

Biomech system: CINEDATA, ERRCHECK & KINEMATICS

It is assumed that you have already digitized a sequence of motion pictures using the Ariel Performance Analysis System (APAS). Your digitized data must be present in the default directory used by the APAS.

Transferring files from the APAS to another computer

To use the Biomech software you must put your data files in a subdirectory on your data processing computer (e.g., in the Multimedia Lab). Two files should have been created by the APAS, **trialname.CF** (Common File) and **trialname.nT** (where 'n' can be 1 through 9). For example, if your files are in the default APAS data directory perform the following commands from the DOS command prompt to copy your files to a diskette.

```
D:
CD \PASDATA
COPY trialname.* A:
```

where, **trialname**, is the name that you gave your digitized "sequence".

To run the Biomech software you will need to create a "control file". This file has the same filename as your data file but has the file extension, **.CFB**. It will contain information about how to construct your linked-segment model and what data processing is to be performed. A copy of this file should be included with your data files. Enter:

```
XCOPY C:\BIOMECH\WALK\WALK.CFB A:\trialname.CFB
```

Remove the diskette and insert into your data processing computer. From the DOS prompt, you must create a data directory for your files. Create a subdirectory with the same name as your data file. E.g., from the command line enter:

```
C:
CD \DATA\WALKING
MD trialname
```

Next, copy your data files to this directory. Enter:

```
A:
COPY trialname.* C:\DATA\WALKING\trialname
```

Converting from APAS to Biomech

To edit your data and convert it to a format suitable to Biomech run the **IMAGER** program and save your corrections before exiting the program. You must also add event codes to your data file to assist in the determination of various gait parameters.

```
IMAGER trialname.1T
```

 (you may have to use **.2T**, **.3T**, ... **.9T** instead)

To save the modified data press "W"(rite) then "Q"(uit) to exit. Enter -5 to renumber your data for the Biomech system.

Starting the Biomech system

Use the CINEDATA program to convert your data from digitizer units to real dimensions. This program will also refine or “straighten” your data by correcting for camera misalignments. Use the command shell BIOMECH.BAT

BIOMECH trialname

This shell will present you with a menu of program options. First, you will need to renumber your data since the Biomech software expects at least four, preferably six, frames to permit filtering and differentiation. Second, choose the option “C” to start the CINEDATA program. You may view its printed output by answering the following question positively.

To customize your control file (.CFB) select the menu option “2”. This program will copy various details from your digitized data file (.DG) to your control file. Now edit the control file to configure it for your data file. Follow the instructions in the document, **Example of a Biomech Control File**. Use the document, **Biomech User’s Manual** to make any required modifications.

Next, select the options “E” for ERRCHECK and “K” for KINEMATICS. The ERRCHECK program compares the measured segment lengths against the lengths of the segments obtained from the frame-by-frame digitized coordinates. KINEMATICS filters the data and computes marker, segment and total body kinematics.

You may now attempt to answer the following questions. Note, the listing (output) from each program is contained in your data directory. You may view them with the option “V” and then selecting the appropriate file. The output files have the extension, .OUT, and the filename of the program that created them. For example, the kinematics are stored in the file, KINEMATI.OUT.

Biomech system: ENERGY and FORCE

To complete the following questions about work and energy you will need to edit the control file (.CFB) and identify the number of frames in your walking cycle (9th number on card 2) and the starting frame number (11th number on card 2). Refer to the Biomech User’s Manual by running the Biomech menu.

BIOMECH trialname

Then select [H] help and [O] to edit the control file. Finally, select [W] to run the work/energy program and view the listing.

To complete your analysis you will have to merge the force platform data with your control file (.CFB). First move a copy of the raw force (.RF) file to your data directory.

COPY A:\WNnnDR.RF C:\DATA\WALKING\trialname\trialname.rf

where, nn, is the trial number of your data and, trialname, is the filename you used to name your data files. You will need to determine the frame numbers corresponding with ipsilateral foot-strike (IFS) and ipsilateral toe-off (ITO). This can be done by viewing your .DG file with the IMAGER program.

IMAGER trialname.dg

Then choose the [2] option from the Biomech menu and answer the questions, appropriately.

BIOMECH trialname

Finally, select the [F] option and view the listing produced by the FORCE program to answer the following questions.

Biomech: POWERS and GRAPH

Start MS-DOS and move to the directory that contains your data files. Start the Biomech software.

BIOMECH trialname

Run the POWERS program to perform the power analyses. View the listing produced.

Press 'P'

Graph and print the results of the power analysis.

Press 'J' (to graph the joint powers)

WALK (enter name of the graph control file)

Press 'N' (to view graph of knee powers)

Press 'N' (to view graph of hip powers)

Press 'Y' (to replot the graphs)

Press 'N' (for black and white graphs)

Press 'Y' (when printer is online)

Press 'N' (to rotate the figure)

Repeat until all three figures have been printed. Then press 'Q' to exit the GRAPH program. Keep the figures for future reference.