



JCC MEETING AT IITH (JUNE 2018)

M2Smart NewsLetter

Vol.1

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RESEARCH MEETINGS AT IITH

WELCOME!

by Haruka Katarao

What is M2Smart Project?

The goal of M2Smart project is to reduce carbon dioxide through optimization of the traffic flow. This research project is targeting global issues, such as contributing to the global environment through the academic partnerships between researchers in Japan (Nagoya Electric Works, Nihon University and Tokyo Institute of Technology) and India (Indian Institute of Technology Hyderabad (IITH)).



Introduction for the Project Team leader and Co-leader

Group 1 [Sensing] Leader: Dr. C Krishna Mohan (IITH), Co-leader: Dr. Satoshi Takahashi (Nagoya Electric Works)

Group 2 [Big Data Analysis] Leader: Dr. Tetsuhiro Ishizaka (Nihon University), Co-leader: Dr. Manuendra Sankar Desarkar (IITH)

Group 3 [Multimodal Application] Leader: Dr. Digvijay Pawar (IITH), Co-leader: Mr. Hideki Komori (Nagoya Electric Works)

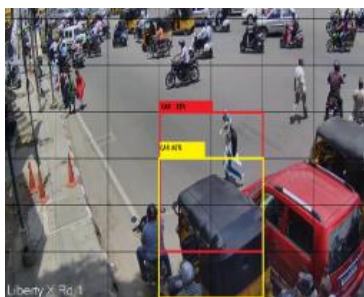
Group 4 [CO₂ Reduction] Leader: Dr. Atsushi Fukuda (Nihon University), Co-leader: Dr. Soumya Jana (IITH)



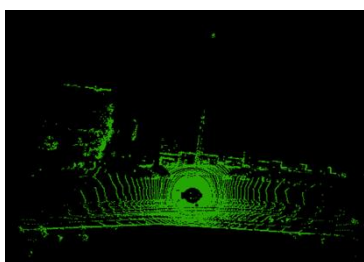
In June and August 2018, research meetings are conducted at IITH.

Different aspects of ITS

by Satish Kumar Reddy



Vehicle detection and tracking.



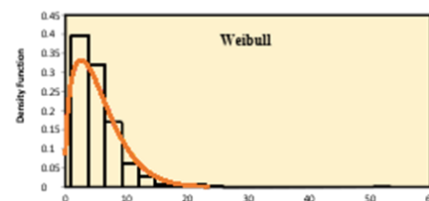
Segmented point cloud of LIDAR images of vehicle.

Traffic management and information systems rely on a suite of sensors for estimating traffic parameters. Vision-based video monitoring systems offer several advantages such as vehicle classifications, lane changes, etc., can be measured. To this end, vehicles were initially detected based on R-CNN structures. They were tracked by online multi-object tracking problem framework.

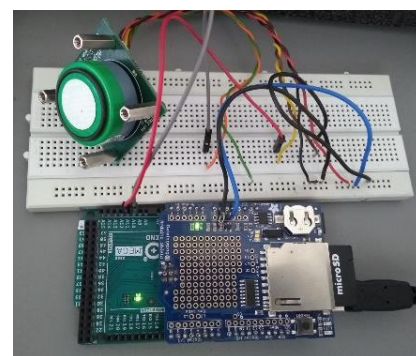
Simultaneously, Lidar technology is also being explored to sense the vehicles, which provides high precision range information with wide fields .

At the same time, driver behaviour such as inter vehicular gap should be analysed at different locations to set safety norms and to predict the impacts on the vehicular emission. To this end, gap acceptance for different classes of a vehicle near T-intersection located at IIT-H main gate was studied.

On the other hand, to examine the effect of transportation sector on carbon foot print, efforts are being made to understand the spatial temporal trends of emissions due to vehicles using low cost CO sensors.



Inter-vehicular gap near IIT-H Main gate on NH-65 Mumbai Highway modelled and fit with Weibull distribution



Initial development phase of compact CO sensing setup to monitor vehicular emission.

ITS Workshop in Bengaluru

by Antony Franklin and Thamilselvam.B

As part of the M2Smart project, Dr. Antony Franklin and Mr. Thamilselvam, the researchers from IITH presented their work in the 5th workshop on Intelligent Transportation System workshop, co-located with COMSNETS 2019 in Bangalore 7-11th January 2019.

- 1) The performance analysis of both single-hop and multi-hop routing protocol using Delay Tolerant Networks (DTN) and AllJoyn framework for Vehicle to Vehicle (V2V) communication was done using a smartphone application developed in house at IITH. Based on the experiments, it is shown that Epidemic routing protocol performs the best in the considered multi-hop scenario in terms of transfer delay, coverage, and throughput whereas, Direct Delivery routing protocol performs better than AllJoyn in single-hop communication. The work of another group, consisting of Mr Thamilselvan B, Dr. Subrahmanyam Kalyanasundaram and Dr. M. V. Panduranga Rao, titled "Coordinated Intelligent Traffic Light using Uppaal Stratego" was presented by Mr Thamilselvam.
- 2) An interesting approach that used statistical model checking and machine learning techniques to improve throughput at an isolated traffic junction has been reported in recent literature. In this work, a new technique is developed using these techniques to show dramatic improvements in traffic throughput when two neighboring junctions act in a coordinated manner.



IITH researchers at the workshop.

Ahmedabad Workshop

by Tetsuhiro Ishizaka



Dedicated autos were parked near the BRT station stilled with a flag



Participants of workshop been given appreciation certificates

In future, the limited accessibility of BRT stations could lead the riders towards increased private motor vehicle. To fill this gap, one needs to deploy efficient last mile connectivity services providing access to BRT stations and homes/offices while simultaneously fine-tuning such services based on the riders comfort, behaviour and requirement. In this paper, the authors demonstrate this idea on a busy BRT station of a commercial area in Ahmedabad, India. This approach was tested in a workshop conducted near busy BRT station with the Multi-modal application (MMA) which can provide shortest and most eco-friendly routes using all possible modes. Specifically, the application was used to track the modal choice behavior of the riders. A questionnaire was taken from the participants on different aspects like ride comfort, transit delay before and after the experiment to examine the effect of seamlessness on rider's opinion.



Interaction with auto drivers and participants

OUR OBSERVATIONS

50%

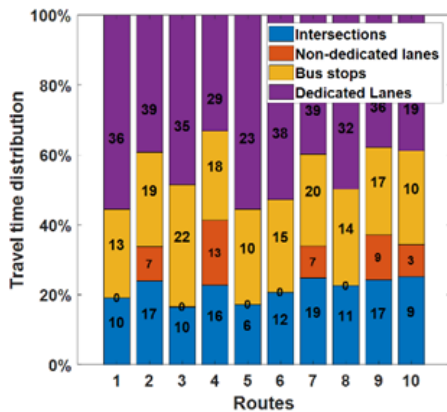
Overall participant satisfaction **prior** to feeder experiment

80%

Overall participant satisfaction **after** the feeder experiment

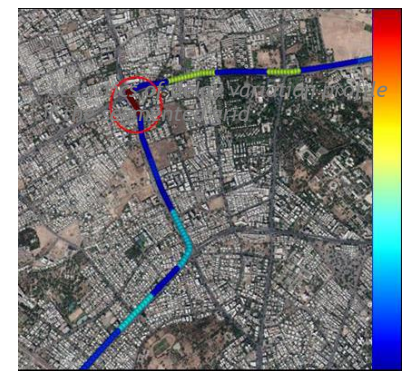
BRT service Reliability Analysis

by Anand Kakarla



Delay contribution of different lanes of a BRT systems.

To improve service reliability of BRTS in Ahmedabad, its travel time characteristics across time-space was analyzed based on incomplete GPS log data. The results clearly indicated that the delay occurs near the big intersections. It was also observed that such intersections contributed about 25% of the total travel time. The velocity profiles were further used to characterize and quantify the delay caused by the mixed traffic zones. It was observed that these zones contributed about 25% of the total travel time. Further, to estimate the spatial distribution of the delay variation along a route, a heuristic segmentation analysis was developed.



Statistics of delay variation profile of the segmented grid

PUBLICATIONS

Conference papers

- Ryohei Hashimoto, Tetsuhiro Ishizaka, "Characteristics BRT Operation and Delay Analysis in Ahmedabad India", Civil Eng. Society, August, Japan, 2018.
- Tetsuhiro Ishizaka, Fumiya Takahashi, Atsushi Fukuda," Basic Study of Transportation choice by access with sharing Taxi", Civil Eng. Society, Japan, August, 2018.
- Tsutomu Tsuboi, "Traffic Service Quantitative Analysis Method under Developing Country", ICACCI, India, September, 2018.
- Tsutomu Tsuboi, "Dynamic Macro Numeric Analysis of Fatal Traffic Accident", ICACCI, India, September, 2018.
- Takashi Hiraide, Tomoya Kawasaki, Shinya Hanaoka, "Clarification of Public Transport Usage Conditions in Ahmedabad, India", Urban Transport and the Environment, Spain, September, 2018.
- Tsutomu Tsuboi, "Traffic Congestion Visualization by Traffic Parameters in India", Czech, March, 2019.
- Anand Kakarla, Ryohei Hashimoto, Tetsuhiro Ishizaka, Atsushi Fukuda, "Exploring the Affect of Mixed Traffic Zones on BRTS: A case study on Ahmedabad BRTS" World Conference on Transport Research - WCTR 2019 Mumbai 26-31 May 2019 (accepted).

Workshop papers

- Suhel Magdum, Mehul Sharma, Srikant Manas Kala, Antony Franklin A, and Bheemarjuna Reddy Tamma, "Evaluating DTN Routing Schemes for Application in Vehicular Networks", in Proc. of 5th workshop on Intelligent Transportation Systems (ITS), co-located with COMSNETS, Bengaluru, India, January 2019.
- Subrahmanyam Kalyanasundaram, M. V. Panduranga Rao, and Thamilselvam B, "Coordinated Intelligent Traffic Light using Uppaal Stratego", in Proc. of 5th workshop on Intelligent Transportation Systems (ITS), co-located with COMSNETS, Bengaluru, India, January, 2019.

Posters

- Tsutomu Tsuboi, "Quantitative Analysis Method of Traffic Service by Traffic Congestion under Developing Country", ISTS&IWTDCS, Japan, August, 2018.
- Atsushi Fukuda, "SATREPS: Smart Cities for Emerging Countries based on Sensing, Network and Big Data Analysis of Multimodal Regional Transport System "Japan Association for Human and Environment Symposium, Japan, September, 2018.
- Tsutomu Tsuboi, "Traffic Flow and Vehicular Lanes Effect Analysis in Emerging Country", Spain, November, 2018.
- Mehul Sharma, Suhel Magdum, Antony Franklin A, Bheemarjuna Reddy Tamma, and Digvijay S. Pawar, "VISIBLE: Application for Vehicle Visibility and Incident Reporting in Real-Time", in Proc. Of Internet Conference, Tokyo, Japan, November 2018.
- Ryohei Hashimoto and Anand Kakarla, "Analyzing the effect of variation of intersection delays on total travel time in Bus Rapid Transit Systems", Honda Y-E-S Forum, Tokyo, Japan, July, 2018.

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SATREPS



M2 Smart Website: <http://m2smart.org/en/>

M2 Smart Facebook: https://www.facebook.com/M2Smart-Project-1884427054904459/?epa=SEARCH_BOX