

# **The AutoEye™ Mark 1 Vehicle Rear View Camera Vision system.**

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# Outline

- Motivation
- Approach
- Results

## Safety – Road Users due to Side Mirrors

- Wing mirrors protrude from the vehicle
- Some trucks and vehicles towing caravans have mirrors far out from the body of the vehicle on outriggers
- Pedestrians and cyclists can be knocked unconscious by the wing mirrors on moving vehicles

## Safety – Road Users due to Side Mirrors

- There have been three recorded deaths of cyclists and motorcyclists from rear view side mirrors.
- Five cases of serious isolated head injury inflicted on children

**Two fatal bicyclist injuries from extended rear view mirrors. Fife D, Davis J, Tate L. *J Trauma* 1983;8:756–7.**

**Fatal motorcyclist injury from a hinged and rounded rearview mirror. Fife D . *Am J Emerg Med* 1989;7 (3) :300–1**

**Serious paediatric head trauma caused by vehicle rear view mirrors  
R Mobasher, B Chitnavis and G Bhattee *Emerg Med J* 2005; 22:455-456**

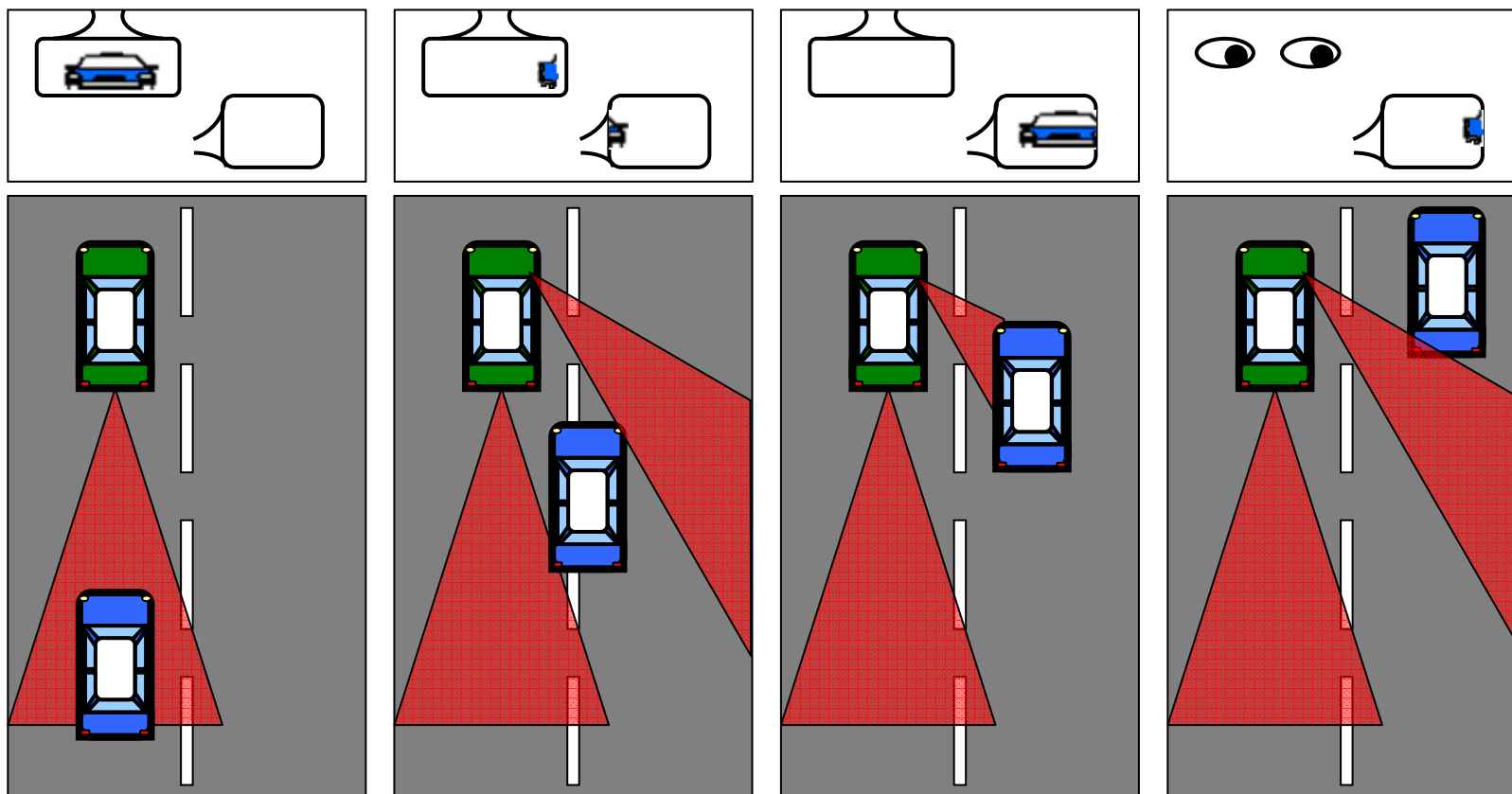
## Safety – Mirror Damage

- In car parks the wing mirrors can be damaged by supermarket trolleys being pushed between cars
- When reversing next to the corner of a wall the wing mirror can be knocked off.
- Some cars now have motorised wing mirrors so that they can be turned to lie closer to the car body but
  - some protrusion
  - motorised elements have reduced lifetimes
  - more costly

## Safety – Side Blind Spots

- There are several blind spots that the driver cannot see using conventional wing mirrors.
- One of the most dangerous for overtaking motorcyclists being beside the driver.
- Supplemental curved mirrors are sometimes added to provide a wider field of view but the image is distorted
- Sometimes a convex circular mirror is glued to an existing mirror, sometimes the existing mirror is curved at its furthestmost edge from the car body.

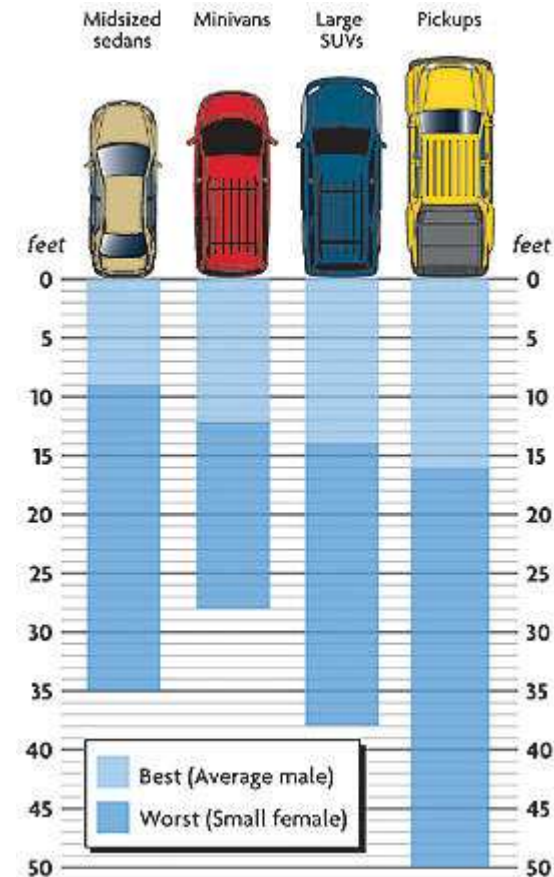
# Safety – Side Blind Spot



# Safety – Rear Blind Spot

- Busses, Trucks, Vans cannot see behind.
- More than 71,000 pedestrians injured every year by motor vehicles in the US.
- At least 50 children are backed over every WEEK in the US.
- 6,637 Children Injured by vehicles in the UK since 01 Jan 2007.

Provided courtesy of  
<http://www.consumerreports.org>,  
<http://www.uk-roadsafety.co.uk/> and  
[www.kidsandcars.org](http://www.kidsandcars.org)



28 inch cone visibility behind vehicles



## Efficiency and Style

- Wing mirrors cause air resistance and reduce power efficiency
- A curved back to the wing mirror improves the streamlining but still causes significant air resistance and loss of fuel efficiency.
- Protruding wing mirrors do not lend themselves to a sleek, smooth, streamlined style.
- Fuel efficiency is becoming important due to sustainability

## The AutoEye™ Solution

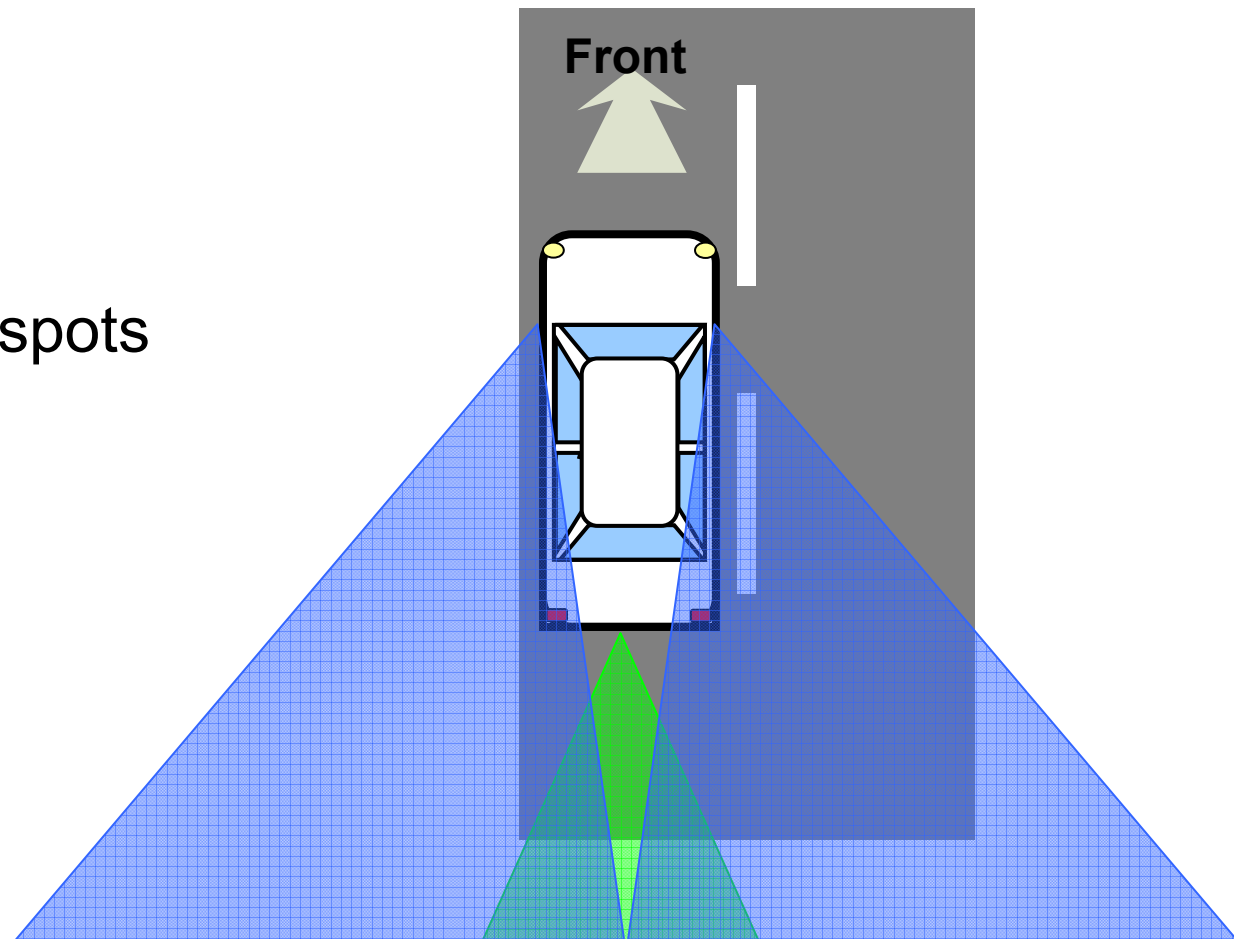
- Replace the wing mirrors and central rear view mirror by video cameras.
- CCD and CMOS Video cameras are reducing in cost due to widespread usage in mobile phones and webcams.
- The real time video feeds are presented to the driver on a flat panel display on the dashboard.
- Some companies are replacing instrument dials by flat panel displays showing instrument dials on the dashboard

## The AutoEye™ Solution

- The real time images are seamlessly merged into a single image of the rear view from the vehicle
  - aids the driver's rapid appreciation of the vehicles environment.
  - Can remove blind spots

## The AutoEye™ Camera Rear View

- Reduced blind spots



## Problems that must be Considered

- Choice of camera quality/cost
- Need low latent delay from camera to display
- Need real time alignment and merging of images
- Parallax and perspective due to camera lateral separation
- Scale differences due to camera longitudinal separation
- Distortion due to wide angle camera lens
- Different characteristics of different cameras
- Vibration, roll, pitch, yaw of cameras

## A Panoramic View from a Single Viewpoint



- Result of merging several photos
- One camera at a single point rotated to several angles
- As seen from a single viewpoint

## A Wide View from Several Viewpoints



- Result of merging several photographs
- Several cameras at different points at fixed angles.
- Cannot be seen from any single viewpoint

# Demonstrations of AutoEye™ Mark 1 System

- Off-line Image Synthesis Demonstration
  - City and Countryside views
- Real-time Image Synthesis Demonstration
  - Live on demonstration stand



