The Evolution of Video Vehicle Detection

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Solutions for Smart Cities of All Sizes

Agenda

Applications of Vehicle Detection

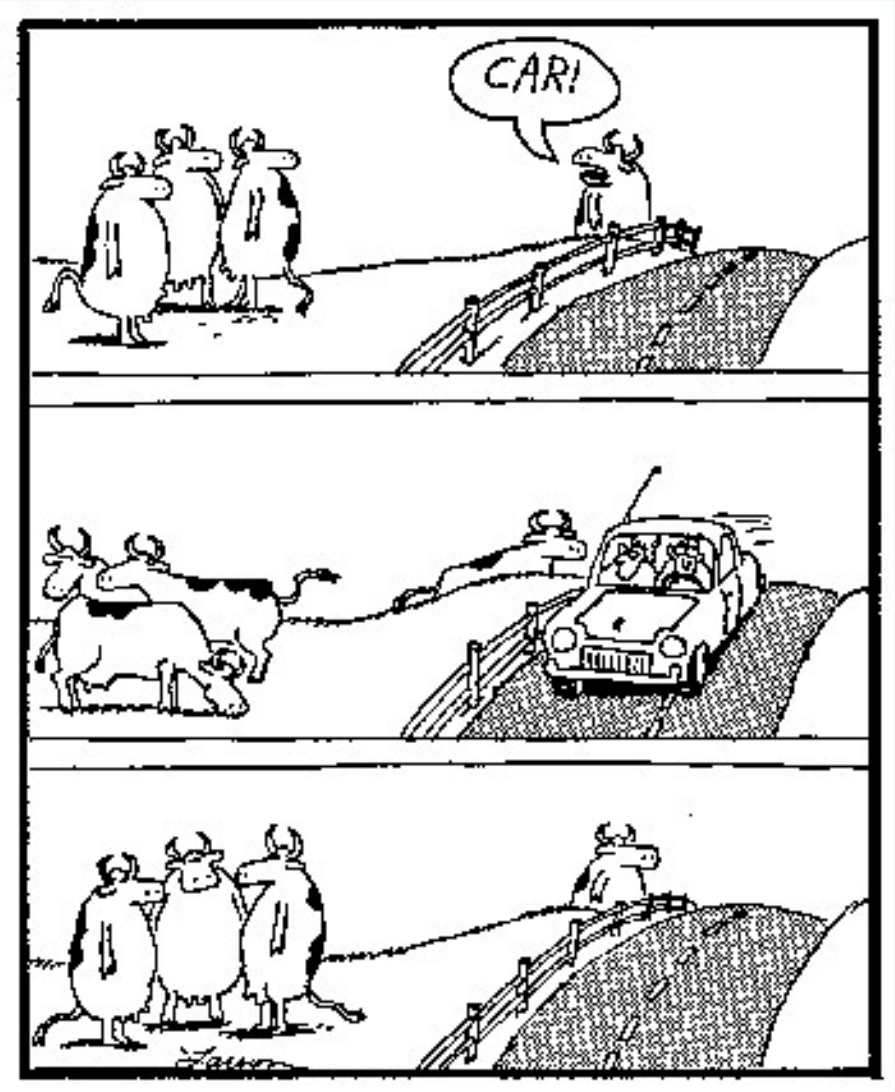
Loops and Video / Technology comparison

3D Omni-directional tracking technology

Vehicle Detection Technology

Applications of Vehicle Detection Technology

- Stopbar Detection
- Advance Detection
- Traffic Data Collection
- Incident Detection & Response
- Situational Awareness

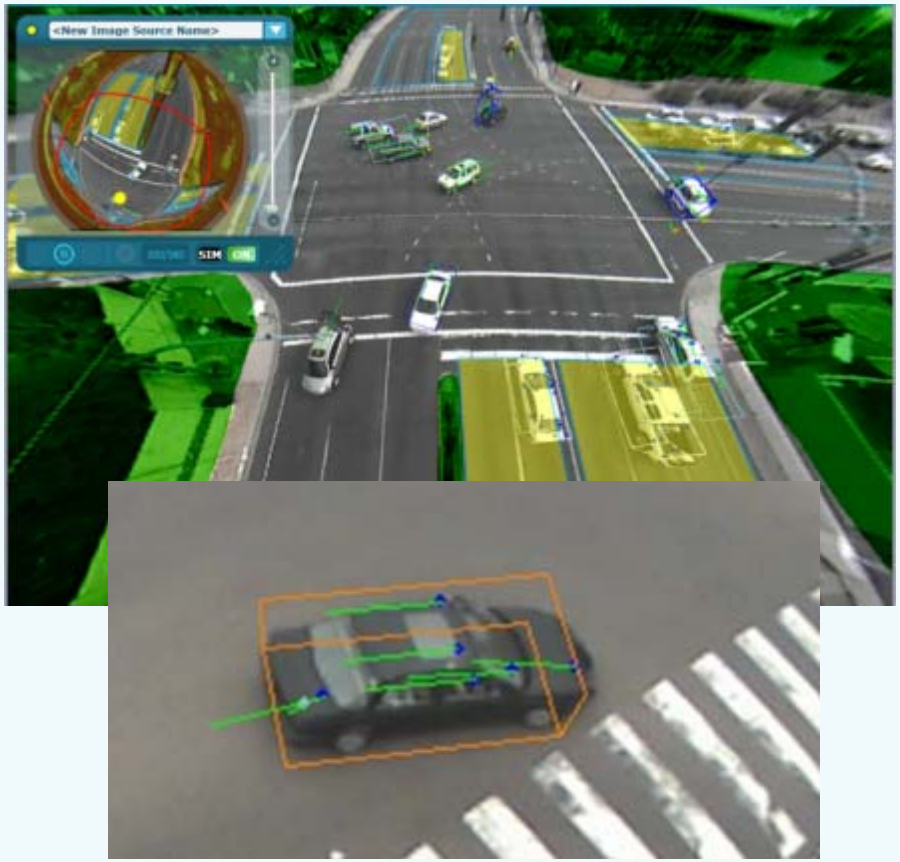


Evolution of Detection Technology

In the Beginning - Loops

1st Generation Video

2nd Generation Video – 3D Omni-Directional Tracking



Loops

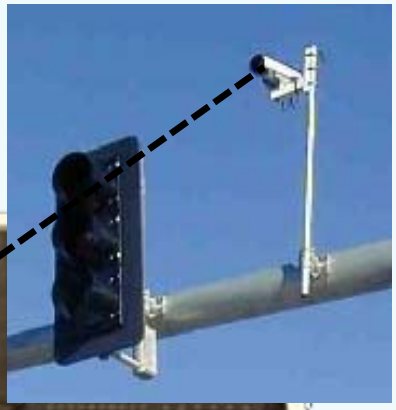
Accurate & Effective…BUT

- Multiple loops / intersection
- Multiple lane closures
- Longest install time (>24 hours for full intersection)
- Maintenance
- Limited life
- No “vision”

1st Generation Video

Non-intrusive, BUT…

- Hardware centric
- Lengthy Installation
- Limited “vision” – looks primarily at pixel changes within a region (tripline)
- Historical issues with shadows and occlusion



2nd Generation – 3D Omni Directional Tracking

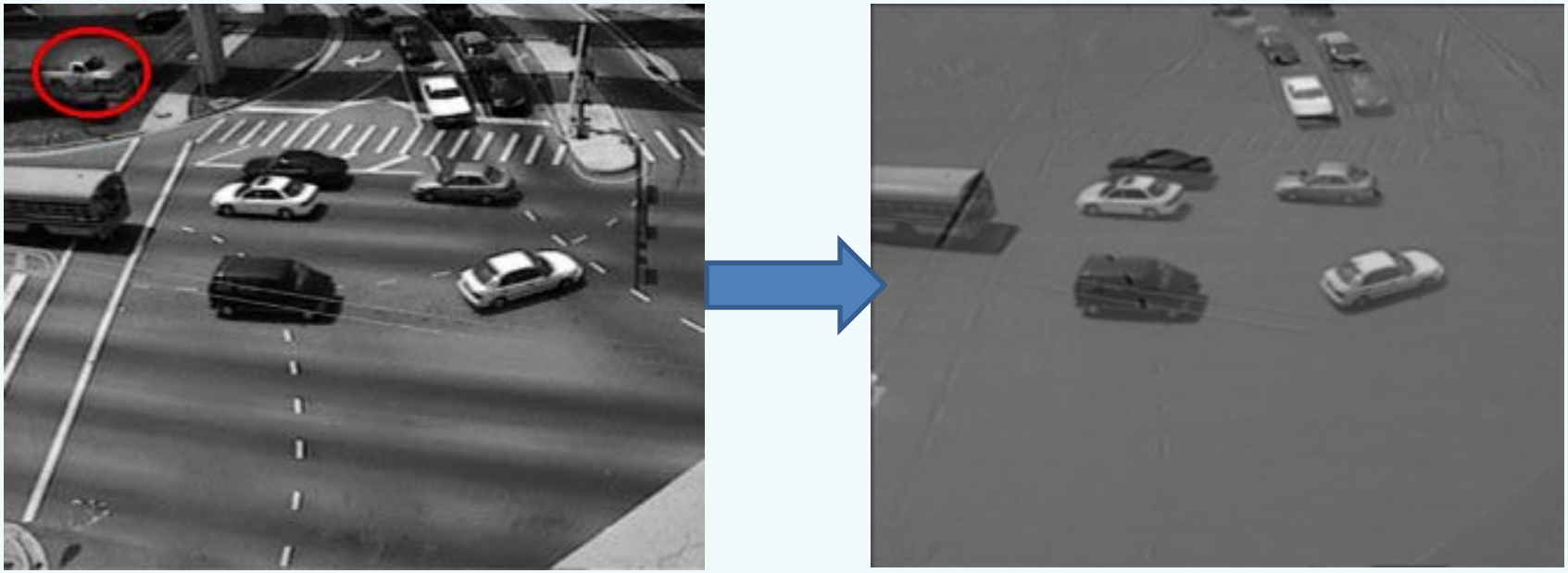
- Software centric
- Short installation time (3-6 hours)
- Full vision
- Intelligent handling of shadows and occlusions

How it Works – 3D Omni-Directional Tracking

Step 1: Image Capture

- Hi Resolution Camera with Ultra-Wide-Angle Lens
- 5 frames per second

How it Works – 3D Omni-Directional Tracking



Step 2: Background modeling

- Background is anticipated
- Adapts with shadows, ambient illumination, etc

Step 3: Background subtraction

- Background is removed, leaving the moving objects

How it Works – 3D Omni-Directional Tracking

Step 4: Edge detection

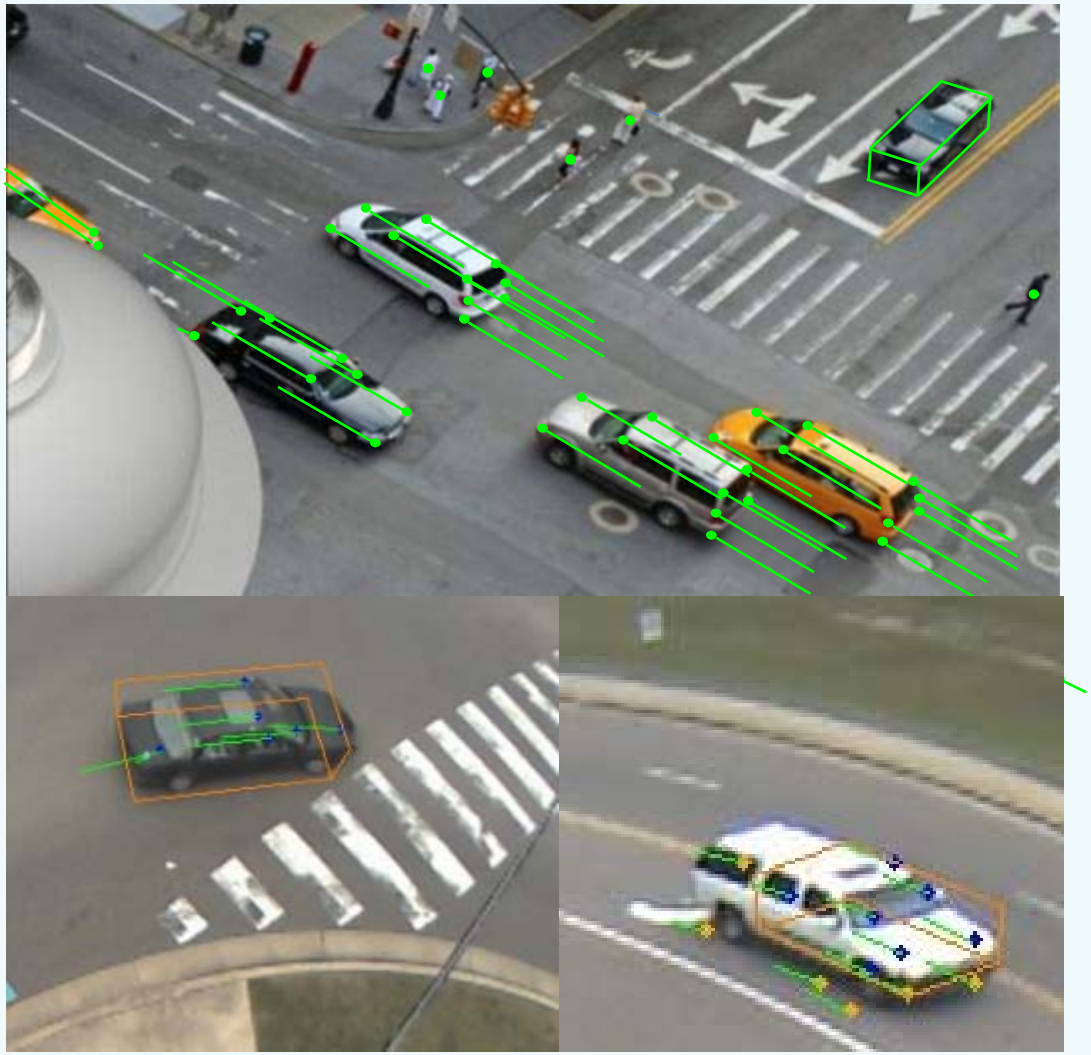
•Edges are identified and tracked through entire camera field-of-view

Step 5: 3-D Modeling

•Based on how edges track in relation to one another, a 3D vehicle model is assigned

Step 6: Omni-Directional Tracking

•Points / models are tracked throughout intersection to trigger stopbar zones, provide TRUE turn movements, average speed, etc



How it Works – 3D Omni-Directional Tracking

Intelligent Occlusion Mitigation

•Objects occluding camera view (mast arms, signals) can be masked. Tracking algorithms "ignore" these items. Tracked objects may travel "through" masks without being dropped.

Intelligent Shadow Handling

•3D objects can cast shadows, pixels can not

•Software knows relative position of sun and the algorithms anticipate where shadows "should" be.

Other Intelligent Benefits

•Virtual Pan-Tilt-Zoom

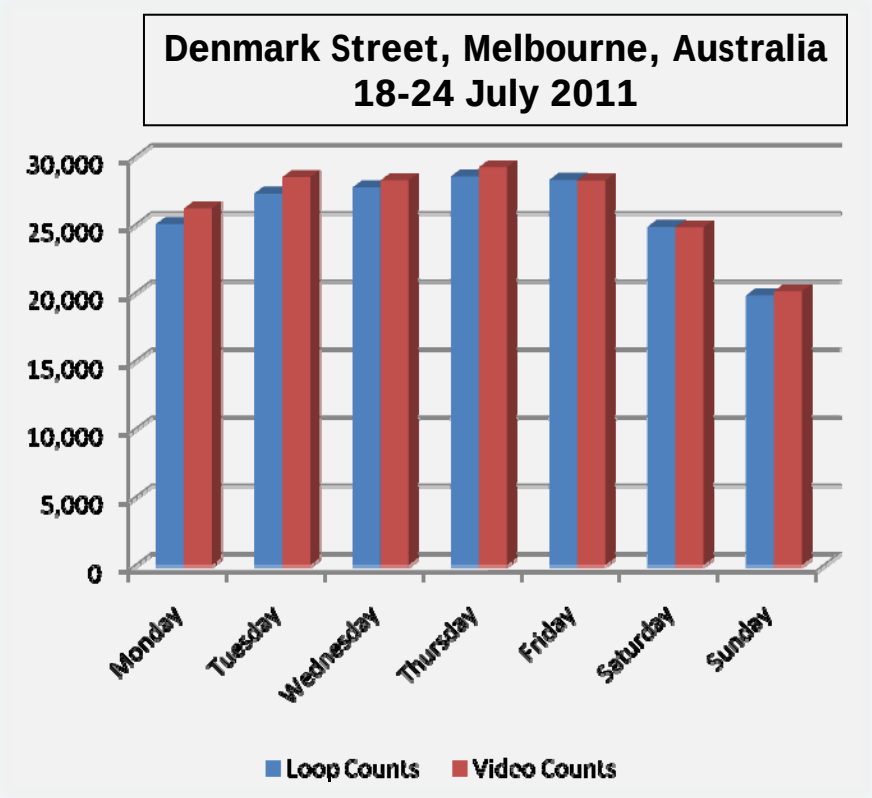
Does it Work?

Melbourne, Australia

Methodology
- *VicRoads installed the technology for purposes of validating count accuracy as part of its Acceptance Testing.*
- *Video detection zones were placed on top of four (4) existing inductive loops on Denmark Street (2 Northbound, 2 Southbound)*
- *Data was collected for a seven (7) day period, 24 hours per day, and results were compared.*

Results
- *Loop detectors counted 181,631 vehicles during this period*
- *The system counted 185,405 vehicles during this period*
- *Count accuracy of 98% compared to loops*

"count accuracy of 98% compared to loops."



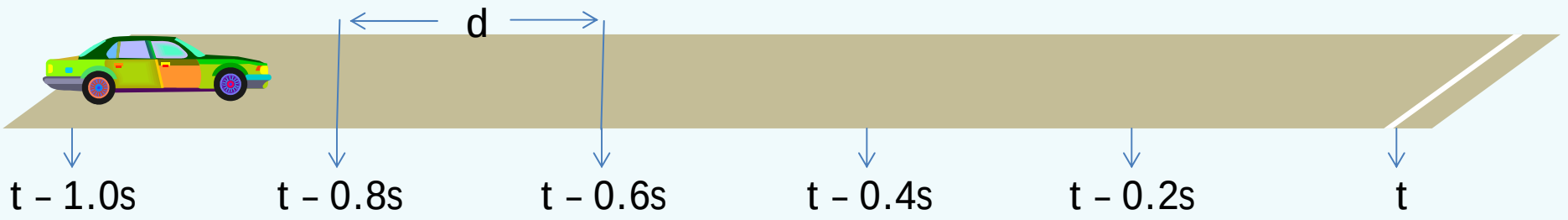
vicroads
keeping victorians connected

Dilemma Zone / Collision Avoidance

3D Omni-directional tracking can significantly enhance collision avoidance via dilemma zone detection based on the following:

- *Assuming a relatively constant speed and predictable vehicle behavior, and a clear line of site, the technology can predict several frames in advance of the current vehicle position*
- *Ultra-wide-angle lens captures 5 frames per second*
- *Distance traveled per vehicle (d) may be calculated at (0.0556 x kph) meters, or (0.2933 x mph) feet per frame*
- *Calls could be made to the controller based on predicted vehicle positions, to either extend green or hold "all red"*

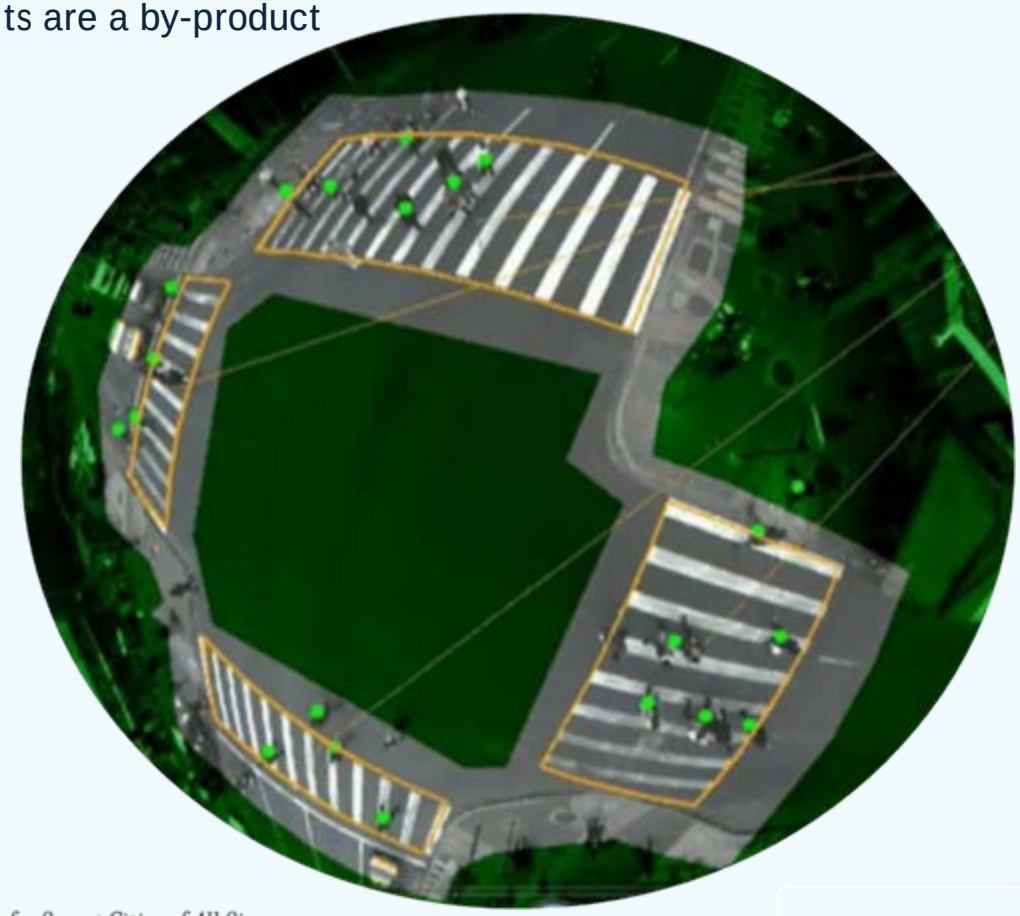
Distance per frame (d)	Meters	Feet
80 kph / 50 mph	4.4	14.6
100 kph / 62 mph	5.6	18.2
120 kph / 75 mph	6.7	21.9



Frame capture every 0.2 seconds

3D Omni-directional tracking can improve the safety of crosswalks by providing pedestrian presence indication

- Does NOT replace pushbutton crosswalk systems, but enhances safety
  - Call is made by pushbutton
  - Additional calls to indicate moving pedestrians in crosswalk for holding the red and/or to trigger signage for drivers that pedestrians are present.
- Pedestrian Counts are a by-product



For More Information:

Aldis™

www.aldiscorp.com

YouTube

www.youtube.com/AldisGridSmart

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