Enhancing Emergency Response and Road Safety using Advanced V2X and AI Technologies for the Preservation of Life, Health, and Welfare

Ramon Vann Cleff B. Raro

Department of Science and Technology – Advanced Science and Technology Institute (DOST-ASTI)

Republic of the Philippines

For Emergency Response… Every Second Counts

METRO

DOTr stops 3 ambulances without patients on Edsa bus lane

By: Zeus Legaspi - @inquirerdotnet INQUIRER.net / 08:28 PM March 04, 2024

Officers from the Special Action Intelligence Committee for Transportation (DOTr-SAICT) intercept ambulances using the Edsa bus lane to cut across heavy traffic despite not carrying any patients. (Photo from DOTr-SAICT)

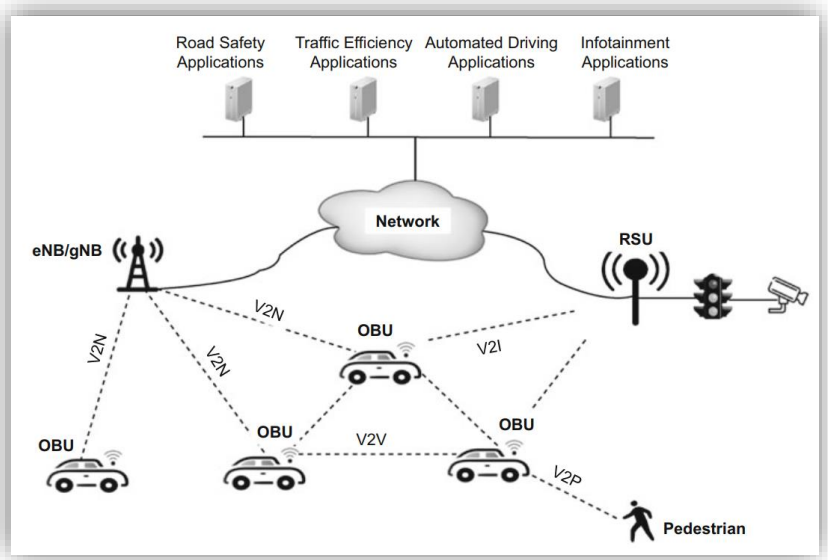
Target Objectives:

1. To develop a system for emergency response vehicles (ERV) and traffic infrastructure communication and coordination
2. To facilitate coordination and information exchange between emergency response components in a centralized platform

1. ERV image generated by AI
2. MMDA Enforcer: https://mirror.pia.gov.ph/news/2023/03/30/mmda-to-impose-30-minute-break-for-field-personnel
3. https://www.youtube.com/watch?v=2CAGb2qw8_I
4. Ambulance near-accident: https://www.facebook.com/watch/?v=851875558883267
5. DOTR, Ambulances: https://newsinfo.inquirer.net/1913894/dotr-on-3-ambulances-without-patients

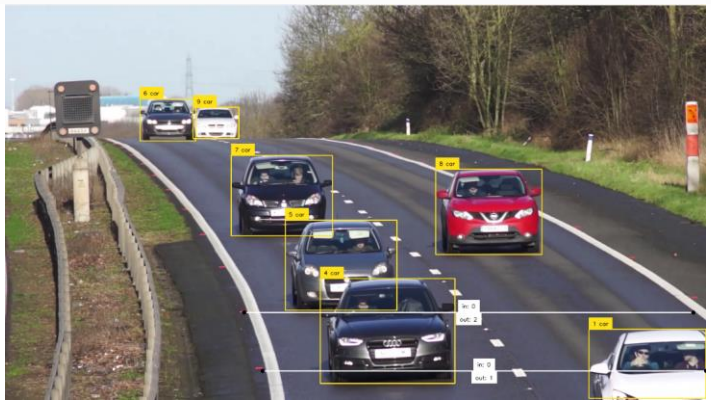
Solution 1: Vehicle-to-Everything (V2X) and Computer Vision (CV)

- V2X enables vehicles to wirelessly communicate with all other road users



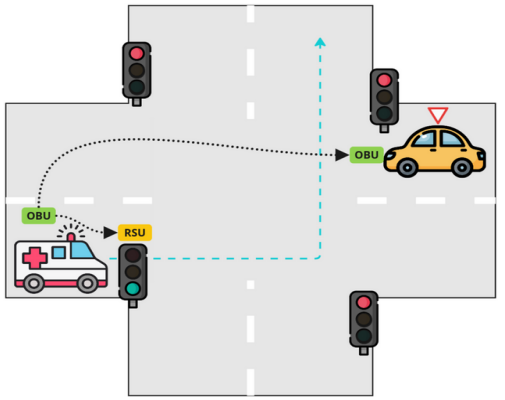
Onboard Unit- OBU (Vehicles)

Roadside Unit – RSU (Traffic Infrastructure)

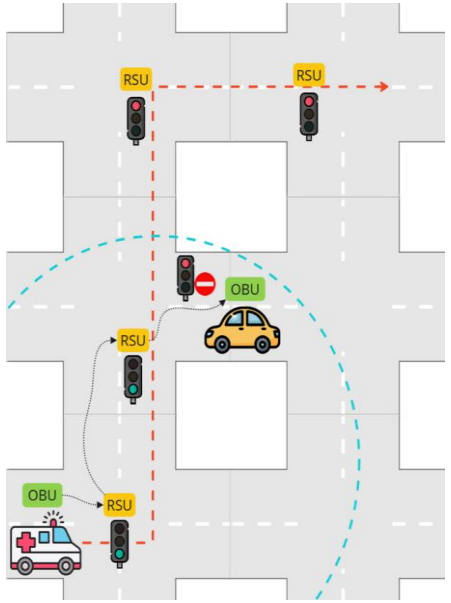


ERV detection (backup)

Primary ERV Applications



Automated ERV Prioritization



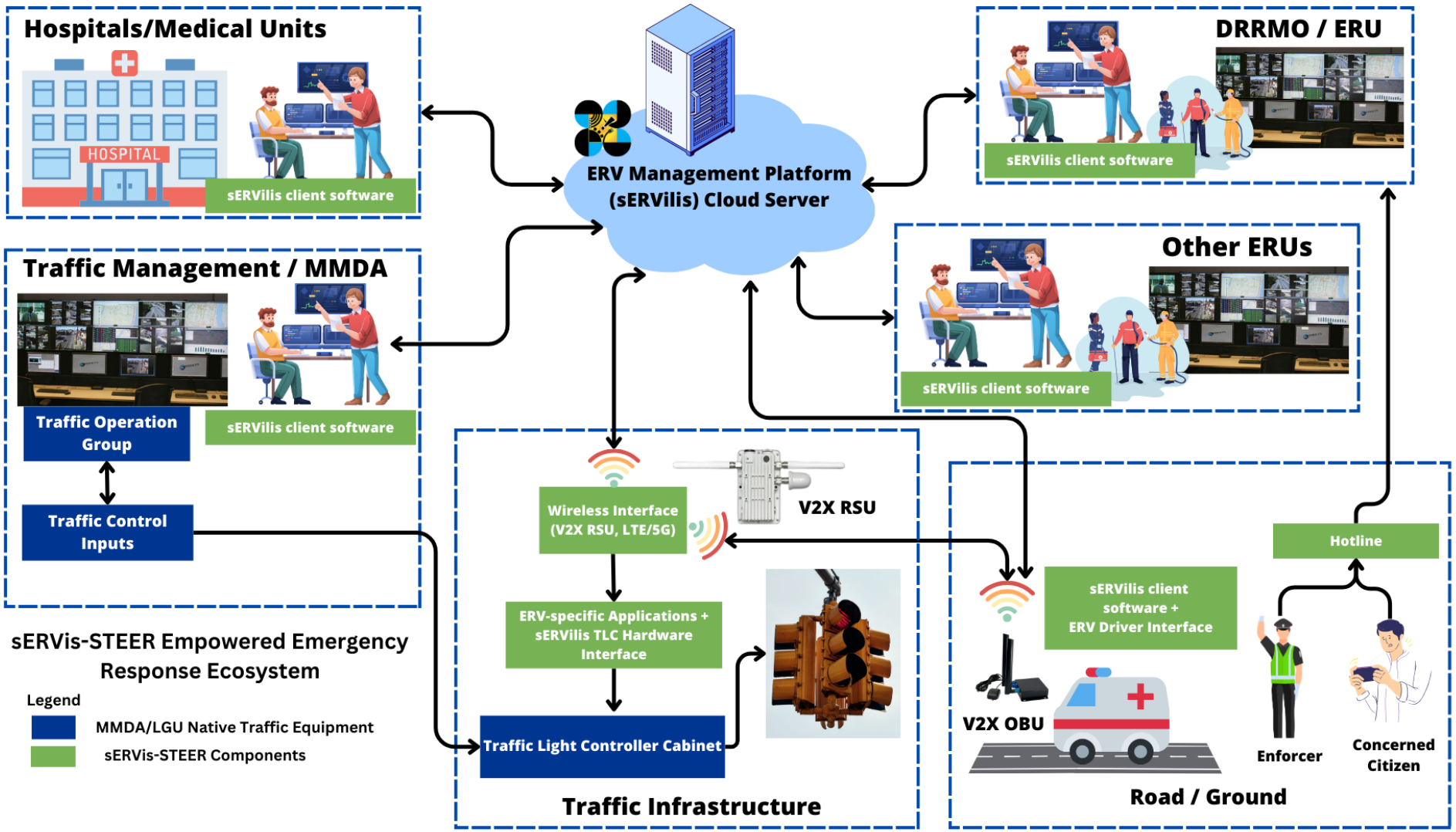
Route Pre-emption and Navigation Assist

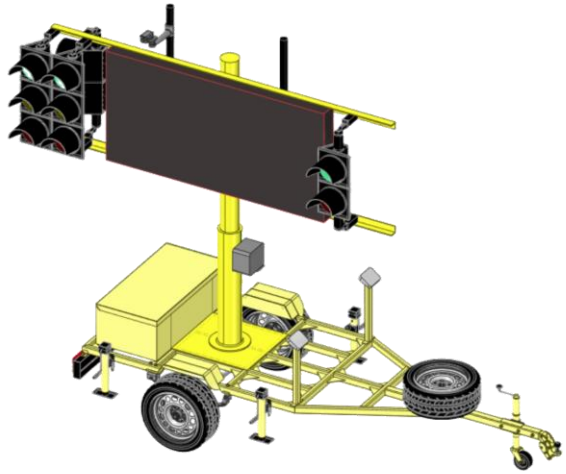
- CV uses machine learning to interpret visual data captured from cameras

V2X: S. Chen *et al.*, *Cellular Vehicle-to-Everything (C-V2X)*. Springer International Publishing, 2023. doi: https://doi.org/10.1007/978-981-19-5130-5.

Solution 2: Swift Emergency Response Vehicle Integration System

Centralized platform to connect emergency response components and exchange information





Smart Traffic and Electronic Enforcer on the Road (STEER)

Emergency Response Can Be Faster… and Safer!

*Simulated at moderate traffic congestion level
**Assumed fuel per liter price: Php 64.40/L

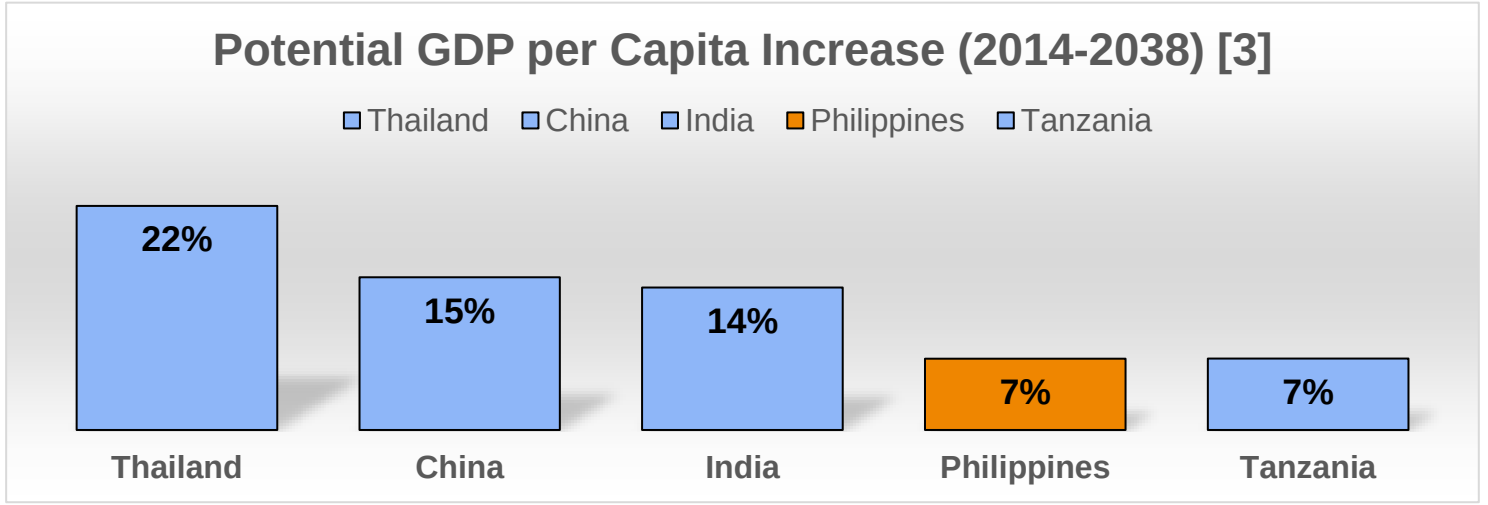
- At least 27% reduction in total response time, and 11% decrease in fuel consumption.
- Reduced carbon footprint (10 ERVs, 22 trips/day, 14,802 kg annually)

Emergency Response Processes	Conventional Methods	With sERVis-STEER
Accident reporting and mission planning	5 mins	5 mins
Coordination and dispatching of ERV	5 mins	2 mins
Deployment to emergency site and hospital*	5 mins	4 mins
Total Response Time	**15 mins**	**11 mins**
Fuel Consumption**	0.63 L/ERV	0.56 L/ERV
Total Fuel Cost	**Php 40.57**	**Php 36.06**

Impact to Road Safety and Traffic Flow Control in PH

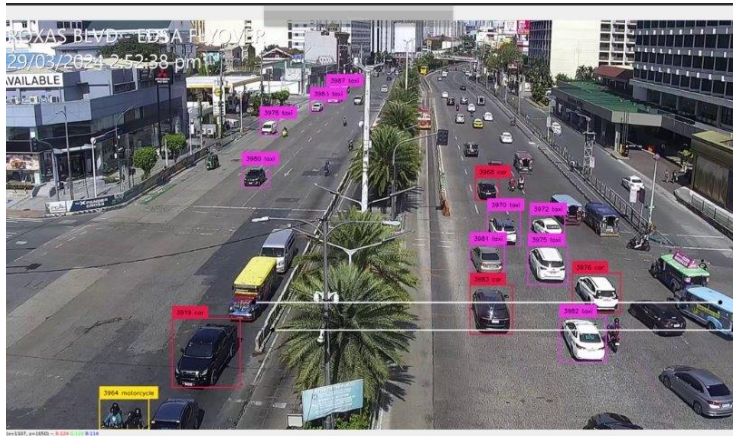
Road accident avoidance for ERVs

- Not only an issue of **health and safety** but also of **economy**
- **Efficient** and **safer** ERV prioritization
- Information **available** to concerned agencies for better coordination



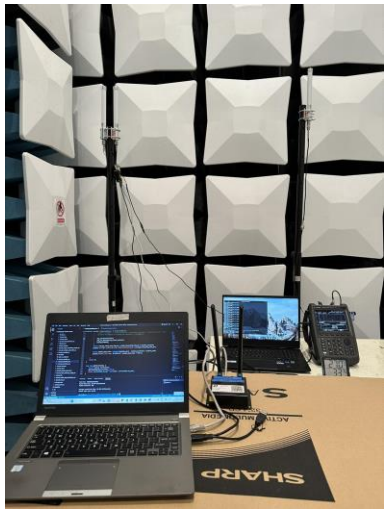
[1] Image from: Global status report on road safety 2018: summary. Geneva: World Health Organization; 2018 (WHO/NMH/NVI/18.20). Licence: CC BY-NC-SA 3.0 IGO)
[2] World Bank. "The high toll of traffic injuries: Unacceptable and preventable." (2017).
[3] https://www.worldbank.org/en/news/press-release/2018/01/09/road-deaths-and-injuries-hold-back-economic-growth-in-developing-countries

Partnerships and Field Activities



CV model to detect ERVs and PH-specific vehicles

Data gathering for computer vision dataset



V2X device testing in Semi- Anechoic Chamber (EPDC)

V2X testing in University of the Philippines Diliman

Partnerships and Field Activities

DRRMO Meetings and Discussions

Meetings with Traffic Management Agencies

Meetings with LGUs

Science Communication Activities

Emergency Response in PH can be Faster and Safer

Target Objectives:

1. To develop a system for emergency response vehicles (ERV) and traffic infrastructure communication and coordination
2. To facilitate coordination and information exchange between emergency response components in a centralized platform

Solutions:

- Vehicle-to-Everything (V2X) and Computer Vision
- Centralized platform for information exchange and ERV management
- System integration

Impact and Outcomes:

- Safe and secure ERV prioritization in times of emergency
- Better coordination, improved economy, increased welfare for patients
- Partnership with academe and government
- Science communication for awareness

BAGONG PILIPINAS

Follow us on our social media channels!

@DOSTASTI

@DOSTASTI

@dost_asti

@dostadvancedscienceandtech980

For questions and other concerns, send us an email

info@asti.dost.gov.ph