



MEASUREMENT TEST STATION FOR WORKSPACE OF HUMAN KNEE

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ABSTRACT

A test station will be designed and built to record points around the surface of several Fixed Orientation Displacement Workspaces (FODW), an idea proposed by Dr. Michael Murphy [1]. The test station will consist of a G2X 6 Degree of Freedom Optical (DOF) Transducer arm manufactured by Immersion and a JR3 67M25A 6 DOF load cell linked to a PCI card. To integrate the load-cell and transducer arm, a C++ program will call functions from the Dynamic Link Libraries of both apparatus, recording the position orientation and 6 loads for any instant. The program will allow this information to be gathered at specified intervals of time or on keystroke prompt. The program will split a large data file into 128 separate FODW files. There will be 8 categories of flexion/extension, four categories of abduction/adduction, and four categories of internal/external rotation. The x,y,z coordinates contained in these files will then be imported to a Rhino file, where the individual FODW can be viewed.

Two controlled tests will be run on the apparatus to insure the validity of its results. The apparatus will be hooked to a 2 DOF test linkage to insure its returned translations and rotations are accurate. Then data from both the load cell and G2X will be tested with a 6 DOF test linkage. In later projects, the FODW of canine knees will be mapped out. Ultimately the FODW of human knees recorded from this test station will be compared to those theorized by Dr John Fuller [2]. It is expected that the models proposed by Dr. Fuller will differ from those found experimentally as Dr. Fuller's models did not account for bone wrapping of the ligaments nor the cartilage found between the bones of the joint.

2. Fuller, John. (2001) Development and characterization of velocity workspaces for the human knee. PhD thesis, Louisiana State University, Baton Rouge, LA.

REFERENCES

1. Murphy, M. (1990) Geometry and the Kinematics of the Normal Human Knee. PhD thesis, Massachusetts Institute of Technology, Cambridge, MA.