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

David R. Selviah, Kai Wang and Martin Richards*
Department of Electronic and Electrical Engineering
University College London
E-Mail: d.selviah@ee.ucl.ac.uk
Phone: 020 7679 3056
* AutoEye™ Limited
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

Serious paediatric head trauma caused by vehicle rear view mirrors
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 furthermost 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-roadsafty.co.uk/ and
www.kidsandcars.org
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