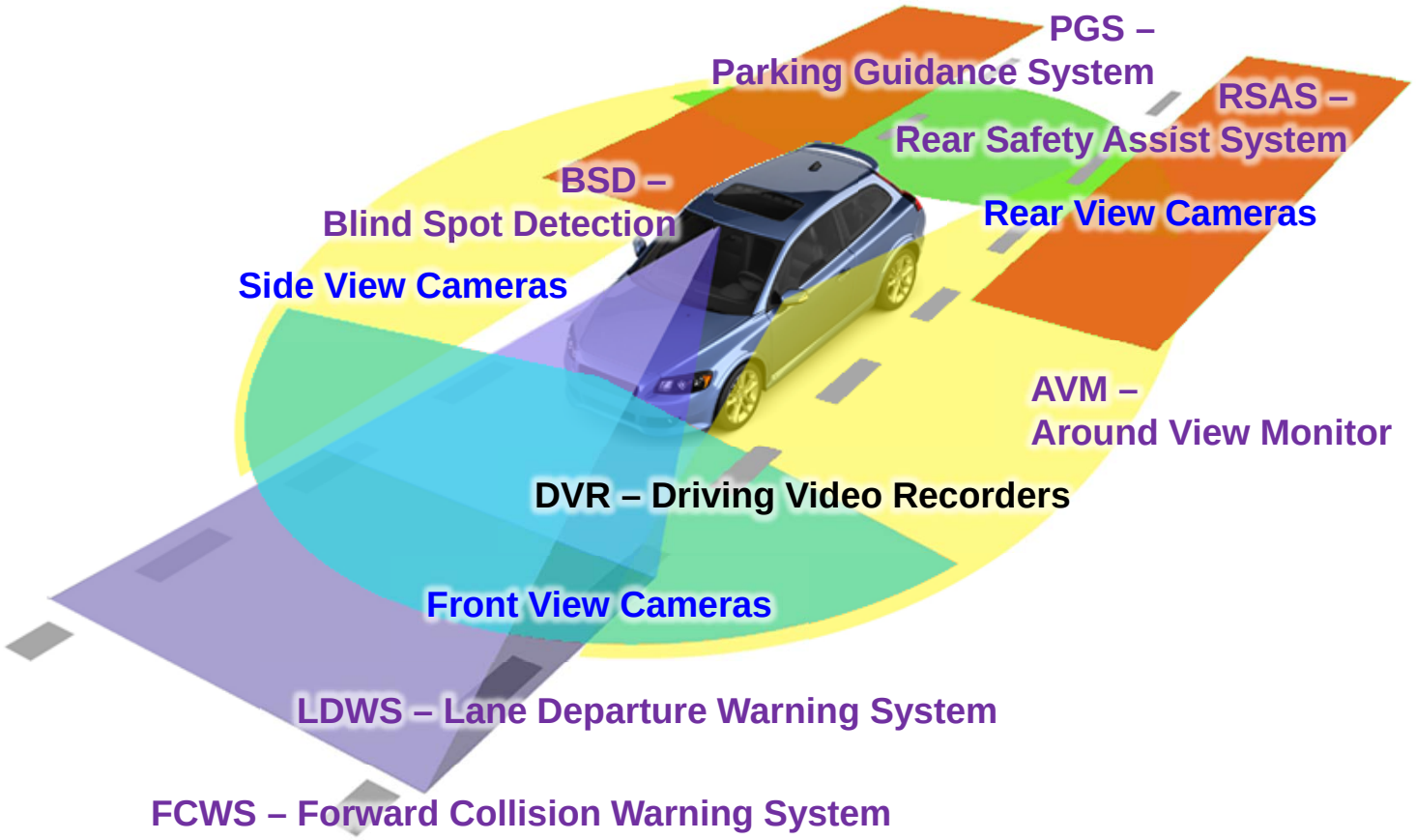
ADAS Application Development

ADAS ➔ Advanced Driver Assistance Systems



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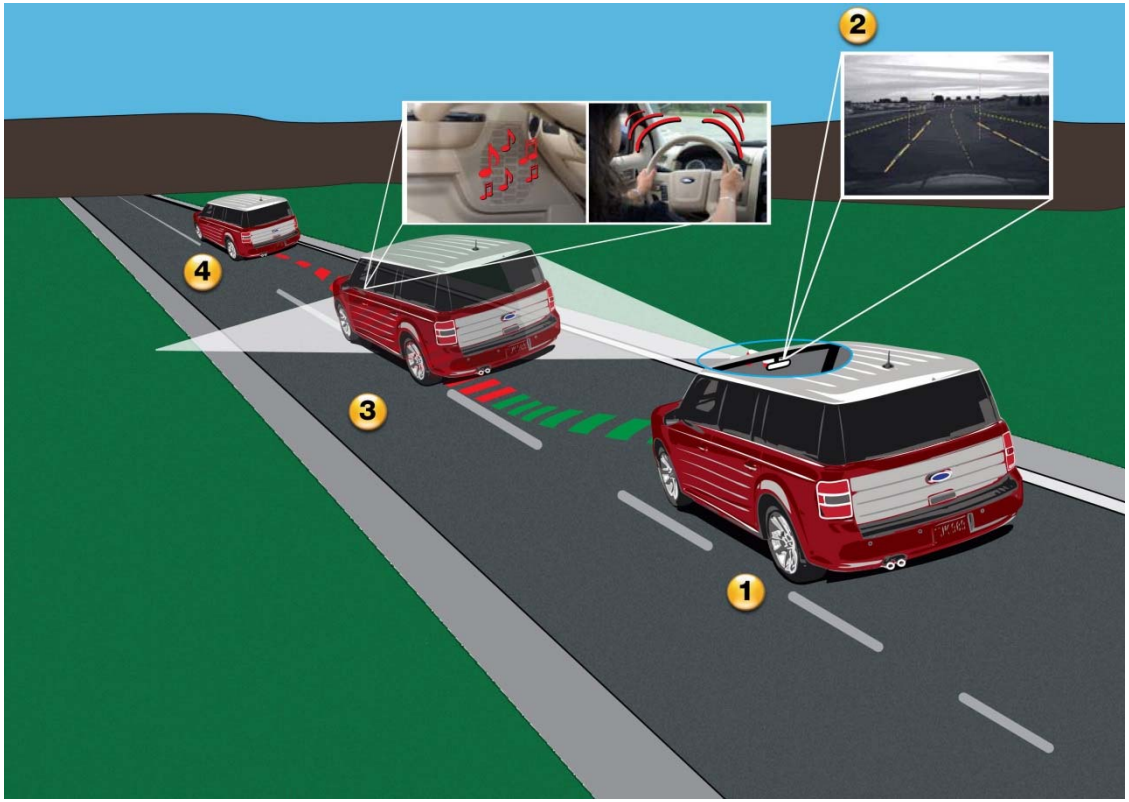
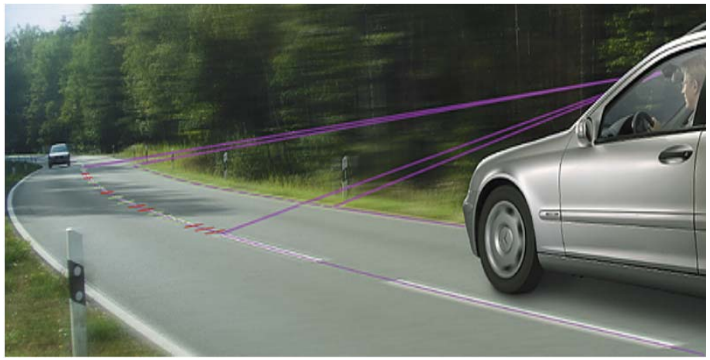
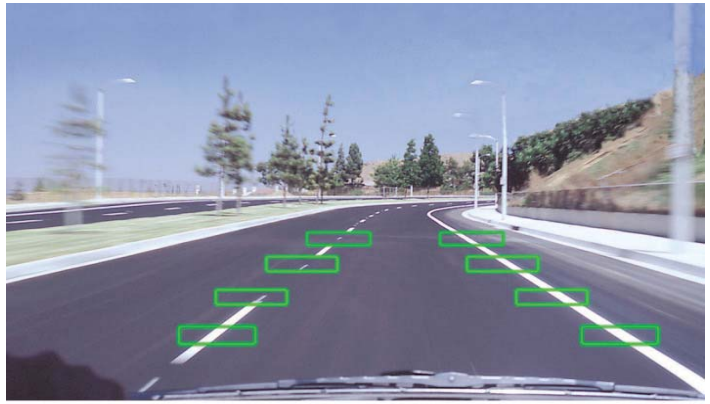
Lane Departure Warning System (LDWs)

- Camera-Based
- To warn the driver when vehicle begins to move out of its lane (unless a turn signal is on in that direction) on freeways.



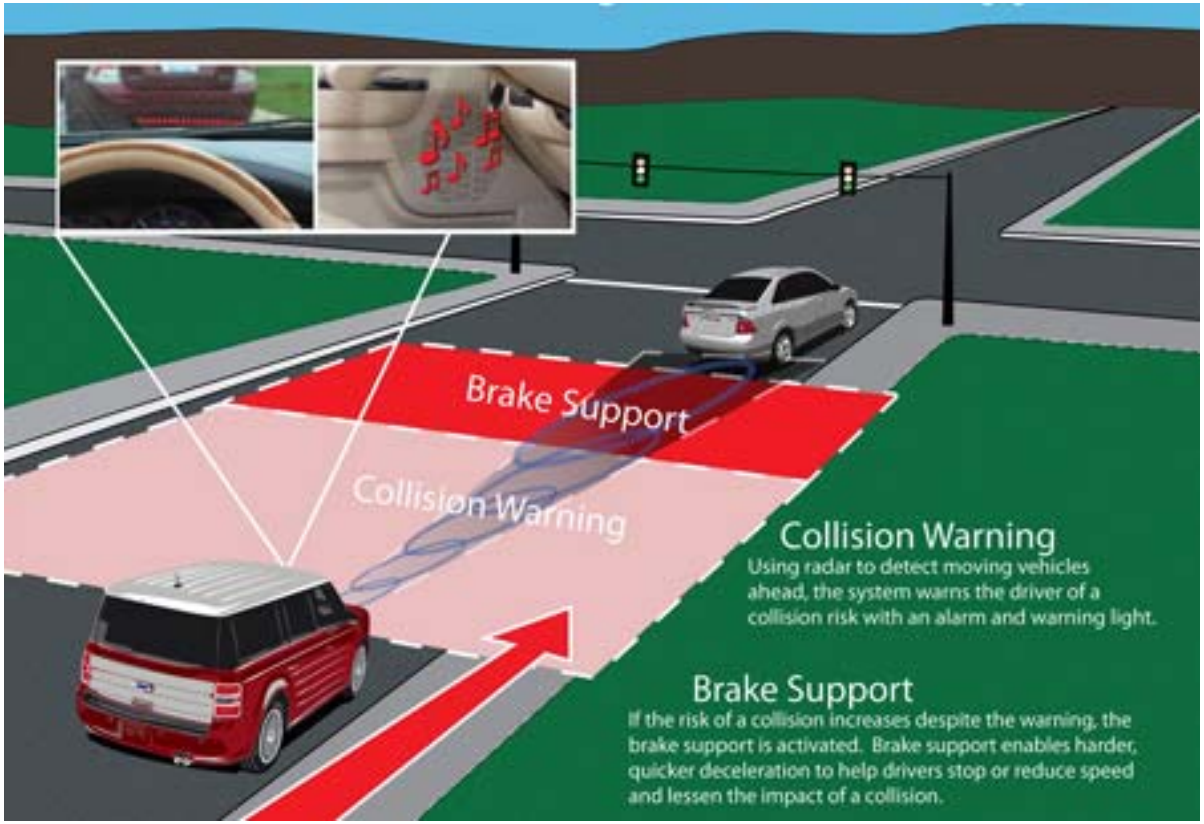


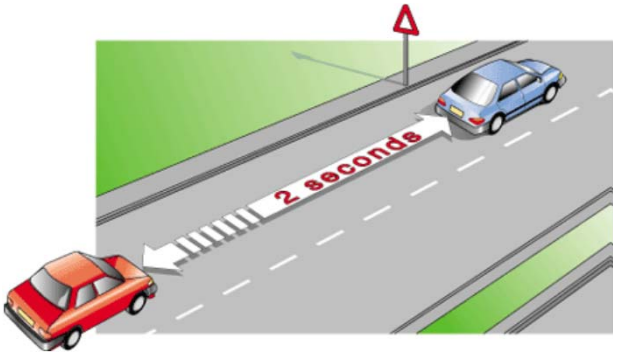


Camera's view of the road ahead as it tracks lane markings

Forward collision warning system (FCWs)

- Camera-based (+) radar Systems
- Forward collision warning system alerts the driver for the risk of a possible crash when the vehicle ahead is slowing or stopped.





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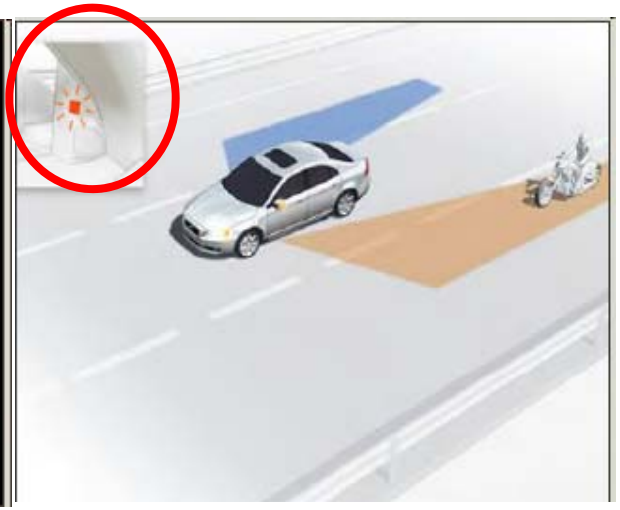
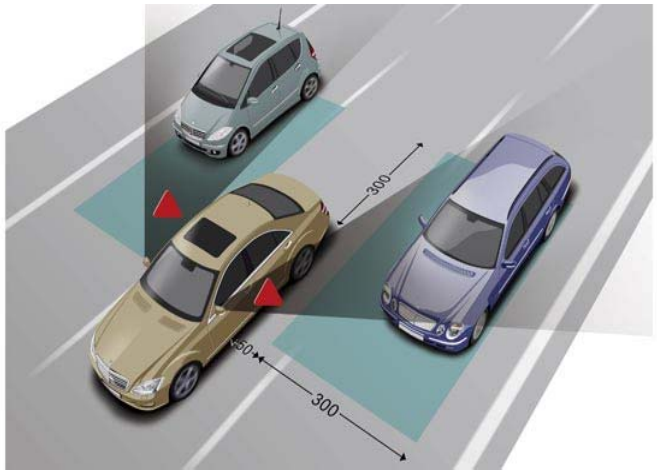
Blind Spot Detection System (BSD)

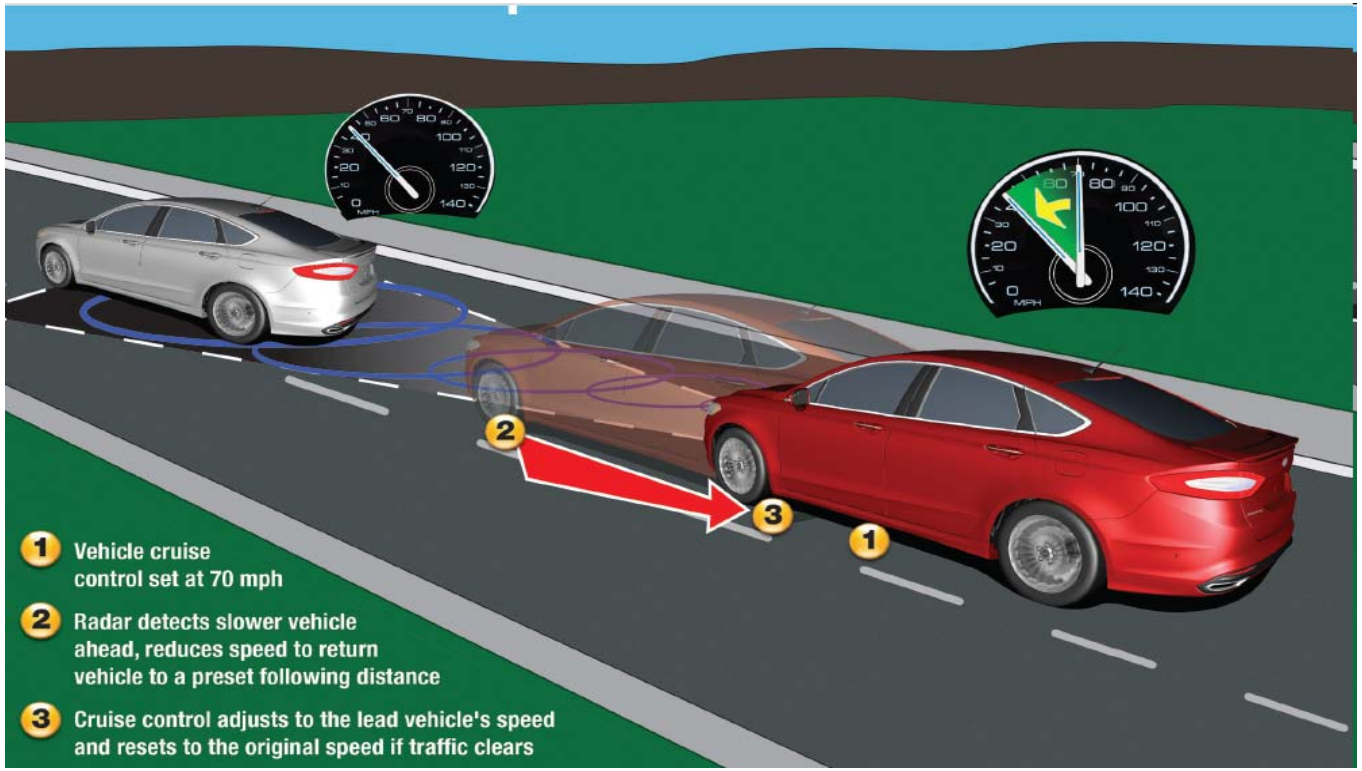
- Camera-based monitoring system.
- “Watches”the area alongside and to the offset rear of the car.
- The system alerts the driver both to cars approaching from behind and cars that have recently been overtaken.





Adaptive Cruise Control (ACC)

- Radar-Based
- Monitor the vehicle in front (up to 180m) and adjust the speed of the vehicle to keep it at a preset distance behind the lead vehicle
- Even in most **fog** and **rain** conditions.



Parking Guidance System (PGS)

- Camera-based or steering angle sensor
- Indicates driver with dynamic information on parking within controlled areas.

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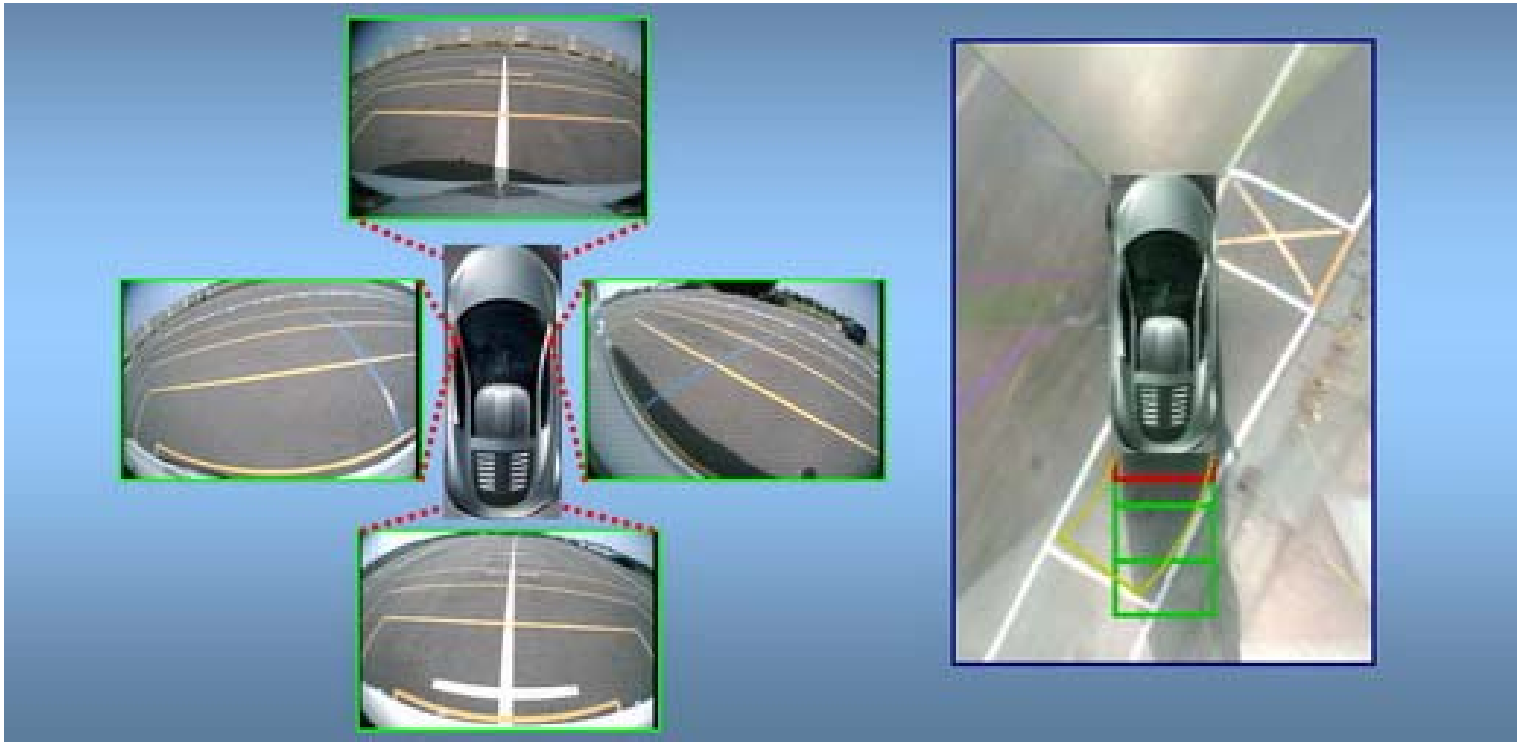
Around View Monitoring (AVM)

- Camera-based
- Display the top view of surrounding vehicle
- Help the driver to visually confirm the vehicle's relation to the lines around the parking space.



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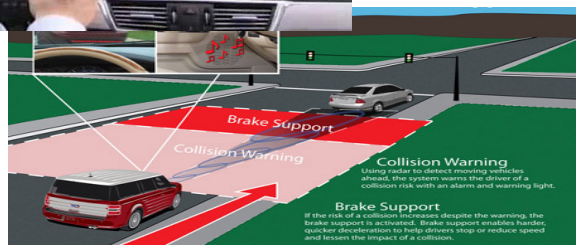
Forward Collision Warning Systems

~ Day & Night Time FCWs ~



Yu-Chen Lin
Researcher
Safety Sensing and Control Department
Intelligent Mobility Technology Division
Mechanical and Systems Research Laboratories (MSL)/ITRI

May 07, 2013

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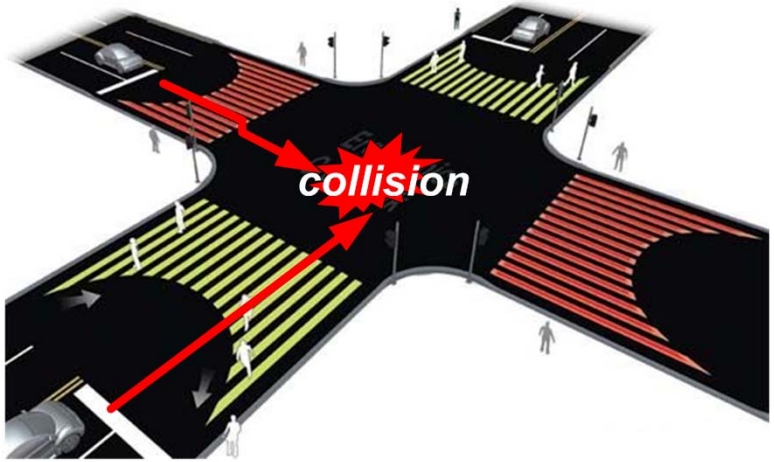
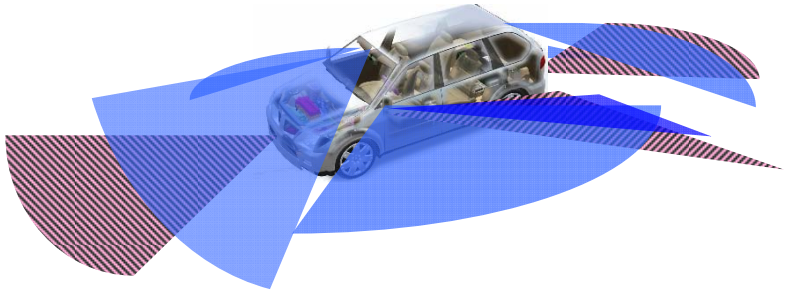
Safety Benefits

- Concept
  - Host vehicle can “See” front vehicles (**driver can’t see**)
  - Host vehicle knows roadway conditions that **you can’t**
  - Host vehicle knows the speed and position of approaching and dangerous vehicles





Vision / Radar

Rear-end Impact

- Vehicle collision from behind
  - Rapidly accelerates
  - Auto moves forward under occupant

- Forward collisions
  - Damage = Sum of both vehicles' speeds
- Rear-end collisions (**unpredictable !**)
  - Damage = Difference between two vehicles'

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Rear-end Crash = Forward Collision

- Collision Mitigation
  - Early warning to rear driver
  - Reduce collision impact speed
  - Reduce collision energy
  - Limited braking authority
  - Active protection system
  - **Timing is everything**

- **The Forward Collision Warning System (FCWs) will have a high potential in preventing rear-end accidents.**

Ref. by Mike Shulman-Ford Motor Company

FCW Systems

~ Forward Collision Warning Systems ~

- **Day**

- **Night**

What are the most significant “features” for vehicle recognition ?

Visual Displays :

- Day : **Shadow**, **Edge**, **Shape**, **Symmetry**
- Night : **Color**, **Intensity (gray-level)**, **Symmetry**, **Shape**

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Night FCW Systems

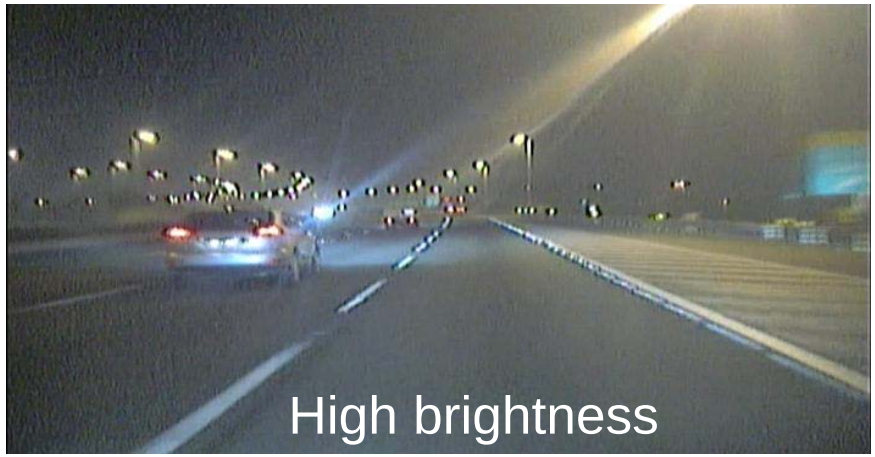
~ Night Forward Collision Warning Systems ~

- **Intentions : Nighttime Vehicle Detection Algorithm**
  - Visible light and color camera – **HDR Camera**
  - Lower contrast / higher noise
  - Major feature of the preceding vehicles : Taillight
  - Taillight detection : color, shape, lane filtering
  - Vehicle candidate extraction – Taillight Pairing (average gray-level, area ratio, aspect ratio)

Night FCW Systems

~ Night Forward Collision Warning Systems ~

- **Night Environment (Low illumination / Noise)**



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Future Development Tech.

~ Augmented Reality ~

Yu-Chen Lin
Researcher
Safety Sensing and Control Department
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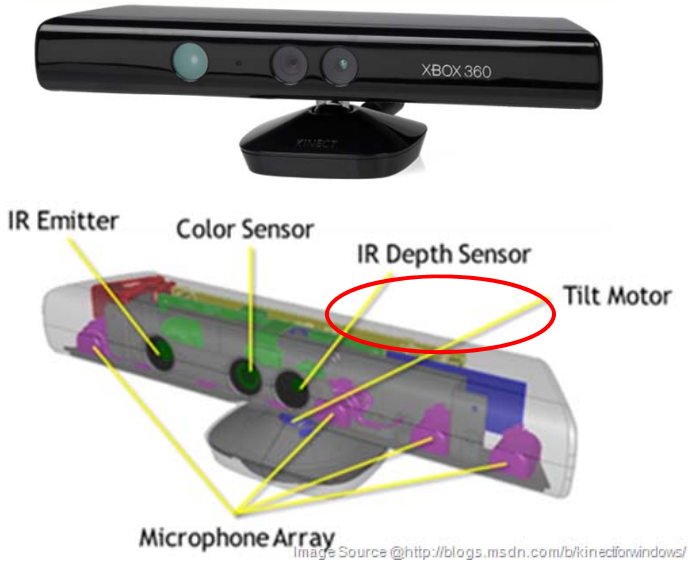
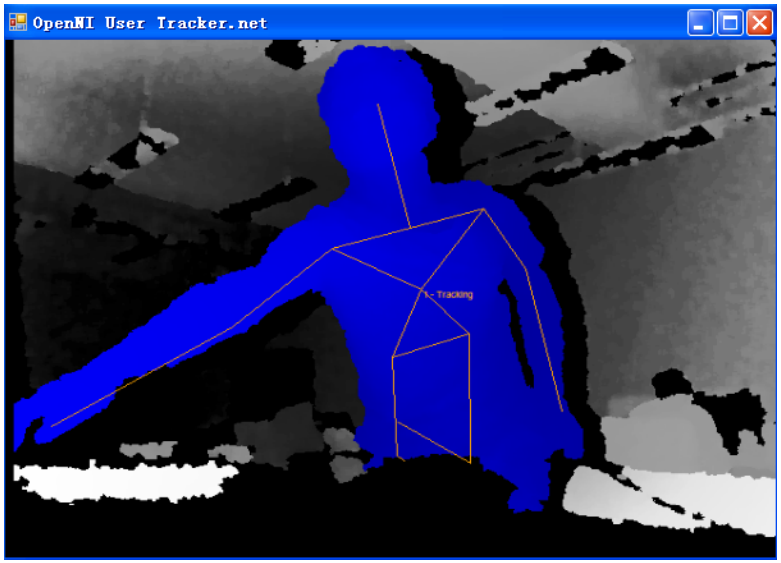
Infra Red Applications





Leap Motion (US 69.99)

Head Tracking - Wii

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Improved Head Tracking - AR

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Global Champion of 2010~2011

~ European Satellite Navigation Competition ~

- Two 3D Level Augmented Reality Navigation (2010) and Mapping for Citizens and Military (2011)

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AR-HUD Car Navigation System

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Thank you for your attention

No one will be injured or killed in the future…