

**MODELLING OF MOTORCYCLE ACCIDENTS AT
NON-EXCLUSIVE MOTORCYCLE LANE JUNCTIONS IN MALAYSIA**

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DEDICATION

Especially dedicated to:

In memorial My father and My mother

H. Soerahman and Hj. Siti Aminas

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment
of the requirement for the degree of Doctor of Philosophy

**MODELLING OF MOTORCYCLE ACCIDENTS AT
NON-EXCLUSIVE MOTORCYCLE LANE JUNCTIONS IN MALAYSIA**

By

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March 2004

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In Malaysia, motorcycles constitute more than half of the total registered vehicles and contribute to more than 60% of casualties (death, hospitalised and slight injury) to total traffic accidents. In the 1990-2000 period, almost 3,000 motorcyclists were killed every year in traffic accidents. To overcome such problems, the exclusive motorcycle lanes have been constructed along the major trunk roads in Malaysia. However, not much work has been done to address junction accidents involving motorcycles. As such, a detailed study on this area has been carried out to allow traffic engineers to establish appropriate junction treatment criteria specifically designed for non-exclusive motorcycle lane facilities.

A total of 104 junctions in Hulu Langat, Klang, Kuala Langat and Petaling districts with 1,095 injury related motorcycle accidents in the period 1997-2000 were included in the study. The generalised linear modelling with Poisson distribution was used to develop the model. The variables of the model were examined using univariate and multivariate analyses.

The final models revealed that traffic flow entering the junction, approach speed, lane width, number of lanes on major road, shoulder width, junction control and land use were significant in explaining motorcycle accidents. Meanwhile, pedestrian flow, number of lanes on minor road and number of intersecting legs were not significant in explaining motorcycle accidents. Non-motorcycle flow on major road had the highest effect on the probability of motorcycle accidents at junctions.

The final models allow traffic engineers to decide the appropriate intervention levels for junction treatment with respect to motorcycle accidents. Using the final models, design parameters for junctions may be changed to achieve the appropriate safety levels for them. The decision on whether to allow motorcycles to pass through a junction without treatment to it or the need for special end treatment to minimise motorcycle conflicts at junctions can be objectively carried out based on the model, and this can easily be done using the software developed in this study.

Apart from the software, a series of design curves relating major road and minor road flows at junctions with typical shoulder widths of 0.0 m, 1.0 m, 1.5 m, 2.0 m

and 2.5m have been established. The design curves were developed based on the number of Personal Injury Accidents (PIA) of 1-PIA per year. These design curves also enable traffic engineers to decide the need for special end treatment of the junctions.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

**MODEL KEMALANGAN MOTOSIKAL DI PERSIMPANGAN LORONG
MOTOSIKAL BUKAN EKSLUSIF DI MALAYSIA**

Oleh

HARNEN SULISTO

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Motosikal merupakan lebih separuh daripada jumlah kenderaan yang didaftarkan dan ini telah menyumbang kepada lebih 60% kecederaan (maut, cedera parah, dan cedera ringan) jalan raya di Malaysia. Dalam tempoh 1990-2000 sahaja, seramai lebih 3,000 penunggang motosikal terbunuh setiap tahun dalam nahas kemalangan jalan raya. Untuk mengatasi masalah tersebut, lorong motosikal eksklusif telah dibina di beberapa lebuhraya di Malaysia. Namun, masih kurang kajian dilakukan setakat ini untuk mengatasi masalah kemalangan jalan raya yang melibatkan motosikal di persimpangan-persimpangan jalan. Oleh yang demikian, kajian terperinci telah dijalankan untuk membolehkan jurutera trafik membangunkan kriteria rawatan untuk persimpangan-persimpangan di lorong motosikal bukan eksklusif.

Sejumlah 104 buah persimpangan di daerah Hulu Langat, Klang, Kuala Langat dan Petaling dengan jumlah kemalangan 1,095 yang melibatkan kecederaan

penunggang motosikal yang berlaku di antara tahun 1997 – 2000 telah digunakan dalam kajian ini. Model generalisasi linier dengan taburan Poisson telah digunakan dalam pembentukan model ini. Pembolehubah model telah dianalisis dengan menggunakan kaedah analisis univariat dan multivariat.

Model yang dibentuk menunjukkan bahawa aliran trafik yang memasuki persimpangan jalan, laju setempat, lebar lorong, bilangan lorong di jalan utama, lebar bahu jalan, kawalan persimpangan dan guna tanah merupakan faktor penting dalam mempengaruhi kemalangan motosikal. Sementara itu, aliran pejalan kaki, bilangan lorong di jalan kecil, dan bilangan cabang persimpangan didapati tidak mempengaruhi kemalangan motosikal di persimpangan jalan. Aliran kenderaan bukan motosikal di jalan utama didapati mempunyai pengaruh yang paling tinggi dalam kebarangkalian berlakunya kemalangan motosikal di persimpangan jalan.

Model yang dibentuk membolehkan jurutera trafik memutuskan paras intervensi bagi merawat sesuatu persimpangan berpandukan kadar kemalangan motosikal yang ditetapkan. Melalui model ini, parameter rekabentuk persimpangan boleh diubahsuai untuk mencapai tahap keselamatan sesuatu persimpangan. Keputusan sama ada membenarkan motosikal melalui persimpangan tanpa rawatan atau perlunya rawatan khas untuk meminimumkan konflik di persimpangan boleh dilakukan berpandukan pada model ini. Ini mudah dilakukan dengan menggunakan perisian yang diterbitkan dalam kajian ini.

Selain daripada perisian, beberapa siri lengkung rekabentuk telah diterbitkan untuk menghubungkan aliran trafik dan lebar bahu jalan 0.0 m, 1.0 m, 1.5 m, 2.0 m dan 2.5m. Lengkung rekabentuk ini adalah berdasarkan paras kecederaan 1.0 kemalangan cedera (PIA) penunggang motosikal setahun. Dengan menggunakan lengkung rekabentuk ini, jurutera trafik juga boleh memutuskan keperluan untuk rawatan khas terhadap persimpangan-persimpangan.

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I certify that an Examination Committee met on 19 February 2004 to conduct the final examination of Harnen Sulistio on his Doctor of Philosophy thesis entitled “Modelling of Motorcycle Accidents at Non-exclusive Motorcycle Lane Junctions in Malaysia” in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations, which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

HARNEN SULISTIO

Date: 4 March 2004

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