



Ph.D. Scholars

Current

Highway safety

Scholar: Amit Agarwal
Supervisors: G. Tiwari

Tool for positioning human body FE model

Scholar: Dhaval Jani
Supervisors: A. Chawla and S. Mukherjee

In-vivo measurement of constitutive properties

Scholar: Hemant N Warhatkar
Supervisors: A. Chawla and S. Mukherjee

Demand models for bicycle traffic integrating landuse parameters

Scholar: Himani Jain
Supervisor: G. Tiwari

Pedestrian behaviour modeling

Scholar: Mariya Khatoon
Supervisors: N Chatterjee and G. Tiwari

Study of bone fracture characteristics

Scholar: Mike W J Arun
Supervisors: A. Chawla and S. Mukherjee

Institutional and regulatory structure for providing urban public transport

Scholar: O.P. Agarwal
Supervisors: G. Tiwari and V. Upadhyay

Safety considerations in bicycle demand models

Scholar: Pankaj Prajapati
Supervisors: G. Tiwari

To study the suitability of airbags for motorcyclists

Scholar: Prashant Vidhyadhar Bhosle
Supervisors: A. Chawla and S. Mukherjee

Estimation of externalities in public transport system

Scholar: Pradeep Singh Kharola
Supervisors: G. Tiwari and A. Kanda

Service level benchmarks for urban transport systems

Scholar: S K Lohia
Supervisors: V. Upadhyay and G. Tiwari

Impact of informal landuse on travel demand

Scholar: S.S.L.N. Sarma
Supervisor: G. Tiwari

M.Tech. Projects

Completed

Driving cycle documentation and its effect on vehicular emission and fuel consumption

Student: Ashutosh Singh Baghel
Supervisor: S.R. Kale

Aerodynamics of air flow through the engine compartment of a conventional bus

Student: Akil Arshad
Supervisor: S.R.Kale

Crash reconstruction using multi body simulation and optimization technique

Student: Raghu Vamsi Kanugula
Supervisors: A Chawla and S Mukherjee

Effect of road divider design on motorcycle stability

Student: Debasis Sahoo
Supervisors: A. Chawla S. Mukherjee

Comparison of exclusive lanes for buses: curbside lanes v/s median lanes

Student: Vishwa Deep
Supervisor: G. Tiwari

Traffic signal modelling using cellular automata

Student: Anjane Kumari
Supervisor: G. Tiwari

Assessment of pedestrian risk at grade separated junction in an urban area

Student: Sumana Biswas
Supervisor: G.Tiwari

Optimal design of speed reduction devices in highways

Student: Pushpita Mondal
Supervisor: G. Tiwari

Evaluation of road safety management on road widening

Student: Ranjan Prakash
Supervisor: R.R. Kalaga

Development of real world driving cycles for various traffic conditions in India

Student: Harish Nalam
Supervisors: R.R. Kalaga and G. Tiwari

Ph.D. Scholars

Completed

Study of the effect of thigh and leg muscle activation on the response of human knee to impact loading

Scholar: Anurag Soni
Supervisors: A. Chawla and S. Mukherjee

Demand model for public transport trips: case study Delhi

Scholar: Mukti Advani
Supervisors: G. Tiwari

B.Tech. Projects

Completed

Development of mode choice model for potential bicycle users

Student: Apurv Bansal
Supervisor: G. Tiwari

Network assignment model for bicycles

Student: Nidhi Arora
Supervisor: G. Tiwari

Modification for HCM 2000 for evaluation of capacity and saturation flow at signalized intersections

Student: Niharika Singh
Supervisor: G. Tiwari

Modification for HCM 2000 for evaluation of level of service of urban intersections including pedestrians

Student: Prateek Choudhary
Supervisor: G. Tiwari

The Transportation Research and Injury Prevention Programme (TRIPP) at the Indian Institute of Technology Delhi, is an interdisciplinary programme focussing on the reduction of adverse health effects of road transport. TRIPP attempts to integrate all issues concerned with transportation in order to promote safety, cleaner air, and energy conservation. Faculty members are involved in planning safer urban and inter-city transportation systems, and developing designs for vehicles, safety equipment and infrastructure for the future. Activities include applied research projects, special courses and workshops, and supervision of student projects at postgraduate and undergraduate levels. Projects are done in collaboration with associated departments and centres at IIT Delhi, government departments, industry and international agencies.



THE NATIONAL ROAD SAFETY AND TRAFFIC MANAGEMENT BOARD BILL, 2010

A bill to provide for the establishment of the National Road Safety and Traffic Management Board for the purpose of orderly development, regulation, promotion and optimization of modern and effective road safety and traffic management system and practices in relation to the national highways and improved safety standards in highway design, construction, operation and regulate high standards in production and maintenance of mechanically propelled vehicles and for matters connected therewith or incidental thereto.

STATEMENT OF OBJECTS AND REASONS

Road transport is the most convenient and popular mode of transport and at the same time, it is also the most complex and unsafe mode of transportation resulting in higher number of road crashes as compared to other sectors of transportation. The world report on Road Traffic Injury Prevention (2004) of the World Bank and World Health Organisation has observed that road traffic injuries are a major but neglected health problem. The report forecasts that in the absence of increased effort and new initiatives, the total number of road traffic injuries and deaths would rise by sixty-five per cent, between 2000-2020 across the world. In India, the number of deaths reported has increased to 1,14,444 in 2007 from 84,674 deaths in 2002. A study conducted in 2002 by the Planning Commission estimated the social cost of road accidents in India at about three per cent of GDP annually which at 2000 prices is estimated at rupees 55,000 crore. In case of developed countries, the cost of road crashes rise between one to two per cent of their GDP.

The number of vehicles in India has been increasing at an average growth rate of ten per cent, per annum since the last few years. The total number of vehicles as on 31st March, 2006 is about nine crores as against three lakh vehicles in the year 1951. India has also taken up an ambitious project of upgrading its National Highways under various phases of the National Highways Development Project. Broadening of National Highways from four to six lanes and construction of Expressways under this project has already progressed to a large extent. This has resulted in an increase in both, volume and speed in traffic flow. At the same time, it also raises serious concerns about road safety.

In most of the developed countries, focused and scientific research is carried out on road safety and road crash injury prevention. These countries have specialized bodies to maneuver adequate resources and supervise the activities required to improve road safety. However, there is no such dedicated agency in India to deal with road safety issues. Though the Ministry of Road Transport and Highways is the administrative ministry responsible for road safety efforts in the country, it does not have the enforcement machinery of its own and other technical resources required to ensure better road safety activities. There are other bodies concerned for road safety issues which are the Transport Departments of the State Governments, automobile testing agencies, highway construction and maintenance agencies, etc. There is also a need to look into the issues as to whether the design, construction and maintenance standards of highways are being scrupulously followed both by the Government and concessionaires. It is, therefore, felt that an integrated and dedicated statutory body is necessary to provide for continuity, expertise and credibility to combat the rising menace of road accidents and fatalities in the country.

In order to look into the issue of creating a dedicated agency for road safety and traffic management, a Committee under the Chairmanship of Shri S. Sundar, former Secretary in the erstwhile Ministry of Surface

Transport was constituted in the year 2005. The said Committee recommended the creation of the National Road Safety and Traffic Management Board through an Act of Parliament which would be responsible to oversee road safety activities in the country.

Based on the recommendations of the aforesaid committee, the National Road Safety and Traffic Management Board Bill, 2010 has been prepared. The salient features of the Bill, inter alia, are as under:-

a) The National Road Safety and Traffic Management Board shall consist of a Chairperson who shall be a person of eminence with ability, integrity and outstanding caliber who has adequate knowledge and professional experience in administration and road transport and five members to be chosen one each from amongst persons having experience in the fields of road design, engineering or construction; automobile engineering or technology; data collection and analysis, accident investigation, research, finance or administration; traffic management, road user behavior strategies or road safety education; and trauma care and rehabilitation;

b) The Board shall, inter alia, perform the following functions, namely:-

(i) in relation to the national highways, recommend minimum design, construction, operation and maintenance standards for the national highways; recommend minimum standards for establishing and operating trauma facilities and para-medical facilities for dealing with traffic related injuries on the national highways; conduct or cause to be conducted safety audits to monitor compliance with the standards notified by the Central Government; make recommendations or issue guidelines relating to design, construction, operation and maintenance standards for the national highways.

(ii) in relation to mechanically propelled vehicles, recommend minimum safety requirements and standards for the design and manufacture of mechanically propelled vehicles; recommend minimum conditions for safe usage of mechanically propelled vehicles including specifying the maximum load bearing and capacity limits; conduct or cause to be conducted safety audits to monitor compliance with the standards notified by the Central Government; recommend standards for vehicular traffic on the national highways including the schemes for segregation of various classes of vehicles in separate speed lanes and their right of way;

(iii) without prejudice to aforesaid, in relation to the national highways and mechanically propelled vehicles, establish procedures and centres for multidisciplinary crash investigation; make recommendations or issue guidelines relating to safety features for vehicles other than mechanically propelled vehicles and for safe operating conditions for such vehicles; promote relevant practices in road safety and traffic management, undertake road safety and traffic education programs, and conduct campaigns to create awareness amongst all sections of road users, children and students on matters relating to road safety; involve non-government organizations working in the area of road safety and traffic management, and assist them in promotion of efficient traffic management and road safety; provide for the special requirements for women, children, senior citizens, disabled persons and pedestrians relating to road safety and traffic management, and assist them in promotion of efficient traffic management and road safety; provide for the special requirements for women, children, senior citizens, disabled persons and



pedestrians relating to road safety and traffic management; advise the Central Government in matters relating to or arising out of traffic management on the national highways and the mechanically propelled vehicles for the purposes of ensuring road safety; advise the Central Government on administration of the provisions relating to safety as contained in Chapters II, IV, V, VII, VIII and XIII of the Motor Vehicles Act, 1988 and the rules made thereunder.

However, the Board cannot exercise the power and jurisdiction in respect of matters relating to public order, roads (other than national highways) and vehicles (other than mechanically propelled vehicles) and the matters which have been specifically provided under the Motor Vehicles Act, 1988 or the National Highways Act., 1956;

(c) the Central Government, in consultation with the National Highways Authority of India, would notify the standards relating to the national highways and mechanically propelled vehicles as recommended by the Board;

(d) creation of the National Road Safety and Traffic Management Fund for meeting the expenses of the Board wherein the one per cent of the revenue from the cess on diesel and gasoline allocated under section 10 of the Central Road Fund Act, 2000 for national highways and rail and road over bridges shall be credited;

(e) the provision for penalty of ten lakh rupees for failing to maintain the standards referred to in the sub-paragraph (c) above.

TO BE INTRODUCED IN LOK SABHA Bill No. 59 of 2010

THE NATIONAL ROAD SAFETY AND TRAFFIC MANAGEMENT BOARD BILL, 2010 ARRANGEMENT OF CLAUSES

CHAPTER 1: PRELIMINARY

Clauses

1. Short title, extent and commencement.
2. Definitions

CHAPTER II: NATIONAL ROAD SAFETY AND TRAFFIC MANAGEMENT BOARD

3. Establishment of National Road Safety and Traffic Management Board.
4. Qualifications for appointment of Chairperson and Other Members.
5. Selection Committee for selection of Chairperson and Members.
6. Functions of Board.
7. Term of office, conditions of service, etc., of Chairperson and other Members.
8. Removal of Chairperson or any other member from office.
9. Meeting of Board.
10. Vacancies, etc., not to invalidate proceedings of the Board.
11. Officers and other employees of the Board
12. Advisory Committee
13. Functions of advisory Committee.
14. Power to call for information.
15. Central Government to notify standards.

CHAPTER III FINANCE, ACCOUNTS AND AUDIT

16. Grants and loans by Central Government.

17. National Road Safety and Traffic Management Fund.
18. Accounts and audit of Board
19. Budget
20. Annual and other reports

CHAPTER IV PENALTIES

21. Penalties
22. Cognizance of offences
23. Composition of offences

CHAPTER V MISCELLANEOUS

Clauses

24. Delegation
25. Power of Central Government to issue direction
26. Power of Central Government to supersede Board.
27. Chairperson, Members, etc., to be public servant.
28. Protection of action taken in good faith.
29. Act to have overriding effect
30. Application of certain laws.
31. Power of Central Government to make rules.
32. Power of Board to make regulations
33. Laying of rules and regulations
34. Amendment of certain enactments
35. Power to remove difficulties.

THE SCHEDULE



NEWS

Goldman, Sharon & Peleg, Kobi (2010). Pupil behaviour on school buses and potential risk factors for injury: an observational study. Bull World Health Organ. 88:570-575.

Objective: To observe pupil behaviour on school buses in Israel and identify hazards as a basis for improving school bus safety.

Methods: Data on student, bus driver and chaperone behaviours and on hazards associated with school buses, bus loading zones and bus stops were collected during an observational study conducted on school buses in rural communities in Israel. This report focuses on observations of student behaviour during school bus rides.

Results & conclusions: Seatbelt use was observed and recorded on 351 bus rides; on 23% of the rides all the pupils fastened seatbelts and on 42% none did...The following pupil behaviours were observed: not sitting while the bus was in motion, standing up before the bus came to a complete stop, being rowdy or extremely noisy, and engaging in physical or verbal conflicts...The presence of a chaperone and the length of the bus route (in minutes) were not found to have a statistically significant association with these behaviours...Primary school pupils were 2.3 times more likely to engage in at least 2 of the observed behaviours than middle and high school pupils...Noise, conflicts between pupils, and pupils moving around on a travelling bus were all disruptive to the bus driver...An important finding of this study is that seatbelt use among school-age children and adolescents is not dependent on seatbelt availability or on regulations requiring seatbelts in vehicles used for school transportation...Bus drivers and transportation coordinators say that it is unrealistic to expect the bus driver to enforce seatbelt use and address misconduct while concentrating on driving safely...This study confirms that seatbelt availability and government regulations are not sufficient to ensure seatbelt usage. In order for laws and regulations to be effective they must be enforced. However, responsibility for enforcing seatbelt use and tackling pupil misconduct cannot be assigned solely to the bus driver, whose principle responsibility is to drive safely. Innovative methods for improving pupil conduct on school transportation vehicles should be designed, implemented and evaluated.

Nathalie Nallet, Marlène Bernard, Blandine Gadegbeku, Karine Supernant, Mireille Chiron (2010). Who takes driving licence point recovery courses in France? Comparison between course-takers and ordinary drivers. Transportation Research Part F, 13:92-105

Objective: Who are the individuals taking these courses? Are they simply unlucky, as they frequently assert when they are on the course? ...The aim of the paper is to compare those taking points recovery courses to the general population of drivers (controls) from the sociodemographic standpoint and with regard to their travel practices, lifestyle and personality profile.

Method: A self-administered questionnaire was answered by 2014 drivers, 853 of whom were taking a course. The data were analyzed aiming to identify the factors that are linked to taking the course, i.e. to recurrent reoffending.

Results & conclusions: The course-takers, of whom 89% were male, admitted committing more violations than the control group. They had more accidents. More male course-takers than controls reported not being happy, and they more frequently had high extroversion scores...Priority must be given to speaking among course-takers and their group life, rather than passive listening. What is required is not teaching but leading a discussion-group...On the other hand it is pointless to speak about technical matters, such as braking distances, knowledge of which does not change behaviours. People do not take driving licence points recovery courses by chance, they differ from typical drivers. The women coursetakers did not differ from the men as regards the personality criteria. They are major reoffenders (for all types of violation), and some have used all the machinery of the system to avoid taking the course. It is only when their driving licence is under extreme threat that they decide to do so...Our research confirms the need to distinguish between determinants of risk (such as social identity and gender) and exposure factors (mileage and violations)... Thus, the road traffic accident prevention message which is accessible to ordinary individuals is not so to the course-takers, whose behaviour is mainly influenced by affective considerations and who deny reality in order to survive in the system. Those who commit violations appear to have more subjective gains than losses, which leads them to minimize the act and its long term consequences. Without a consideration of these data, the effect of current prevention policies is very likely to plateau out.

Paul Mees (2010). Density and sustainable transport in US, Canadian and Australian cities: Another look at the data. Proceedings 12th WCTR, Lisbon, Portugal.

The link between density and automobile use is accepted by many critics of the compact city, as well as by advocates of the idea. Critics argue that the density increases required to substantially change transport patterns are unachievable or undesirable, with the result that there is no practical alternative to continued automobile dominance. This view seems even to have influenced the International Panel on Climate Change, whose fourth Climate Change Assessment Report, released in 2007, has little to say about transport... However, the IPCC working group makes a valid point. Increasing the urban density of a large metropolis is likely to be expensive, disruptive and time-consuming, and may be impossible to achieve within the timeframe necessary to combat urgent problems like climate change and oil insecurity. This is particularly so if some commentators are correct about the magnitude of the density increases that are required for sustainable urbanism.

The data suggest the need for a serious re-examination of the 'compact city' solution to mode shift... There is no doubt that very large differences in density can influence transport patterns. Hong Kong's very high density is a major reason why automobile use is so low: if the city somehow became as spacious as Boston or Brisbane, car usage rates would increase. But the question for policy-makers is whether changes in density of the kind that might be possible in real urban environments will significantly influence mode share. On this question, the answer appears to be in the negative. The compact city is not the solution to the problem of automobile dependence. Many decades of compact city policies might make Ottawa as dense as Los Angeles is now, or Brisbane as dense as Las Vegas, but changes like this are unlikely to produce significant shifts to metropolitan-wide travel patterns. This analysis supports the suggestion made 15 years ago by the UK Royal Commission on Environmental Pollution: 'there is no single pattern of land uses that will reduce the need for travel, and so reduce the effects of transport on the environment'... Similarly, the notion that effective public transport cannot be provided in areas with densities below 100 or even 30 persons per hectare appears to be incorrect. These findings should be good news for policy-makers and others concerned about problems like global warming and oil security. They suggest that transport policy, which can be changed more rapidly and with less expense and controversy than urban density, is a more important influence on outcomes. It might even be possible to make the necessary changes in time to save the planet.

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Endowments for perpetual Chairs
Volvo Chair for Urban Transport
CONFER, India: TRIPP Chair for Transportation Planning

Transportation Research and Injury Prevention Programme
Room MS 808 (Main Building)
Indian Institute of Technology
Hauz Khas, New Delhi 110016, India
Phone: 91-11-26596361, 26858703
Fax: 91-11-26858703, 26851169
Email: mahesh@cbme.iitd.ernet.in
www.iitd.ac.in/tripp



ABSTRACTS of Ph.D. Dissertations

Title: Demand Estimation for Public Transport Systems - Case Study of Delhi.

Scholar: Mukti Advani

Supervisor: Geetam Tiwari

Department: Civil Engineering Department

Abstract: Since large sums of money and other scarce resources are invested in creating transport infrastructure, it is important to avoid projects, which fail to provide the expected benefits. The aim of the present study is to develop a travel demand model for public and private transport modes, which can provide better estimates of travel demand. This study examines the demand of public transport trips, including the ongoing metro network in Delhi.

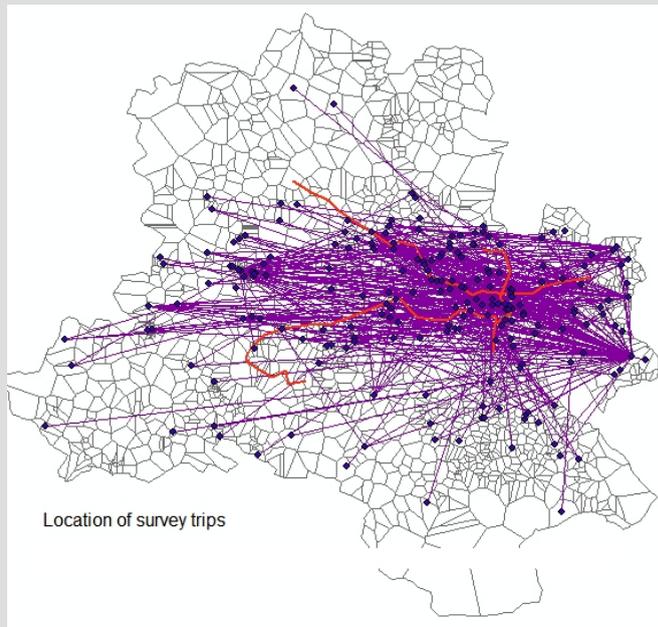
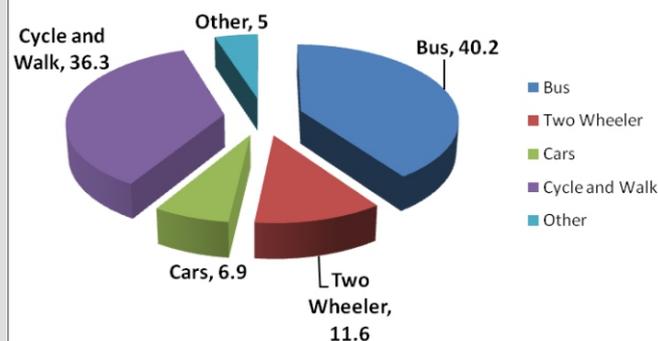
The central research focus of this study is to find out the impact of access and egress trips on travel demand estimation. The study explores how different types of zoning affect the access and/or egress trips. The importance of access and egress trips in mode choice modeling along with its relationship to main line haul can't be minimized; hence including these explanatory variables along with vehicle ownership for estimation of expected ridership on the metro system and on the bus system has studied. This study also includes the effect of different feeder modes on public transport ridership. The study also focuses on sensitivity between different modes to better understand the competitiveness between different travel mode options.

The empirical evidence from Indian cities makes a strong case for critical analyses of travel demand forecasts. Different parameters have been considered important in developing the demand estimation model for public transport services. Travel demand models based on better information of access trips, egress trips, total travel time, travel cost, income, socio-economic and landuse attributes have to be developed for a more accurate demand estimation.

Since access and egress trips have been considered very important in mode choice, this study develops a demand estimation models including details of distance, time and cost of access and egress trips based on two different methods of creating traffic zones which generates significantly different access and egress trip lengths. The model is run using the conventional traffic zone system where 90% of the zone's size is in the range of 2-5 sq km. Since this size hides the details of access and egress trips, which tend to be much smaller, a new zoning system based on creating zones around public transport stops/stations has been developed to capture the details of access and egress trips; 95% of the zones are of an area less than 1 sq.km. The first database set (database set-1) is created for zoning based on conventional traffic zones around the service area of public transport service stop/stations. The mode choice model has been run on both the zoning systems to estimate the ridership.

The methodology includes a review of the present and proposed transport policies of Delhi and travel characteristics of different commuters in the study area. Commuter travel characteristics collected in the primary surveys have been used for developing the demand estimation the ridership.

Modal Share in Delhi - Year 2001

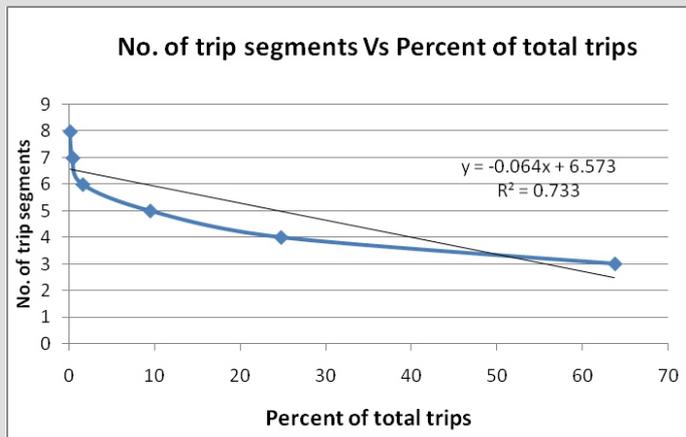


The methodology includes a review of the present and proposed transport policies of Delhi and travel characteristics of different commuters in the study area. Commuter travel characteristics collected in the primary surveys have been used for developing the demand estimation model. Nested logit models for modeling mode choice behavior of different commuters have been developed. Statistical tests of the significance of different parameters show that not only the absolute value of access and egress trips but the ratio with the main line haul trip is also significant. The multinomial logit model implies equal competition between all pairs of alternatives. Though in both the database sets, this is not the case, when we consider the choice between car, two-wheeler, bus and metro. Accordingly, nested logit models have developed for both the database sets. A comparison of the sensitivity between different modes leads to a final nest for further analysis. The final nested model of database set-1 includes access and egress time, access and egress cost, main line haul time, the ratio of access-egress time with total time and the vehicle ownership. The model of database set-2, shows different estimation parameters for access and egress time, total time, the ratio of access plus egress distance to total distance. Both the database sets have different





Continued from overleaf:



results for nested logit model after the full metro network construction in the year 2021 is completed. The model estimates modal shares of motorized vehicle trips in four different scenarios. These include rerouting of current bus routes and expected improvement in the speed of cars and buses, and decrease in speeds of cars and buses. The rerouting of bus trips has a marginal effect on the number of trips by metro. Share of metro trips increase substantially when the speeds of cars, two wheelers and buses decrease. The model estimated 7% to 16% trips according to the database set-1 and 15% to 22% according to the database set-2 of the total motorized vehicular trips would be made by metro. Approximately, 15% to 30# trips of public transport would be made by the metro as per database set-1 and 27% to 36% according to the database set-2. All parameters have been tested and significant parameters have been used to prepare the final nested logit model. Interestingly both database sets accept the same nesting of modes and both the nested logit models show a significant sensitivity between bus and two-wheeler choice.

The mode choice model developed in this study predicts that after the construction of the full network of Delhi metro (256 km) in the year 2021, the number of trips made by metro will be between 1.38 million to 3.17 million (7% to 16% of the total estimated trips in Delhi in the year 2021) as per database set – 1 and 3.0 million to 4.3 million (15% to 22% of the total estimated trips in Delhi in the year 2021) as per database set-2. Database set-1 based on conventional zoning and artificial collectors does not capture the details of access and egress trips. Therefore, zoning based on smaller zones around public transport stops is recommended for better estimation of trips especially of public transport demand. Even after the construction of the complete network of 256 kms, the Delhi metro would be able to carry 15% to 13% trips of the total trips made by public transport and 85% or 69% of public transport trips will be on the bus according to the database set-1 results while as per database set-2, metro trips range between 27% to 36% of public transport trips. Since the majority of the city trips are short trips (less than 10 km), a road based system provides better accessibility in comparison to the metro system. While planning new metro systems the demand estimation must be reviewed in this context. Road based systems, which provide better network connectivity and shorter access distance can offer a viable alternative to private vehicles.

Title: Study of the Effect of Thigh and Leg Muscle Activation on the Response of Human Knee to Impact Loading

Scholar: Anurag Soni

Supervisor: A. Chawla and S. Mukherjee

Department: Department of Mechanical Engineering

Abstract: In car-pedestrian crashes, most of the current understanding of human lower limb response, especially the knee joint, is based on the results of cadaver tests or simulations with passive lower limb finite element models. However, real world car-pedestrian accidents involve live human bodies (having the capability of contracting muscles), and not cadavers. Consequently, the effects of muscle contraction on the lower limb response in a crash have not been studied so far.

This thesis investigates the effects of active muscle forces on the response of the knee joint when the lower extremity is subjected to impact. For this, a lower limb finite element model with 42 active muscles has been developed. Here, active muscles, assuming straight line action from origin to insertion, have been modeled using 1-D bar elements. To simulate muscle contraction, Hill muscle model has been assigned to each muscle bar element. Finite element simulations of impact loading have then been performed in PAM-CRASHTM, an explicit solver, and the response of the lower limb in various car-pedestrian crash scenarios has been investigated. Results have consistently indicated that activation of muscles has a potentially significant effect on lower extremity injuries during a car-pedestrian impact. Hence, it was concluded that effects of active muscle forces should be considered in pedestrian studies.

