UNIVERSITI TEKNOLOGI MARA

DEVELOPMENT OF INFORMATION ARCHITECTURE AND NOVEL SIMULATION SYSTEM FOR PILLION ASSESSMENT WORKSTATION

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Thesis submitted in fullfillment
of the requirements for the degree of
Doctor of Philosophy
(Mechanical Engineering)

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Motorcycle road accidents have become a global transportation safety issues where motorcyclists suffer mortality and non-fatal injury crashes. In the recent years, studies in the motorcycle niche area have been an overwhelming area of research interest. Researchers utilized motorcycle simulator as an alternative assessment to conduct studies in the motorcycle niche area. However, it is noticeable that studies on motorcycle and pillion (passenger) are very limited. This might be due to most of the motorcycle simulators were built exclusively for the rider, thus lack of capability to conduct experiments and assessments toward pillion. This study aimed to establish a novel information architecture exclusively for pillion from existing ergonomics knowledge, as a guide for future studies in motorcycle niche area involving the pillion, named Pillion Motorcyclist Information Architecture (PIMIA). PIMIA is a combination of two (2) information architectures which are Pillion Risk Information Architechture (PRIA) and Pillion Posture Analysis Component (PIPAC) (consisting of PIPEC and PIPOC). Based on the parameters identified from the PRIA, PIPAC, PIPEC and PIPOC, a new simulation system exclusively for pillion named Pillion Simulation System (PISIS), integrated into Postura Motergo™ was established. It is a system that composes the rider, motorcycle and environment into a single system. It enables the respective motorcycle simulator to be fully automated, providing a new medium and workstation for conducting research on the pillion. As a result, there is a vast room for explorations and innovations in research towards pillion. The PISIS was validated by using both quantitative research and experimental research (riding posture analysis, questionnaire survey and muscle activity measurement). For the quantitative research via questionnaire survey, 100 voluntary subjects participated where the subject undergone the simulation using PISIS and a set of designed questionnaire were distributed. A set of questionnaire was designed and distributed to 100 respondents in order to obtain the public motorcyclists' perception on the system. Meanwhile, the experimental research was aim to determine and compare the muscle activation of pillion while practicing pillion riding posture on both Postura Motergo™ and real motorcycle. The validation involved bilateral measurement of seven (7) muscle groups (Sternocleidomastoid, Upper Trapezius, Latismuss Dorsi, Erector Spinae, Extensor Carpi Radialis, Bicep and Posterior Deltoid) using Surface Electromyography and eight (8) subjects participated voluntary for the experiment. This study managed to establish novel information architecture named PIMIA and novel simulation system named PISIS for pillion assessment workstation. Conclusively, PIMIA and PISIS can help to bridge the gap between the researcher and studies concerning the pillion in motorcycle niche area. Such development presents a vast room and exploration for further research on pillion with respect to physical, physiological and psychological ergonomics in the motorcycle niche area.

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