

DEBRA: Digital Emergency Brake Response Alert System

Charvak Karpe
Nathan Ackerman
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DEBRA

- Actually 2 different systems
 - Improving highway safety
 - Measuring car performance

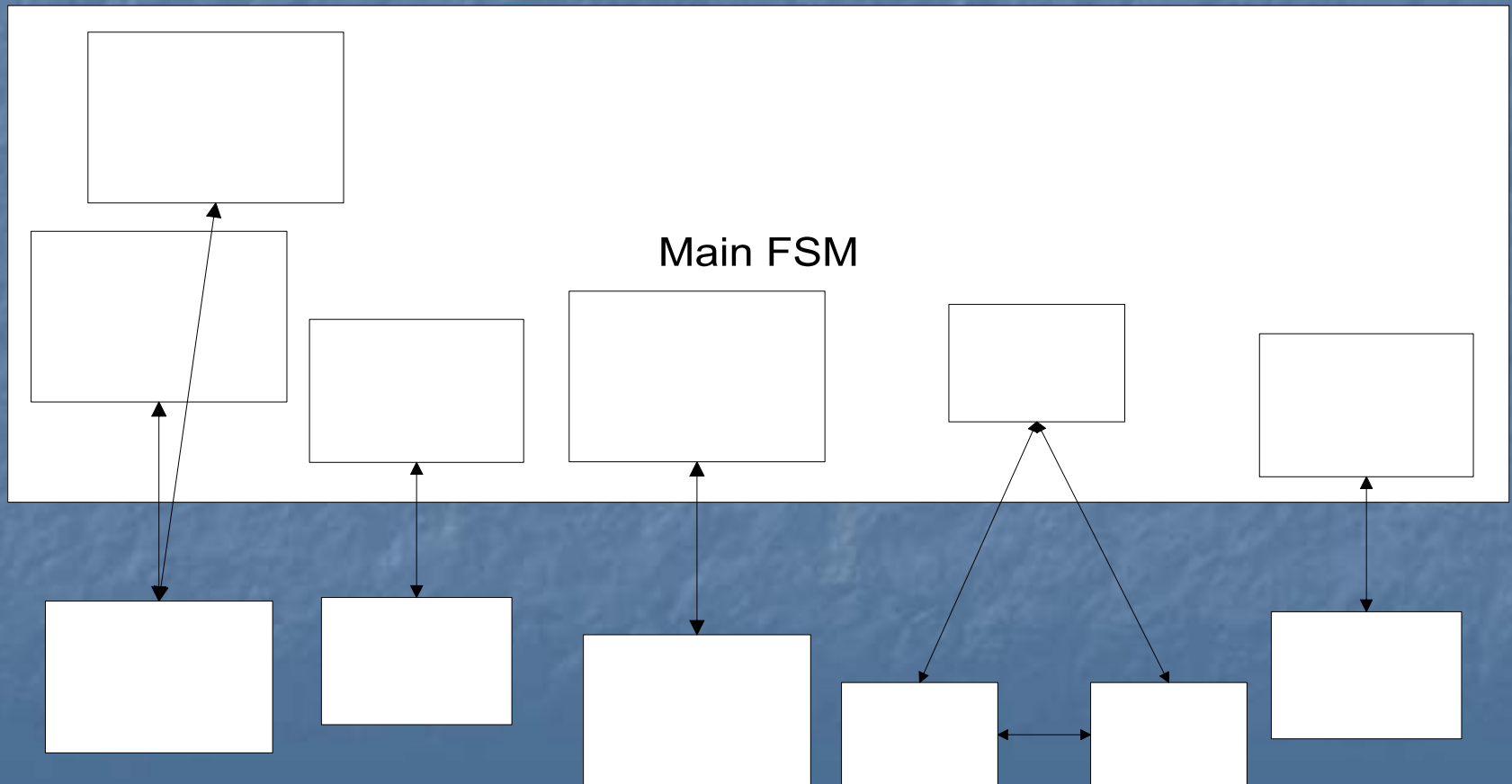
Problem: Cars Crash

- Approximately 1.5 Million rear endings each year
 - Rear ending ~23% of all accidents
 - 2,000 deaths
 - ~950,000 injuries.
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- Let's make a distinction between fast braking and slow braking vehicles!

DEBRA paradigm

- Fast braking vehicles (FBV) realize they are braking quickly
- FBV sends visual and RF warning to other cars
 - FBV flashes brake lights instead of constant on during periods of high deceleration
 - FBV sends RF information to other cars notifying them of deceleration
- Surrounding cars react
 - Drivers observe attention grabbing brake pattern
 - Units in other cars listen for RF and play audio warning to drivers of FBV in vicinity

Functional Diagram



Accelerometer Module

- Acceleration = $\sqrt{x^2+y^2-1}$
- Braking = $[x \ y]^* [xr; yr]$
- Operating frequency = 20Hz to block vibrations.
- Tests: 0-60mph, braking, $\frac{1}{4}$ mile, open time.

Performance Interface

- LCD display in cockpit.
- Press 0-60 button to begin test.
- Timer starts automatically when acceleration is detected.
- Acceleration is integrated once to get velocity.
- Test stops when velocity reaches 60.

Quarter Mile

- Push button to start test.
- Acceleration is integrated twice to get distance.
- Timer starts when acceleration is detected and stops when integrated distance is at least $\frac{1}{4}$ mile.

Braking Test

- User brings vehicle to desired start speed (e.g. 60 mph), then presses brake test button.
- Timer starts when braking is detected, stops when braking stops.
- Dual integral of acceleration provides distance output.

Toys

