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“Demonstration of an Emergency Vehicle Priority System (Automated Green Corridor System) using Japanese originated international standard V2X communication technology that has been undertaken in Ahmedabad city, INDIA”

ZERO-SUM, LTD.

In December 2019, ZERO-SUM, LTD., with the support from the Ministry of Internal Affairs and Communications, JAPAN and in collaboration with Connected Solutions Company, Panasonic Corporation and with approval from the Ahmedabad Municipal Corporation in INDIA, conducted a demonstration experiment showcasing an emergency vehicle priority system (Green Corridor System) that uses a UHF band based Japanese originated international standard V2X communication technology.

This experiment demonstrated the use of an emergency vehicle priority system in which an emergency vehicle such as ambulance and traffic signals communicate with each other through the UHF band using V2X communication technology originating from JAPAN. This is the first demonstration of its kind in the world on a public road.

Goal of the experiment

This experiment that uses the application of UHF band V2X communication technology, aims at addressing and solving one of the most important challenge faced by emergency vehicles such as ambulances today, i.e. reaching their destination in the quickest time permissible, which is sometimes not possible owing to traffic congestion. This has been undertaken by adopting and expanding the Japanese communication message specifications according to local conditions in INDIA. This technology controls traffic signals installed on the road to prioritize the passage for approaching emergency vehicles. Upon the detection of an emergency vehicle, the traffic signals in the route direction of the emergency vehicle will turn green so as to decrease any traffic congestion, thereby enabling the emergency vehicle to get free passage and reduce the travel time to its destination. Parallelly, Variable Messaging Sign Boards such as traffic information boards will inform motorists on the road to make way for the priority passage of the emergency vehicle by flashing such messages, thereby enabling the emergency vehicle to run smoothly and reduce the travel time to its destination even more. The demonstration used UHF band frequency for the communication of

information, which due to its high penetrability through buildings and natural obstructions and less interference from other devices is the most ideal for urban areas in ASIA where there is a higher urban populace and buildings alongside the roads that are densely populated.

Outline of experiment

A V2X communication device was installed on an emergency vehicle, on traffic signals and on a traffic information board. When an emergency vehicle equipped with a V2X communication device approaches the traffic signals and traffic information board on which a V2X communication devices are installed, the V2X devices communicate with each other, and as a result, traffic signals in the approaching direction of the emergency vehicle will turn green and the information that an emergency vehicle is approaching is immediately displayed on the traffic information board for the convenience of motorists on the road, enabling them to make way and allow the priority passage of the emergency vehicle. This system has helped demonstrate that a priority system for emergency vehicles on public roads can be implemented.

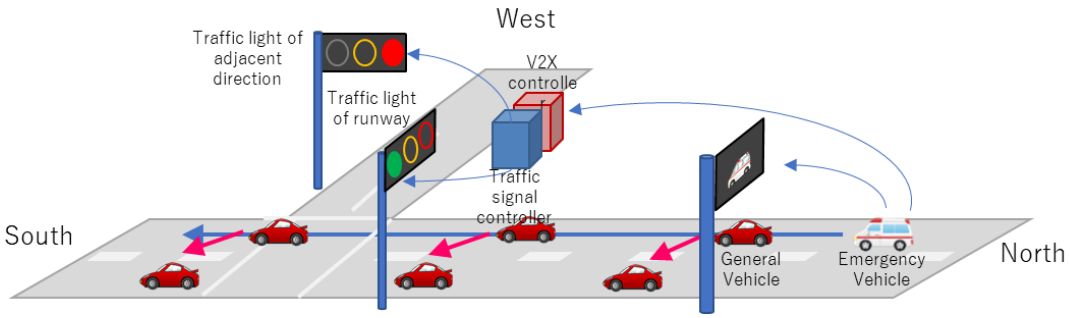

Image of experiment

Location of experiment

The experiment was conducted on the West Bank of the Riverfront Road in Ahmedabad, which is the capital of the western state of Gujarat in INDIA.

The River front Road runs along the western banks of the Sabarmati River which flows through the center of Ahmedabad City.

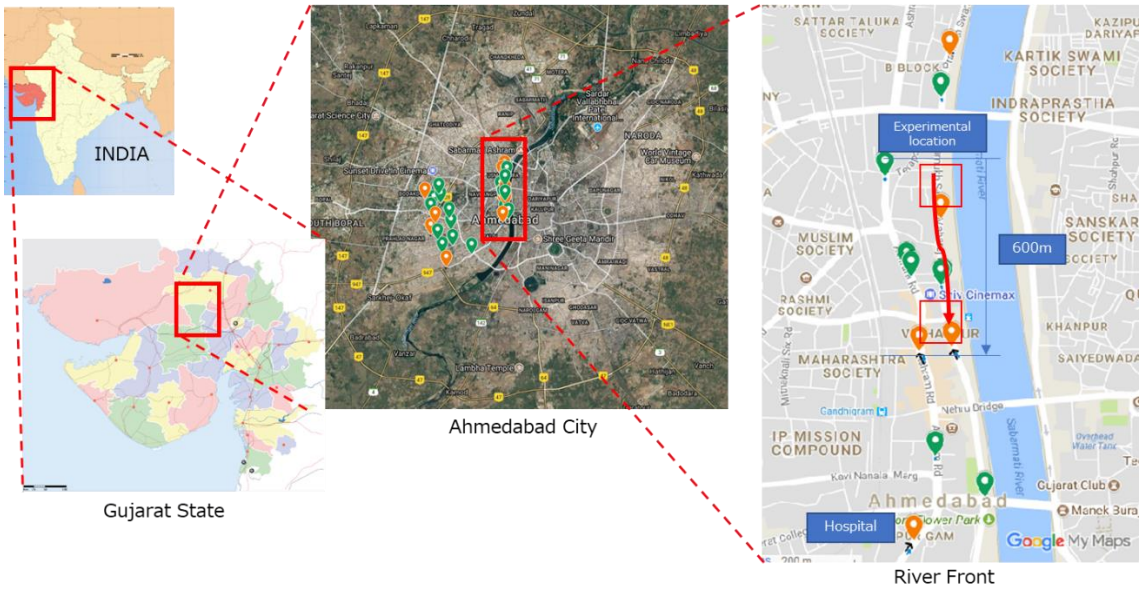

Image of experiment location

Results of the experiment

Upon completion of the demonstration it was found that the emergency vehicle priority system that uses UHF band and the V2X communication technology which is similar to the Japanese "700 MHz band Intelligent Transportation Systems Standard (ARIB STD -T109)" and “Inter-vehicle Communication Message Specifications (ITS Connect TD-001) is very stable as the communication between the V2X devices was confirmed. Moreover, it was observed that, by controlling the traffic signals in the approaching direction of the emergency vehicle, the vehicle passed through the intersection smoothly and reduced the travel time to its destination. Furthermore, it was also observed that by displaying the emergency vehicle approaching information on the traffic information boards, most motorists move aside to give priority passage to the emergency vehicle, thereby enabling the emergency vehicle to run smoothly and reduce the travel time even more. The UHF band used in the demonstration experiment was acquired under an experimental license from the Wireless Planning and Coordination (WPC) Wing of the Ministry of Communications, Department of Telecommunications, INDIA.

Image of smooth intersection passing utilizing vehicle priority system

Image of Traffic Information Board with V2X device showing emergency vehicle information

The next deployment

In the next phase of the experiment, we will consider expanding the experiment implementation area. Further, by showcasing this experiment to the relevant ministries and industry groups, we hope that the integration of such systems are standardized into the specifications for future signaling systems and ITS (Intelligent Transportation System) ancillary components such as Variable Messaging Sign Boards and other such infrastructure to be implemented under smart city programs by city municipalities.

Role of organizations in this experiment

ZERO-SUM, LTD.

ZERO-SUM introduced and operates a traffic congestion mitigation system in Ahmedabad city in Gujarat, INDIA. ZERO-SUM is in charge of the experiment component to be undertaken in INDIA for the project titled “Research for the oversea expansion of ITS technologies in Japan” funded by Ministry of Internal Affairs and Telecommunications, JAPAN“. Zero-Sum ITS Solutions India Private Limited, a subsidiary of ZERO-SUM, LTD. Is responsible for coordination with Ahmedabad Municipal Corporation, local traffic police and WPC, and is also responsible for the preparation of the field experiment in Ahmedabad city, INDIA.

https://www.zero-sum.co.jp

https://www.zero-sum-its.co.in

Connected Solutions Company, Panasonic Corporation

Connected Solutions Company, Panasonic Corporation is heading a project titled “Research for the overseas expansion of ITS technologies in Japan”, funded by Ministry of Internal Affairs and Telecommunications, JAPAN. Connected Solutions Company, Panasonic Corporation oversees the organizing and conducting of experiments related to this research across several countries worldwide. In India, Connected Solutions Company, Panasonic Corporation has partnered with ZERO-SUM, LTD to successfully conduct the experiment for the demonstration of V2X communication technology.

https://www.panasonic.com/global/corporate/profile/segments.html#cns

Explanation of terms

Ahmedabad Municipal Corporation, Ahmedabad city, Gujarat State, INDIA

The Ahmedabad Municipal Corporation is responsible for the civic infrastructure and administration of the city of Ahmedabad which is the largest city in the state of Gujarat, INDIA. Ahmedabad city has a population of 5.6 million people and is the seventh largest city in INDIA. Several Japanese automotive companies in recent years have setup their manufacturing facilities around Ahmedabad City. Ahmedabad city is also one of the first cities selected under the Smart City program implemented by Prime Minister Narendra Modi and has been at the forefront in the implementation of smart technologies for the betterment of its citizens.

UHF (Ultra-High Frequency)

Ultrashort frequency band. Radio waves with frequencies range 300 MHz to 3 GHz fall under this category. Two of the key characteristics of radio waves in the UHF band is the long

communication distance range, and its ability to penetrate natural and man-made obstacles. It is used in mobile phone communication, wireless LAN, wireless communication for automobile and mobile communication for business use.

V2X -Vehicle to Everything(X)
V2X is the collective term for technologies and systems for exchanging information between automobiles and other automobiles, automobiles and roadside equipment & automobiles and pedestrians using wireless communication system.

700 MHz Band Intelligent Transportation Systems Standard (ARIB STD-T109)
It is a standard compiled by the Association of Radio Industries and Businesses, Japan (ARIB) to support safe driving using vehicle-to-vehicle and vehicle-to-infrastructure communication system. The exchanging of information will enable the prevention of traffic accidents and help realize safer driving. The safe driving support services started from Japan and has been in use since 2015.
https://www.arib.or.jp/english/std_tr/telecommunications/std-t109.html

Inter-vehicle Communication Message Specifications (ITS Connect TD-001)
It is a standard compiled by the Association of ITS Connect Promotion Consortium, Japan to support safe driving using vehicle-to-vehicle and vehicle-to-infrastructure communication system. It assists drivers by providing with the information obtained via wireless communication by infrastructural equipment installed on the road and among vehicles, in front of intersections etc. with poor visibility.
https://www.itsconnect-pc.org/en/_img/about/TD-001.pdf

WPC
The WIRELESS PLANNING & COORDINATION (WPC) Wing, Department of Telecommunications, Ministry of Communications, INDIA is the National Radio Regulatory Authority responsible for Frequency Spectrum Management, including licensing and caters for the needs of all wireless users (Government and Private) in the country. It exercises the statutory functions of the Central Government and issues licenses to establish, maintain and operate wireless stations.

“Research for the overseas expansion of ITS technologies in Japan”
“Research for the overseas expansion of ITS technologies in Japan”, is a research project funded by the Ministry of Internal Affairs and Telecommunications, JAPAN. This project aims

to implement demonstrations of the world standard-based Japanese originated V2X technology to achieve improvements in the traffic safety conditions, based on the previous study of the traffic accident information from several Asian countries and regions in 2018. This research will cover 3 countries and regions including INDIA for the implementation of V2X demonstrations.

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