

An Indian-Australian research partnership

Project Title:	Effect of human factor and dynamics of connected and autonomous vehicles on highway infrastructure elements	
Project Number	IMURA0861	
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Research Clusters:

Research Themes:

Highlight which of the Academy's CLUSTERS this project will address? <i>(Please nominate JUST one. For more information, see www.iitbmonash.org)</i>		Highlight which of the Academy's Theme(s) this project will address? <i>(Feel free to nominate more than one. For more information, see www.iitbmonash.org)</i>	
1	Material Science/Engineering (including Nano, Metallurgy)	1	Advanced computational engineering, simulation and manufacture
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3	Math, CFD, Modelling, Manufacturing	3	Clean Energy
4	CSE, IT, Optimisation, Data, Sensors, Systems, Signal Processing, Control	4	Water
5	Earth Sciences and Civil Engineering (Geo, Water, Climate)	5	Nanotechnology
6	Bio, Stem Cells, Bio Chem, Pharma, Food	6	Biotechnology and Stem Cell Research
7	Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng	7	Humanities and social sciences
8	HSS, Design, Management	8	Design

The research problem

Highway infrastructures are developed considering vehicle dynamics and human factors. With the introduction of connected and autonomous vehicle fleet, the effect of human factor and vehicle dynamics on highway infrastructure would change. For example, the psychological widening considered in the horizontal curve may not be required for autonomous vehicles. Such changes could have significant impact on future infrastructure development and cost. It may also improve the efficiency and capacity of the available infrastructure. Therefore, it is important to understand the potential changes in human factor and vehicle dynamics due to the connected and autonomous vehicle fleet. In this study, various infrastructure elements such as, intersections, interchanges, horizontal curves, vertical curves and reversible lanes would be reviewed to quantify the effect of human factors and vehicle dynamics on physical dimension of those elements.

Project aims

The primary aims of this project are:

- Investigate the effect of human factor on physical dimension of various infrastructure elements.
- Study the dynamics of human driven and autonomous vehicles.
- Assess the minimum infrastructure dimensions required for continuous and autonomous vehicles.

Expected outcomes

The expected outcome on research output includes:

- Not less than 2 high-level international conference presentations per year
- Not less than 1 high-level journal publication per year
- Aim at continuously recruiting research student in future, e.g. 1 per two year

The expected outcome on research advance includes:

- In-depth understanding of human factor and dynamics of human driven vehicles in various infrastructure elements.
- Optimized infrastructure elements for connected and autonomous vehicles.
- Preliminary guideline on infrastructure element dimensions for connected and autonomous vehicles.

How will the project address the Goals of the above Themes?

The vehicle industry is gradually shifting from human driven vehicles to connected and autonomous vehicles. Dynamics of human driven and connected and autonomous vehicles are expected to be different. Accordingly, the infrastructure dimension might change. Therefore, the proposed project would help to find the optimum infrastructure for the connected and autonomous vehicles. It would require analysis of big data and simulation of various scenarios to recommend dimensions of various infrastructure elements.

Capabilities and Degrees Required

The ideal set of capabilities of a student for this project are:

- Knowledge of highway geometric design
- Understanding of vehicle dynamics
- Experience in computer programming and software
- Exposure in advanced analytics

Potential Collaborators

Monash University: Dr. Nan Zheng
IIT Bombay: Prof. Avijit Maji

Select up to **(4)** keywords from the Academy's approved keyword list (**available at <http://www.iitbmonash.org/becoming-a-research-supervisor/>**) relating to this project to make it easier for the students to apply.

Transportation and Traffic Engineering
Data Science, algorithms