

**UNIVERSITI TEKNOLOGI MARA**

**COMPUTER ALGORITHM FOR  
AUTOMATED DETECTION OF  
INTRAMEDULLARY ROD HOLE  
POSITION AND ORIENTATION**

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Thesis submitted in fulfillment  
of the requirements for the degree of  
**Master of Science**

**Faculty of Mechanical Engineering**

October 2014

## 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 result 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 other degree or qualification.

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

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Of Intramedullary Rod Hole Position And  
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## ABSTRACT

In minimal invasive orthopedic procedure such as distal locking, a lot of surgeon's time is usually wasted to determine the hole's position of intramedullary rod before screw can be insert at desire place. Often patient expose to x-ray until the surgeon get it right. The gap between manual distal locking procedure and fully automatic distal locking procedure is huge. The biggest and hardest is the system must able to recognize an X-ray image and all the relevant content inside it. Therefore to close the gap between manual and automatic, automatic image recognition system using machine vision algorithm must be developed. To obtain the intramedullary rod's holes screw coordinate (X, Y, Z) in cost effective and reasonable real time period using machine vision. Taken into account this is early research period, real surgery x-ray image is not use because of complexity and uncertainty involved. Therefore simulated x-ray image is use in control lab environment. This research is to automatically determine the holes position, distance and orientation of intramedullary rod in distal locking procedure by using in-process 3D machine vision image recognition system. It is achieve by using special algorithm that detect holes 2D coordinates and average width of intramedullary rod. After that the algorithm converting the average width value to Z-coordinate. Angle Z and angle Y are than determined through the X,Y,Z coordinates obtain earlier.

## ACKNOWLEDGEMENTS

Bissmillahirrahmanirrahim,

Thanks to God that bestows me intelligence and intellectual in order to complete this research. Without it, this research could not be completed. I'm very grateful to his blessing, love and mercy uncounted for.

Also thanks to Dr Muhammad Azmi Ayub who very helpful and provide flexible freedom in completion of this research. His guidance, ideas, and encouragement are much appreciated.

I would like to thank my spouse Farrah Idayu Bt Abdul Mutalib for unwavering support, encouragement, and confidence in me. You are truly my love and certainly remain in my heart.

In addition, i would like to thank to Mohd Elwan, a staff in mechatronic laboratory for helps, encouragement, and assistance particularly when the equipment broken and engulfed in confusing technical problems.

Also not forgotten, my parents, father-in-law and mother-in-law who are always track my research progress although they don't really understand it. Thanks for your encouragement and concern.

Special thanks to Faculty of Mechanical Engineering UiTM and Institute Graduate Studies UiTM for professionalism and dedicated work to ensure good administration and service for all students during my research period.

Also a lot of thanks for my sponsor Minister of Science and Technology Malaysia (MOSTI) for providing financial support (E-Science and National Fellowship Fund) for whole 3 years research.

It is very helpful and I'm very grateful for your full support. Without your financial support this research would not be accomplish. Last but not least is thanks for all person or parties involved either directly or indirectly in completion of this research. Once again: Thanks you very much.

Ahmed Zulhilmi B. Mohd Ziyadi  
October 2014

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