6th Annual Smart 50 Awards

Honoring the 50 most transformative smart projects each year

Smart 50 Awards, in partnership with Smart Cities Connect and Smart Cities Connect Foundation annually recognize global smart cities projects, honoring the most innovative and influential work.

Learn About Smart 50 Awards

Smart Cities Connect Conference and Expo offers the most comprehensive conference, exposition and accelerator of smart city innovation in North America. We deliver premium networking and educational opportunities with a keen focus on city leaders and their priorities. Working closely with the technology community, we bring together the largest collection of intelligent systems providers for energy, infrastructure, networks, data management, urban mobility, citizen engagement and governance solutions.

About ROVER (AI)

Project Name	Optimizing Road Maintenance Using Artificial Intelligence
Location	Durham, Ontario, Canada
Description	The Region identified an opportunity to improve its road patrol program and pothole patching work program through partnering with the technology provider Visual Defence on the development and use of its AI solution. The solution is an app called ROVER, that is installed on a smartphone that uses a camera to automatically detect, identify and capture images of potholes using AI and uploads the incident information to a cloud server. The smartphone is mounted to the windshield of the patrol vehicle and operates automatically. Unlike human inspectors, the technology doesn't get distracted or have to compete with the focus required for the safe operation the vehicle. It scans for road deficiencies, logs and takes an image of the detection sending it to the cloud server. ROVER then processes and analyzes the images captured by the camera ensuring that the deficiency is of interest. The Region's staff can easily access and review the incidents through a web browser. Each incident includes information such as: GPS Coordinates, High resolution image, Direction of Travel, Street number/range, Detection Time, Road Class (dictating repair priority), and pothole size and depth. The technology has tools which automate sorting through the data quickly and efficiently, and allows quick resolution of hazardous deficiencies, as well as a data driven approach to road maintenance. The incident data is also automatically associated with the road segment and GIS asset information, allowing the Region to exclude roads which are not under its jurisdiction. In addition, the road segments and GIS data allow the Region to know what the road class is, which means that the Region can set different review and resolution processes to different road segments. The Region can use the technology's heat map in order to view which roads are in dire need of repair and what the state of the roads are on a broad level. The Region can then decide how they would like to assign the work, for instance, if they would like to send out a patching crew and patch all of the potholes along a specific road section in one day, plan work in specific areas during off peak travel times or plan a larger project to resurface the road.

Project Cost

The project is currently funded through a government grant program.

Project Influence

Prior to the subject technological innovation, the Region utilized a road patrol program and civic reporting to identify road deficiencies. The road patrol program was primarily paper record based and relied on inspectors dividing their attention between navigating a vehicle safely and identifying deficiencies. Once a deficiency was noticed, the patroller would safely stop the vehicle at the location to document the deficiency in their patrol log or complete any emergency repairs and record any actions that were required, and move on to the remaining road sections assigned for patrol. At the completion of the daily patrol the patroller then submitted the logs to the road supervisor who then reviewed the noted deficiencies and prepared work orders for the repair crews to complete based on priority, class of roadway and location. The repair work was then scheduled and dispatched to crews who completed the repairs using generic information describing the deficiency and updated the work order to confirm the actual repair details. While this approach was the standard, it posed some safety risks and resulted in missed deficiencies. It also required frequent stops to log issues (resulting in wasted time), which would then have to be processed/prioritized by a supervisor and duplicated in a separate system (wasted administrative time). The paper based system provided broad notes (i.e. curb lane between intersection A and B) resulting in additional wasted time for repair crews having to search for the issues. Repair crews would then produce additional paper records resulting in further administrative work. Along with the obvious inefficiencies of this program, there were many distractions that came up during the patrols that couldn't be avoided, making it difficult for the patroller to identify all the deficiencies along the roadway. The patroller's attention was also divided with having to identify and record deficiencies within the right of way related to signage, road conditions, vegetation control, line markings and drainage (these are just a few examples). Unfortunately, some distractions were also unavoidable for the operator of the vehicle such as focus of operating a vehicle, roadway visibility due to traffic congestion and parked cars, pedestrian movement, changing traffic signals and more. Given the working conditions and these distractions it was to be understandable that some deficiencies and potholes may go unnoticed and that the patrol logs can therefore provide an inaccurate report on the true state of the roadway.

This ultimately results in some detections going unnoticed, therefore causing reporting of missed deficiencies by the public. Since using the technology the following outcomes have been achieved:

1. Excellence in public service: The number of calls received from members of the public has decreased significantly, proving that the Region is maintaining its roads better through the use of the technology
2. Improved productivity: the technology has helped to identify 6250 potholes on the Region's over 1.5 years on the Region's roads, resulting in a significant improvement on pothole reporting. The technology also helps to minimize the number of stops, and time spent by the repair crews having to search and locate the deficiencies which also means less disruption to traffic and more time repairing deficiencies to improve roadway safety. Additionally, staff are now allowed to focus more on other urgent matters such as overgrown vegetation, missing signs, roadway blockage, debris, drainage, lane markings and allocate time differently and more efficiently.
3. Improved efficiency in the pothole repair program: automatic and consistent detection of more incidents allows for more incidents to be considered which would not otherwise be reported, such as incidents that do not require immediate emergency repairs, but if addressed can help extend the life of the road.
4. Better compliance with Provincial Minimum Maintenance Standards: By having timely access to records of potholes locations and being able to prioritize them effectively, potholes can be repaired in compliance with provincial standards in a more efficient manner using digital records.
5. Reduced risk exposure: by using the platform to identify priority incidents and responding to them, the Region reduces its exposure to potential claims. Also, the reduced distraction to a road patroller driving a vehicle as a result of this technology results in an inherent improvement to personal road traffic safety.
6. Digitization of data: Having the data available in a digital format makes it easy to measure the number of potholes precisely and accurately on Regional roads. It also helps to prioritize repairs of serious deficiencies by map location and route planning, providing a more efficient spring patching program by visually seeing which areas/roads have the most potholes, and helps to correlate data with annual road rehabilitation programs.
7. Improved budget planning and allocation: Being able to review total number of potholes with data that can be reviewed in many ways (i.e. class of roadway, individual roadways, and approximate size of pothole) allows more reliable estimates of scope of work and budgets for the repair crews. Due to the projects versatility and being easily transferable Durham Region sees this project being an asset to many more municipalities. This project is also the first of its kind where the AI works directly in the vehicle, providing pavement information almost in real time.

Other Winning Projects

- A Better, Safer, More Connected Canton, Canton, OH
- A2GO Autonomous Vehicle Initiative, Ann Arbor, MI
- Achieving Spatial Equity Via Data-Driven City-making: How State of Place Helps Philadelphia Create More Just, Thriving Communities, Philadelphia, PA
- Application of AI Recognition System To Detect Highly Polluting Scooters, Taichung City, Taiwan
- Artificial Intelligence & Machine Learning For Traffic Signal Control, Utah
- Austin AI Housing Analysis, The University of Texas at Austin and Austin, TX
- Body-Worn Cameras For Civilian Law Enforcement Staff, Miramar, FL
- Chicago Smart Lighting Program, Chicago, IL
- City of Chattanooga Near-Crash Project, Chattanooga, TN
- City of Kitchener Robotic Sidewalk Inspection Pilot Program, Kitchener, Canada
- City of Miramar Mass Notification Platform, Miramar, FL
- City of North Las Vegas Utilities Department Advanced Metering Infrastructure Project, North Las Vegas and portions of Clark County, NV
- CITYDATA: Mobility Big Data + AI For Public Health In Yala Province, Thailand, Yala Province, Thailand
- Cloud Based Records Management Software, Miramar, FL
- Covington Connect, Covington, KY
- Damage Assessment Tracking, Coral Springs, FL
- Digitizing Routes, Shortening Time On-Road, and Saving Taxpayer Dollars, Harrisonburg, VA
- FlexiRide Melbourne, Victoria's First Demand-Responsive Transport Service Created In Partnership With Moovit, Melbourne, Australia
- Flow Labs Predictive Traffic Control With Utah Department of Transportation, Salt Lake City, UT and Utah State
- Georgia Smart Communities Challenge: How the City of Valdosta, Georgia Improves Traffic Monitoring and Communication For Safety, Connectivity, and Efficiency, Valdosta, GA
- GR PayIt, Grand Rapids, MI
- Guaranteed Energy, Water, and Wastewater Savings Performance Contract Project, Miramar, FL
- Gun Shot Detection Technology, Miramar, FL
- HCS EdConnect, Powered By EPB and Chattanooga's Smart City Infrastructure, Chattanooga and Hamilton County, TN
- inCitu: Augmented-Reality-Powered Urban Renewal, New York, NY
- Integrated Mobility Innovation Project: Regional Cloud-Based Traffic Management Artificial Intelligence (AI) System, 13 central Ohio counties: Logan, Union, Marion, Morrow, Knox, Licking, Delaware, Franklin, Madison, Pickaway, Fairfield, Hocking, Athens
- INZONE Las Vegas, Las Vegas and Clark County, NV
- Memphis Uses Preteckt AI To Save Big On Tires - 600 A Year!, Memphis, TN
- Milpitas Smart City Infrastructure Program, Milpitas, California
- Optimizing Road Maintenance Using Artificial Intelligence (ROVER AI), Durham, Ontario, Canada
- Particulate Matter Versus COVID-19, Cleveland, OH
- Risk & Resilience: Tracking Impacts of Sea Level Rise On Critical Infrastructure, Norfolk, VA
- SAFER (Situational Awareness for Emergency Response), Frisco, TX
- Shedding Light In The City of Suisun City, Suisun City, California
- Slow Streets Measurement Project, Kitchener, Ontario, Canada
- Smart Cities Powered By FIWARE, Sweden
- Smart City Data Integration and Monitoring System, Chattanooga, TN

- Smart Eyes: Protecting Lancaster's Public Assets, Lancaster, PA
- Smart Intersection Vision Zero At University of South Florida St. Petersburg, St. Petersburg, FL
- Smart Lake Erie Initiative, Cleveland, OH
- Smart Parking, Mesa, AZ
- Smart Train Avoidance, Lima, OH
- SmartSA Interlocal Data Sharing Agreement, San Antonio, TX
- Taichung City Air Quality Internet of Things Development, Operation and Maintenance Project, Taichung City, Taiwan
- Taylor County Middle Mile Network, Taylor County, WI
- Traffic Camera Analytics With Machine Learning, Raleigh, NC
- True Smart Cities at City of Hamilton Using IRIS AI Technologies, Hamilton, Ontario, Canada
- Urban Intelligence-As-A-Service, Bad Hersfeld, Germany
- Virginia Smart Community Testbed, Stafford, VA
- Winnipeg Police Service: Virtual Police Response, Winnipeg, Manitoba, CanadaVille de Longueuil
- Support for the coordination of municipal civil protection organizations in the face of COVID-19

Smart Cities Connect on Social Media

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