AN IN-PROCESS ROBOT CALIBRATION OF SERIAL LINK MANIPULATOR ARM BASED ON A 3-D MACHINE VISION FOR MINIMAL INVASIVE ORTHOPEDIC SURGERY OPERATION

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Tuan,

KELULUSAN MEMBIAYAI PROJEK-PROJEK SCIENCEFUND DI BAWAH RMKe-9 *CYCLE* 2/2006

Dengan hormatnya perkara di atas adalah dirujuk.

Sukacita dimaklumkan Jawatankuasa Kelulusan MOSTI telah meluluskan kertas cadangan tuan dan membiayai projek penyelidikan di bawah dana ScienceFund *Cycle* 2/2006.

Sehubungan dengan itu tuan dibenarkan untuk memulakan penyelidikan. Walaubagaimanapun tuan masih belum dibenarkan untuk membuat sebarang tuntutan atau permohonan pembelian menggunakan peruntukan penyelidikan ini memandangkan duit peruntukan masih belum diterima oleh IRDC pada masa ini.

Untuk makluman tuan, peruntukan akan dimasukkan selepas MOSTI selesai menyemak semua *Research Agreement* (RA) yang telah ditandatangani oleh penyelidik UiTM. Urusan bagi Research Agreement (RA) akan diuruskan oleh pihak IRDC.

Penyelidikan yang diluluskan adalah seperti berikut:

No Projek	Penyelidik	Fakulti	Tajuk	Tempoh Penyelidikan	Jumlah Diluluskan (RM)
02-01-01-SF0110	Muhammad Azmi Ayub	Fakulti Kejuruteraan Makanikal	An In-Process Robot Calibration Of Serial Link Manipulator Arm Based On A 3-D Machine Vision For Minimal Invasive Orthopedic Surgery Operation	24 months	230,000.00

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PENYELIDIKAN, PEMBANGUNAN DAN PENGKOMERSILAN LANDASAN KEWIBAWAAN DAN KECEMERLANGAN

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ABSTRACT

The long term aim of this research project is to design and develop a minimum invasive surgery for femur orthopaedic robot assisted surgery. This requires a fast with high accuracy and quality of the surgery operation. Three main objectives in this research were addressed. These objectives are as follows,

- To identify the source of errors in robot trajectory planning during the drilling operation of bone surgery and determine the in-process calibration procedures using a 3 dimensional vision system and 6 degrees of freedom force-toque sensor for compensating the trajectory planning errors.

- To calibrate and evaluate the drilling force and torque profile for compensating the errors in robot trajectory planning during the drilling operation.

- To determine the performance of the robotic bone drilling operation

In order to achieve the abovementioned objectives, the integrated mechatronic research methodology which encompasses development of the hardware and software of the system is very important and has been realised. The hardware components of the mechatronic system consist of two sub-system which are as follows:

    i. An industrial robotic system

    ii. A machine vision system

The software components of the mechatronic system of the orthopedic surgery consist of two computer algorithms:

    i. Machine vision computer algorithms for the calibration procedures.

    ii. Computer algorithm to generate the trajectory planning and to control the motion of the robot.

The method of in-process calibrations will be explained, analysed and evaluated. Finally, the performance of the robotic trajectory planning during the bone drilling will also be explained, analysed and evaluated.