

# SIMULATE User's Manual

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This program is for use in conjunction with the Biomech Motion Analysis System to simulate airborne human motion. The output from this program is the absolute position of a six or ten linked-segment model (this information may be reanalyzed by Biomech or plotted with Imager).

## Initial Parameters:

1. The original digitized data (DG file) must be run through CINEDATA and then through KINEMATICS. The KINEMATICS step must include the .DR option (difference in relative angles). This step is accomplished by placing a 1 in column 21 of image 5 in your control file (see control file manual for further information). The angles must be in the order - neck, right upper arm, right forearm, left upper arm, left forearm, right thigh, right shank, left thigh, left shank (set this via the control file). This file may not contain frames where the subject is in contact with the ground (in this case the simulation is invalid).
2. A .SIM file must also be constructed so the program can read the input parameters. Here is an example of a .SIM file.

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```
'Diving Simulation 105B (S.B.)'  
4.392 77.4 0.02 461.07 0.0 -18.5 1 1  
251.6 285.1 302.1 318.0 341.2 318.0 341.2 250.4 245.6 250.4 245.6  
96.7 131.6 132.7 132.5 137.0 132.5 137.0 65.8 25.8 65.8 25.8  
0.420 0.165 0.230 0.220 0.230 0.220 0.380 0.350 0.380 0.350
```

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Where:

### Line 1 Title

**Line 2** Field 1 = takeoff velocity (m/s)

Field 2 = takeoff angle (deg)

Field 3 = time interval (s)

Field 4 = weight (N) or mass (kg)

Field 5 = ground level (cm)

Field 6 = angular momentum (N.m.s)

Field 7 = create contralateral limb (1=yes, 0=no)

Field 8 = staging frame number (airborne phase)

**Line 3** Starting x coordinates (cm)

(hip, top trunk, ear, elbow, wrist, elbow2, wrist2, knee, ankle, knee2, ankle2)

**Line 4** Starting y coordinates (cm)

(hip, top trunk, ear, elbow, wrist, elbow2, wrist2, knee, ankle, knee2, ankle2)

**Line 5** Segment lengths (cm)

(trunk, head, arm, forearm, arm2, forearm2, thigh, shank, thigh2, shank2)

3. To run the SIMULATE program use the following command line:

`SIMULATE {/Disk/None/Lineprinter/Terminal} filename`

where /None = produces no listing

/Lineprinter =sends listing to the printer

/Terminal =sends listing to the terminal (not recommended)

/? =command line help

4. Once the program is run a .SN file will be created so that the program IMAGER can be used to display the simulation results.
5. To change the orientation of the subject, the initial parameters, or the angular momentum you can directly alter the .DR and .SIM files for the desired effect or use the INTERACT program.

`INTERACT {/Create/None/Lineprinter/Terminal} filename`

where /Create = produces a new .SIM file

/None =produces no listing

/Lineprinter =sends listing to the printer

/Terminal =sends listing to the terminal (not recommended)

/? =command line help

\*\*\*\*\* End of SIMULATE User's Manual \*\*\*\*\*