Laboratory 1: Rigid Body Kinematics – Instructions for Report
September 13, 2007
BIOEN 5201 – Introduction to Biomechanics
Instructor: Jeff Weiss
TA: Shawn Reese

Each student must turn in a separate laboratory report representing his or her own work. The report should be prepared using MSWord or an equivalent word processor. The department has asked me to include grading of the grammar and style of your written report as part of the means of evaluation, so please proof your report, rewrite the initial draft as necessary and check for spelling and other grammatical errors before submission. The report should contain the following sections:

Title/Name:
Your report must include the following information in the upper-left corner of the first page:

BIOEN 5201 - Laboratory 1, Fall 2007: Rigid Body Kinematics
<YOUR NAME HERE>
<DATE HERE>

Objective:
State the purpose of the lab measurements and analysis. Motivate the need for the measurements. State your perception of the intended educational goals of the laboratory in terms of learning new measurement and analysis techniques. This section should be one paragraph.

Methods:

a) Describe the methods and step-by step procedure to perform the measurements, i.e.
   Use of Polhemus digitizer to measure 3D coordinates statically
   Use of DMAS system to track 3D marker coordinates

b) Provide a high-level step-by-step overview of the program flow in the supplied MATLAB programs.
   Describe any subroutines and reference them by name
   Explicitly write (in direct notation) the overall kinematic equations that are used in the supplied MATLAB program to obtain the transformation between embedded coordinate systems.

Sections a) and b) should be no longer than two pages, combined.

c) Add comments in the provided MATLAB files to describe EVERY set of executable commands that follow the denotation “%C:”. Note that some lines have already been commented for you to get you started using the program. Turn in your annotated versions of the programs (gsuntay.m, rot.m, trans.m, transform.m and mag.m) as a hardcopy appendix to your lab report (see below). Please do your own work. Please limit your comments to the first 72
columns so they don’t run off the edge of the page. NOTE: Comments should not just explain what the code is doing, but why it is being done.

Example of a good comment (full credit):
% Using the above temporary z-axis vector directed along the femoral shaft,
% establish the y-axis vector by crossing with efx, which is oriented medial-lateral.
efy = CROSS(temp_efz, efx);

Example of a bad comment (no credit):
% take the cross product of temp_efz with efx
efy = CROSS(temp_efz, efx);

Results/Discussion:

Run the Matlab code using both your group’s specific files, and the general TA file provided. The text files need to be formatted before running them successful in the Matlab code. You need to understand how the data is loaded into the program to format them correctly. Remember that the black markers were digitized at two points on the surface of the spheres; the code expects the marker centroids. (HINT: Use Excel to edit the text files).

Turn in the plots of the Grood-Suntay angles (3) and translations (3) versus test time that are generated by the MATLAB program. (1 page). This should be done for the general files (‘ta-90flexion.txt’, ‘ta-digitizer.txt’) and the group specific files (e.g. ‘w1-90flexion.txt’, ‘w1-digitizer.txt’). All groups need to run the general files, and their own specific group’s files.

Interpret your results. Are they what you expected? Why or why not? This section should be 1 page.

Also include any comments on how the lab may be improved, strengths and weaknesses.

Appendix:

Include the annotated source code for the program (see Methods part c above) as an appendix to the report. Please add your comments with a word processor. If possible, make your comments a different color.