

# **Forces User's Manual**

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## **Introduction**

Forces is a biomechanical analysis tool designed to work with files containing raw force data (.RF files) from any number of force platforms (Kistler, AMTI, etc.). Data can be converted from the force plate data file (.DAT for Kistler, .ANA for AMTI etc.) to .RF format using the BioProc software. Forces can then be used to view, analyze and edit the data in both tabular and graphical formats through the use of several stand alone programs accessed through Forces as well as several features built in to the program itself. Graphical formats include static views as well as animated views in both 2D and 3D.

## **Getting Started with Forces**

Forces can be accessed by clicking on the Forces button in the Biomech for Windows program. As well, it can be accessed right from your desktop in the grouping of programs in the folder labelled "Biomech". Once the main form of the program appears, clicking the "Refresh File Lists" button will display four lists: digitized data file list, models list, force files list and output files list. This program is mainly concerned with the force files list and the output files list. With respect to the menus, the File, Data, Model and Animate menus are mainly for use with the Biomech for Windows application program. The programs containing the features within Forces can be found in the Programs menu. To be able to use these features, an .RF file must first be selected from the force file list.

## **Programs Menu**

### **a) Analyze**

This option loads the DOS based program FPAalyze. FPAalyze is useful when looking at statically starting motions such as jumps, sprints starts or postural movements. After entering some basic trial parameters, FP Analyse displays in tabular format an impulse analysis in the x, y and z direction as well the vertical moment impulse. The programs also displays: a displacement and velocity analysis; maximum and minimum forces; kinetic, potential and total energy(work) and average and relative power.

### **b) History**

This option loads the DOS based program FPhist and graphically displays a force history of the selected trial. Press Esc to return to Windows.

### **c) Rotate**

This option loads the DOS based program FPRotate. This program allows you to graphically view the force history of a trial from any angle in the x, y or z plane. After the DOS based program is finished running, the graph will be located in the force file list with the trial name and an extension of .RRF. This file may not be there when you return to Windows, however, clicking the Refresh File List button will bring up the file.

### **d) Force Signature**

This option eventually loads the DOS based program FPSig and graphically displays the force vector static signature from a number of views. First, however, a form with several options appears. This allows you to input your force plate dimensions as well

as which view you would like to see: sagittal only, 2D, or 3D. Should you choose 2D, a graph will display the force signature from an anteroposterior view, mediolateral view as well as a superior view. This graph can be found in the output files list with the name Preview.plt. Should you choose 3D, this graph can be found in the output files list under Fpsig.acd. Use the arrow keys to rotate the graph in any direction and the Home key to return to the original image. Other options are also available such as the drawing of a footprint, direction correction, use of a skip factor.

## **Other Features**

Forces contains a feature that will animate the force vectors from an .RF file. This is not a stand alone program but a built in feature to Forces. After an .RF file has been selected, it must be read by the software by pressing the button labelled “Read Forces”. It is important to remember that each file must be read before it can be animated. Clicking on the button labelled “View Forces” will display the values for each record in the file in tabular format. Clicking on the button “Animate” displays the animation screen. Once the animation has begun, the Step button will stop the animation at each force record and display the force, displacement and moment values for that individual record. You can then work your way through each individual force record. There are several input boxes to modify the animation. “Vector size” simply changes the size of the vectors while “Scaling” changes the magnification of the entire animation. The “Increment” box serves as a skip factor while the delay box changes the speed of the animation. “Body weight” can also be entered to normalize the vectors to that value. There are several ways of displaying the animation as well as several views including side view, top view, rear view and custom view. Custom

view allows you to input angles for the x-axis (pitch), y-axis (roll) and z-axis (yaw). The program can then animate from that custom view. As well, there are several features that can be selected for the animation such as the drawing of a footprint, an animation of the path of the centre of pressure (with or without vectors), real-time animation and an option to normalize the vectors to the body weight entered in the input box.

The Forces main screen has several other buttons leading to separate, stand alone Windows applications: BioProc2, BMwin98, Imager98 and CFBEEdit.