SOUTH AFRICA ROAD FEDERATION

Non-Motorised Transport Practitioner's Course

13 NOVEMBER 2020

Session 15: NMT & Technological Innovation

SARF
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BENEFITS OF INVESTING IN CYCLING Dr Rachel Aldred

Investing in cycling will generate benefits for the whole country, not just those using a bike to get around. Eleven benefits are summarised here which can help solve a series of health, social and economic problems. This report shows how investing in cycling is good for our transport systems as a whole, for local economies, for social inclusion, and for public health.

Investing in cycling will enable transport authorities to start putting in place the infrastructure we need to ensure people of all ages and abilities can choose to cycle for short everyday trips. As well as making cycle journeys more pleasant, safer and faster, it sends the signal that cycling is a normal way to travel. This is important because the perception of cycling as a marginal and minority mode is off-putting to many people.

Further reading:
https://www.cyclinguk.org/blog/how-investing-cycling-makes-sense-and-makes-money#:~:text=investment%20in%20cycling%3A-,1.,spend%20by%20up%20to%2030%25.

Session 15: NMT & Technological Innovation

- 3D & LED lighting applications
- Vehicle-to-Pedestrian (V2P) Communications for Safety
- Pedestrian detection systems
- Other technologies to promote NMT safety
- Bicycle Internet of Things – Connected cycling
- In vehicle detection systems
- Automated vehicles and NMT users
- Renewable energy street lighting
- Drone applications

3D pedestrian crossings

- To encourage motorists to be cautious and to limit the risk of speeding and accidents, the City of Ísafjörður in north-western Iceland has inaugurated 3D pedestrian crossings by way of a cleverly-detailed optical illusion.

- Not only does the innovative design give foot-travelers the feeling of walking on air, it also gets the attention of drivers, who will be sure to slow down their speed once they spot the seemingly floating ‘zebra stripes.’

LED Lighted Zebra crossing The Netherlands

http://www.designboom.com/design/lighted-zebra-crossing-illuminated-crosswalk-amsterdam-01-08-2016/

- Many accidents take place on pedestrian crossings — often caused by poor visibility, where car drivers are unable to clearly see the crossing, and subsequently, the people on it. The problem is magnified after dark, when visibility is further reduced.
- The lighted zebra crossing, is an illuminated crosswalk. The white stripes of the ‘zebra’ light up both the crossing and its pedestrian traffic.
- Sensors — embedded into the technology — register the number of passing vehicles, as well as their velocity, axle load, and the number of pedestrians. Two versions of the crosswalk: one for brick paving, and one for asphalt
- Long-life and low-power LED lighting is incorporated within the plates, which each measure 200 x 50cm. Commonly, two plates are used for each zebra ‘stripe’.
- The lights can be turned on and off at the demand of local authorities with no daily maintenance required.

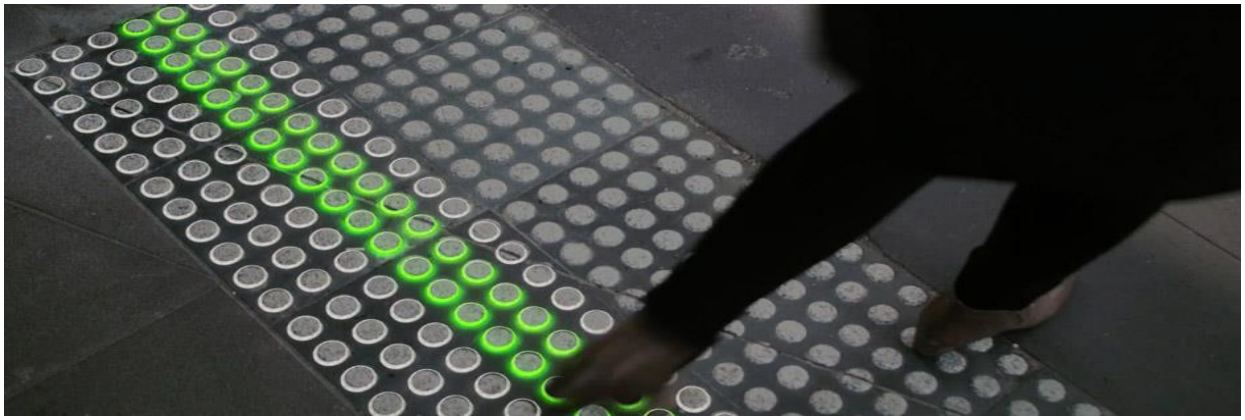
LED Lighted Zebra crossing - The Netherlands

Pedestrians and Smart Phones

- LED lights fitted into the pavement at an intersection in the Dutch municipality of Bodegraven-Reeuwijk to improve the safety of pedestrians waiting to cross.
- The LEDs light up green or red in synchronisation with the traffic signals, indicating when it is safe to cross for those with their eyes on their smartphone.

Ground level traffic lights for pedestrians

- Prompted by accidents involving pedestrians, in-ground traffic lights prevent pedestrians using smartphones from walking out onto the road.
- The Melbourne Smart Tactile Paving system would light up in red and green to tell face-down smartphone users when they can cross the road safely.
- Several applications of concept in Netherlands, Germany, Australia and other countries.

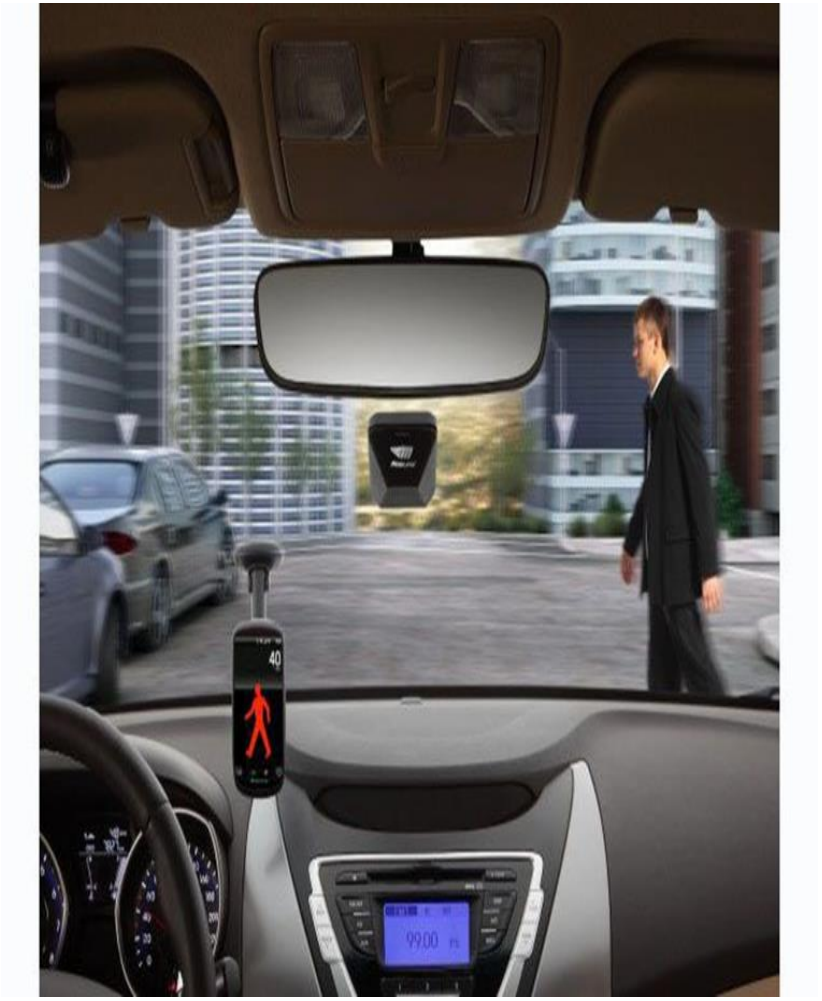


More LED applications - Renewable energy street lighting

- Solar street lights provide lighting without the need of standard electrical power. Completely independent or off-grid. Photovoltaic modules or solar panels harvest the sunlight during the day and convert it into energy, which is then stored in a dedicated battery system. During the night, the stored energy is distributed as power for LED lighting.
- Traditional or conventional (metal halide or high pressure sodium) street lights draw their power from standard electrical grid, which generates energy from fossil fuel (non-renewable) sources.

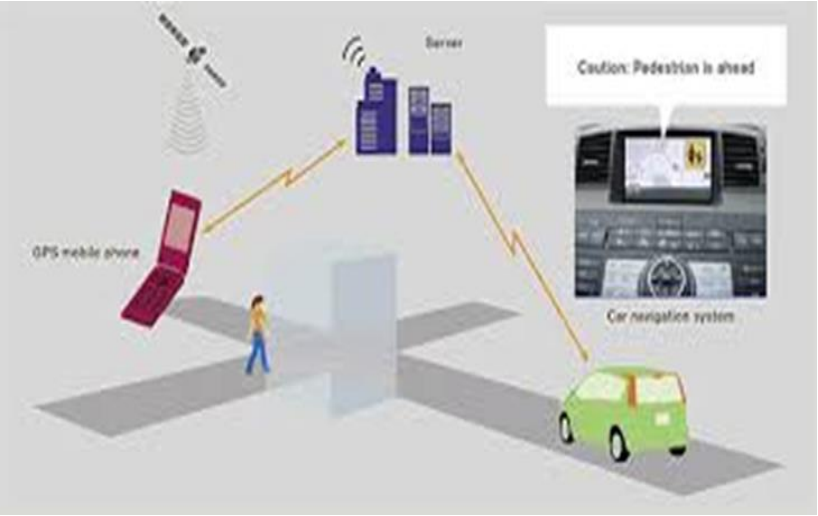
Vehicle-to-Pedestrian (V2P) Communications for Safety

- The Vehicle-to-Pedestrian (V2P) automatic safety system takes advantage of hardware already in smartphones, such as GPS and accelerometers, to make people on the street "visible" to its cars.
- It also lets the car know whether the person is paying too much attention to their phone -- texting or listening to music, for example -- and not enough attention to the road. If the person is about to step in front of the car, an audio and visual warning is sent to both.



GPS Mobile ITS for Pedestrian Safety

- The system cooperates with GPS mobile phones to detect pedestrians and alert drivers of the presence of pedestrians using voice and display messages on the car navigation monitor
- Collects the position data of pedestrians, communicating with GPS mobile phones carried by pedestrians.
- Detects pedestrians in the direction ahead of the vehicle. This information is then sent to the server where it is determined if the driver should be alerted.
- Informs driver of presence of unseen pedestrians via navigation voice message and display.



Technologies to promote NMT safety

Pedestrian Detectors

- Detecting waiting pedestrians within a defined detection zone and manages traffic lights to optimized them for keeping vehicle and pedestrian traffic moving in harmony.
- When it detects waiting pedestrians, it activates the green time for the pedestrian, and when no pedestrians are present, it maintains a steady flow of vehicle traffic and holds the red time for pedestrian traffic.

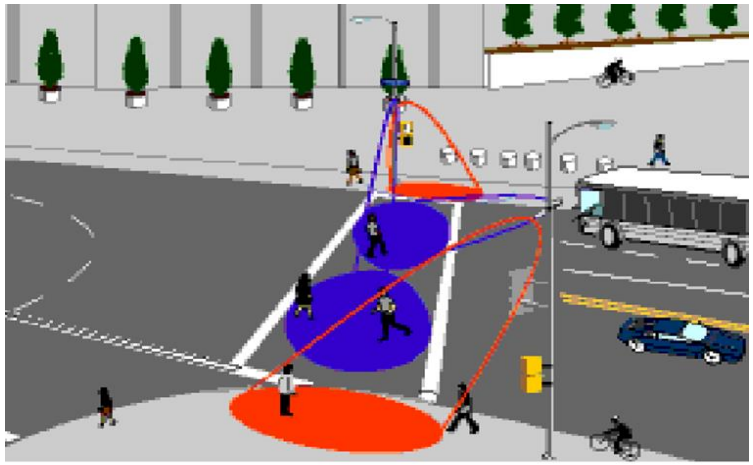
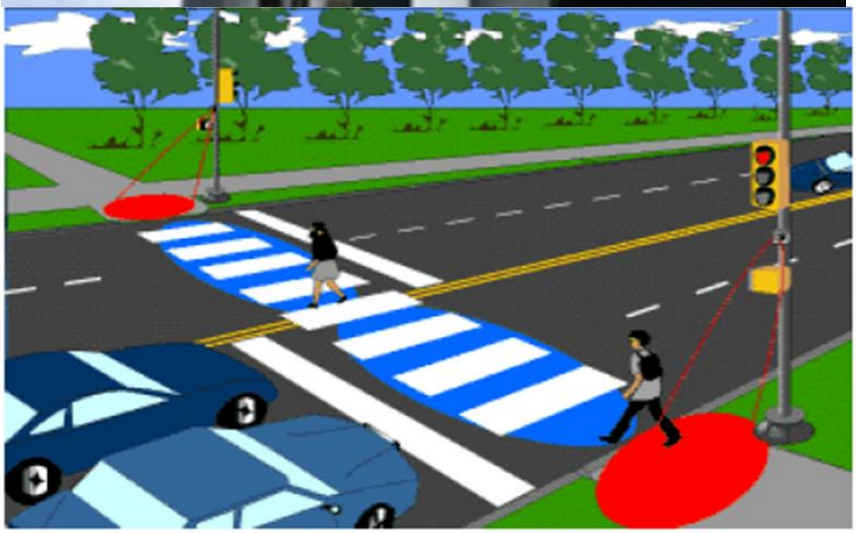


Figure 1. Concept of Pedestrian Detection Zones.



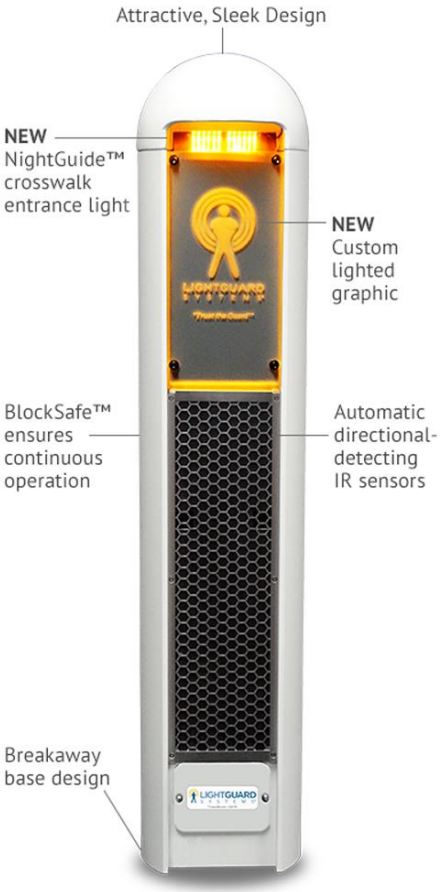
Technologies to promote NMT safety

Pedestrian Detection Pads

- The tactile pads are super thin — just 3.5 mm tall with a 1.5 mm lip — and ideal for adhering to existing pedestrian ramps.
- The pad is meant to act as a supplemental call button and also works to cancel a call request if the pad is vacated, thus keeping auto traffic moving.
- This same technology can be used to determine the presence of bicycles.

Pedestrian detection bollard

- The pedestrian detection system consists of entry ‘gateways’ created by two opposing bollards that are installed 0.6-1.2m from the kerb at the crosswalk entrance.
- As pedestrians pass between the bollards, infrared light beams detect their presence, activating visual communications between the motorist, pedestrian, the bollard and the LED warning lights embedded into the pavement, visible to approaching motorists up to 305m in advance of the crosswalk.



Technologies to promote NMT safety

Pedestrian GPS

- Those who are blind or visually-impaired are even more at-risk for pedestrian accidents, having the added complication of walking on the streets without the ability to read signs or see traffic signals.
- Voice-controlled GPS units for blind or visually-impaired pedestrians helps them locate themselves or navigate cities, locating intersections and giving directions, based on the final destination. For large cities, it can also integrate public transportation routes, including train, subway and bus directions.

Technologies to promote bicycle safety

Rain sensor monitor

- Priority for cyclists during inclement weather in Rotterdam.

Flexible bollards to protect cyclists (and pedestrians)

- The problem with common types of plastic bollards is that they do not have a lot of rebound. Many fixed base bollards withstand a limited number of hits before they crack and fall over.
- Bollards of polyurethane plastic are an alternative that is gaining popularity in European cycling centres.
- These bollards are flexible throughout the bollard body, rather than sitting on a spring or hinge, and so do not have the same points of vulnerability.

Technologies to promote NMT safety

Turn-signalling gloves

- To let motorists know where the cyclist is heading on the road, it helps to use hand signals.
- Back of each glove contains a waterproof array of high-intensity LEDs arranged to form a blinking directional arrow.
- Lights are activated by touching pair of metal contacts together – one on the inside of the glove's thumb, and one on the inside of its index finger.

Technologies to promote NMT safety

Cycle tag

As cyclists approach a junction, the tag sends a signal to a nearby reader, which in turn switches the light to green.

Connected Biking: How the Internet of Things Will Change the Future of Biking

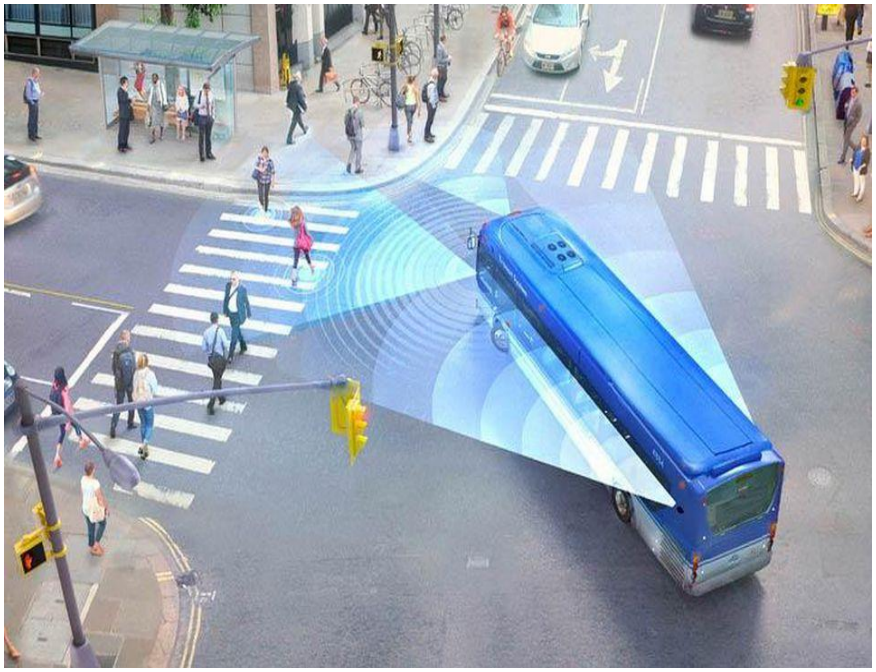
- A connected bike uses technology to facilitate a securer and more personalized biking experience for everyone on the road. Accessible and integrated between their bike, home environment, the roads and their smart devices.
- A connected bike can be equipped with sensors, which increase safety and awareness for the bike and the rider while in transit. For example, haptic feedback technology can be used to help the rider navigate their journey through vibrations in the handlebars, keeping the rider safe while in traffic.

Connected Biking: How the Internet of Things Will Change the Future of Biking

- In addition to haptic feedback, audio cues can also help the rider navigate, as well as warn of traffic incidents, meaning that no more dangerous glances at their smartphone while on the go, making their journey safer, as well as safer for the other commuters.
- As part of the Connected Streets project, London-based Future Cities Catapult has come up with five innovative technologies that could improve cyclists' route choices, wayfinding and, above all, safety on the urban road, by using the internet of things to complement existing cycling infrastructure.

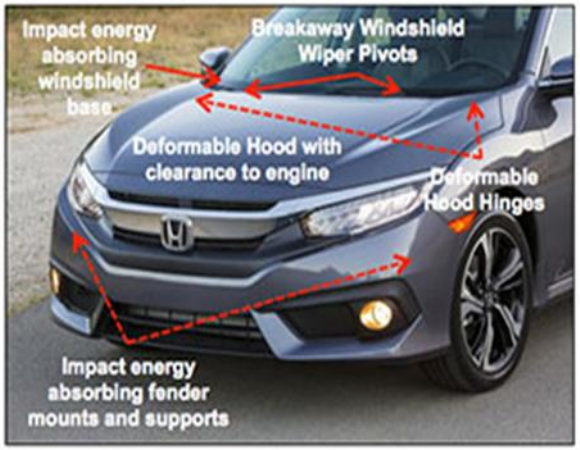
Bus Turn Warning Systems for Pedestrians and Cyclists

- The pedestrian warning system sounds an external audio warning when a bus is making a left or right turn. The collision-avoidance system uses smart sensors to detect imminent risks of forward and side collisions and both visual and auditory warnings to help avert them.
- The system places multiple sensors around the bus to detect vehicles and pedestrians in front and on the sides of the bus.



Safer vehicles to reduce pedestrian/cyclist injury

- Reduce risk of pedestrian deaths and injuries by modifying fronts of vehicles to make them "softer" when contact pedestrian.
- New vehicles with sensors in the front bumper - detect when a pedestrian has been hit. Trigger a giant U-shaped airbag that inflates near the bottom of the windscreen.
- Heavy vehicle blind spot detection systems.



Automated vehicles (AV) – safety considerations for pedestrians and cyclists

Detection issues

- Key challenge area for AV automated technologies - ability to detect and predict the movement of pedestrians and bicyclists.
- Automated detection and tracking technologies.
- Many challenges ……..

Drone applications

A Survey of Unmanned Aerial Vehicles (UAV) for Traffic Surveillance

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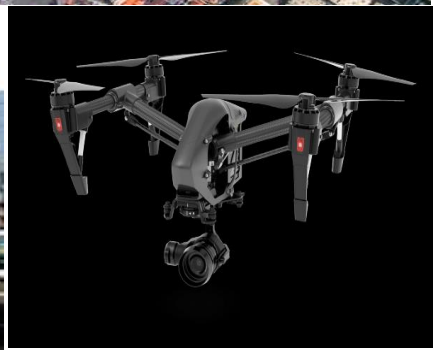
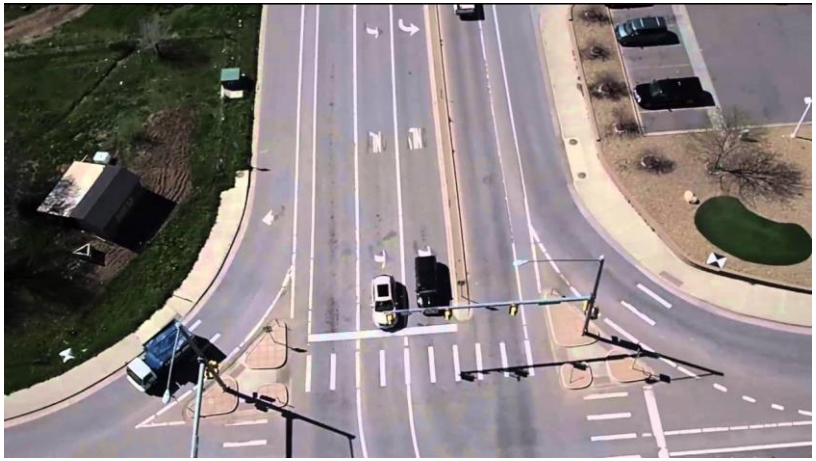
Abstract

The United States Department of Transportation (DOT) has been interested for the past several years in obtaining data on traffic trends and to monitor and control traffic in real-time.

Currently, there are several methods by which the DOT regulates and monitors road transport. Cameras mounted on towers, detectors embedded in pavements or pneumatic tubes, and unmanned aircraft have been proven to be expensive and time-consuming solution candidates. However, aerial monitoring has the potential to yield detailed information to help traffic planners, as well as commuters. Unmanned Aerial Vehicles (UAVs) may provide a “bird’s eye view” for traffic surveillance, road conditions and emergency response. The purpose of this technical report is to provide a survey of research related to the application of UAVs for traffic management.

Drone applications

Drone applications

UAVs may be employed for a wide range of transport operations and planning applications:

- Incident response
- Monitor freeway conditions
- Coordination among a network of traffic signals
- Traveller information
- Emergency vehicle guidance
- Track vehicle movements in an intersection
- Measurement of typical roadway usage
- Monitor parking lots
- Estimate Origin-Destination (OD) flows
- Pedestrian and cycling studies?