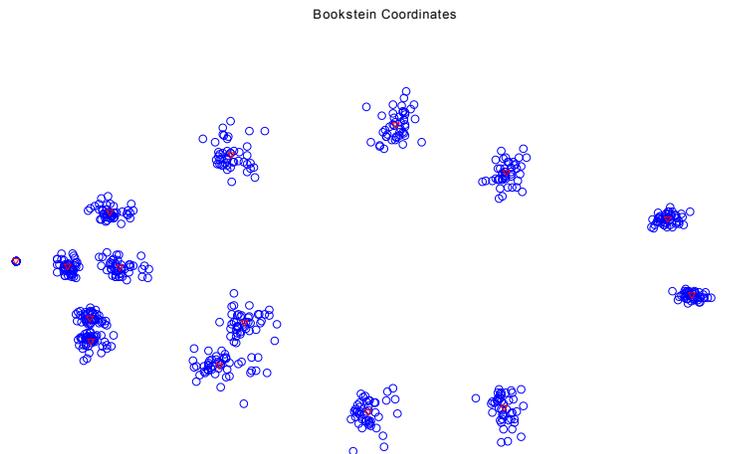


IMP: CoordGen6- Coordinate Generation Utility: User's Manual

The IMP software series is a set of tools for the analysis of biological shape using 2-D landmark-based morphometric geometric methods, and CoordGen6 (COORDinate GENerator) is a software tool for generating various superimpositions of the landmark configurations. CoordGen6 can generate, display and save data sets in Partial Procrustes Superimpositioning, Bookstein Coordinates, Sliding Baseline Registration and RFTRA superimpositioning. The input files needed for CoordGen6 may be in TPS file format (F.J. Rohlf, 1993-present, see the morphometrics web site at SUNY Stony Brook, <http://life.bio.sunysb.edu/morph/>) as produced by the TPSDig program (Rohlf, 1998), or in the x1y1x2y2...CS file form used by IMP, in which each specimen is arrayed on a row of a matrix (see further discussion below). The output files are in either the IMP file format or the TPS file format. Additionally, CoordGen can rescale the data using the endpoints of a ruler included in the measurements of landmark locations, display the landmark configurations in each of the superimpositions, and generate reference forms from the data in each superimposition.



The image above shows 16 landmark coordinate measurements from 46 specimens of *Serralmus elongatus* (a piranha) in Bookstein Coordinates (registration to a baseline).

CoordGen6 forms the “entry-point” to the rest of the tools in the IMP series. All other software tools in IMP use the same file format, and this file format also loads directly into Excel, SPSS, SAS and other software packages, since the data are stored in a data matrix such that each row is a specimen, and each column is a coordinate.

This manual will not serve as an introduction to Geometric Morphometrics, if you are completely new to the field, spend some time browsing the website at StonyBrook run by F. James Rohlf to locate further resources.

Credits:

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Referencing:

The IMP series is completely free, but I would appreciate being referenced if you use it in published work.

Please reference my name and address, and ideally the website address,

<http://www.canisius.edu/~sheets/morphsoft.html>

Using CoordGen6

CoordGen6 is a Coordinate Generating program meant to generate data files of landmark based geometric morphometric data in different types of superimpositions, Bookstein Coordinates (BC), Sliding Baseline Registration (SBR), Procrustes Superimpositioning (PS) and Resistant Fitting Theta Rho Analysis (RFTRA). The program also displays data sets and allows for the generation of mean or reference specimens in each type of superimposition. The output files can be generated in the TPS format used by James Rohlf's software or the x1y1x2y...CS format favored by Zelditch, Sheets et al.

Input File Formats

The program can currently load three distinct data types, TPS files with a ruler visible in the image, TPS files with no ruler, but already correctly scaled, X1Y1X2Y2 formatted data with a ruler, and X1Y1X2Y2...CS format files.

To load a TPS file, the TPS format rules must be followed, see the documentation with F. James Rohlf's software(see the website listed earlier, or the example below). The only critical factor for CoordGen is that the symbol sequence LM=XX be on the line immediately before the set of values representing the coordinates of each specimen, where the x and y coordinates are paired on each line. XX is the number of landmarks. Any information after the number of landmarks following LM= is ignored, so this is a good place to put a specimen label or other comments.

In the example below, two specimens are shown, with 12 landmarks each.

Formatting of data file may be done using Word or Excel, or any other program that is capable of outputting ascii text files. The 'Save As' option in Word or Excel will let you specify MS-DOS text files which work well.

If you are loading a file that has a ruler in the image, the software assumes that the ruler is the last two landmarks in the list, and that the ruler has a length of 10 units. If this does not match your data, use the ruler endpoints boxes to specify where the ends of the ruler are, and the ruler length box to specify the ruler length. Then use the carry out rescaling button to re-adjust the value of the landmark positions and calculate the centroid size.

If you have no ruler in the image, the data is assumed to be in properly scaled units, and to need no further rescaling.

Example of a TPS File

```
-----  
lm=12 NmFMucr9961.14  
  
-0.610532943 -0.038347425  
  
0 0  
  
6.658621854 0  
  
6.383230709 1.710340255  
  
5.330457755 1.541734119  
  
4.292655691 1.005759472  
  
3.635827883 1.282463352  
  
3.451709528 1.541522289  
  
2.368022595 1.954188762  
  
4.934116656 2.748121443  
  
6.868267338 6.411733679  
  
7.436270911 5.456881889  
  
lm=12 NmFMucr9961.20  
  
-0.542 0  
  
0 0
```

6.257 0
6.014 1.435
5.011 1.246
3.982 0.9075
3.3995 0.989
3.1285 1.3815
2.113 1.6525
4.713 2.5055
6.962 6.447
7.449 4.957

X1Y1 Raw Data With Ruler

This file format consists of the set of landmark measurements for each specimen arranged as the row of the data matrix. The first column is the x coordinate of the first landmark, the second column is the y-coordinate of the first landmark, followed by in successive columns by the x and y coordinates of all other landmarks in order. This option again assumes that the endpoints of a ruler are included in the landmarks, the endpoints of the ruler are used to rescale the rest of the data.

If you have data are already properly scaled and in the x1y1....format, use Excel to 4 columns indicating landmarks at (0,0) and (0,1) to your data set, and use a ruler length of one. This will allow CoordGen to load your data and produce TPS or X1Y1...CS format output files.

X1Y1...CS Files, Format and Input

In this file format, the coordinates of all landmarks corresponding to a single specimen lie on a single row or line of the file. The X coordinate of each landmark is listed first, followed by the Y coordinate, with a space between each. The Centroid Size (CS) of the data is the last item in the list. So for data in 2 dimensions with k landmarks, there are k pairs of X Y values plus CS or $2k+1$ values on a single row or line. Each line of the file is a separate specimen. There are no labels in these data files, only numeric values. All of the IMP software using this system is written to avoid changing the ordering of specimens, so that the order of all specimens in an X1Y1...CS file is fixed, and the same as the digitizing file it was created from.

CoordGen will load X1Y1...CS files in, so that you can convert from one superimposition to another, or generate reference forms or plots from it.

Sample X1Y1...CS file

```
0 0 1 0 0 1 1 1 4
```

This is an X1Y1 file for a square in BC with corners at (0,0), (1,0), (0,1) and (1,1) which had a centroid size of 4 before being placed in BC registration.

Output File formats

The output file format button will allow you to choose the output format you want, either TPS for use with Rohlf's software or X1Y1...CS format for this software suite.

Clear Axis

This button will remove the axis from the diagram. Some people like axis, some don't!

Copy Image to Clipboard

This button copies the graph onto the windows clipboard, so that it can be pasted from there into other programs. Word seems to be a nice choice for just saving images for later use. I don't know exactly how other software will react. Try it, let me know what happens. You can copy images into drawing programs if necessary. Miriam likes Arts and Letters Express, CorelDraw also seems popular.

Copy Image to EPS File

This button will allow you to produce an Encapsulated PostScript file, which may then be loaded into Adobe Illustrator, and many other programs.

Print Image

Print the image to the default Windows Printer. This uses the default Windows print drivers. It may or not work particularly well, I haven't tested it extensively. I recommend using Copy Image to Clipboard to get good quality prints. This print button is meant as a fast and dirty way to get hardcopies, not for publication quality images.

Baseline Windows

Bookstein Coordinates and SBR both require that you specify the choice of baseline points. The software is set to use the first and seventh landmarks as the baseline, after all this works great for piranha! Fill in your choice of baseline points to be used. The software numbers the landmarks according to their ordinal position in the input file. Use

the display buttons (Display BC) to see if you have the landmarks you wanted. You may output files in more than one choice of baselines, this may be helpful in some analyses.

Display Buttons

There are display buttons for BC, SBR and Procrustes superimpositioning methods. This will let you see what the data file looks like. I recommend always saving a BC file, it is the easiest to convert to the other formats later on in your analyses. A BC file can always be loaded back into CoordGen later to generate the other file formats.

The landmark points of the data specimens will be shown in blue, the current reference specimen will be shown in red.

Reference Specification

You will need to specify how to form the reference specimen. The default is to use all specimens to calculate the reference. You may specify that the program is to use the average of the N smallest or the N largest if you prefer. Set the N value by using the N= window. The default N is 5.

Note that the Procrustes Reference generated by this program is not aligned to the principal component axis (PCA) of the mean form as of October 26, 2000. This will be done in later versions of this program. Other software in this software suite does carry out a PCA orientation of the reference. This difference only matters when calculating the partial warp scores using the 2 component uniform model. Don't worry about it at the moment.

Save Data Buttons

The program will save data in any of the superimpositions available. I advise looking at the data in a given superimposition prior to saving it, just to keep track of what baseline setting and reference specification are in use at the time, since you may well change these while using the program.

The file format button allows files to be output in TPS or X1Y1...CS format as discussed earlier.

The Save BC labeled button saves a BC format file with the comment information (all characters on the same line as LM= in the input TPS file) on the start of each line. This may be a helpful file in keeping track of the ordering of the data sets.

Save Reference Buttons

These buttons save the reference form currently in use. This is helpful if you later want to compute partial warp forms using a common reference.

To compute a grand consensus mean over many data sets, save each one as an X1Y1...CS file in BC, then use a word processor to concatenate them all into one giant X1Y1...CS file, load this into CoordGen and generate a reference form based on all data, or you could generate a mean of all your juvenile specimens, or...you get the idea.

Exit

Exits the program. There is no "Clear" button, successive files replace their predecessor.

Figure Options

This pull down menu has a number of options that let you alter the display, ie. symbol sizes, color etc.