# BoundingBall

**BoundingBall** [**/F/Z**] ***scatterWave***

The BoundingBall operation calculates a bounding circle or the bounding sphere for a set of scatter points. The operation accepts 2D waves that have two, three or more columns; data in the additional columns are ignored.

When *scatterWave* consists of two columns the operation computes the bounding circle. Otherwise it computes the bounding 3D sphere.

### Parameters

*scatterWave* is a two-dimensional wave with X coordinates in column 0, Y in column 1, and optional Z coordinates in column 2.

### Flags

| | |
|---|---|
| /F | This flag applies to 3D scatter only. It uses an algorithm from "An Efficient Bounding Sphere" by Jack Ritter originally from *Graphics Gems*. Unfortunately it does not give an accurate bounding ball but something that is sufficiently large. This algorithm is less accurate but it produces a ball which is sufficiently large to contain all the points. |
| /Z | No error reporting. |

### Details

The center and radius of the bounding sphere are stored in the variables: V_CenterX, V_CenterY, V_CenterZ, and V_Radius.

If you are not using the /F flag, the operation also accepts a 2 column wave consisting of X, Y pairs for calculating the center and radius of a bounding circle in the plane.

### Example

```
Make/N=(33,2) ddd=enoise(4)                // Create random data
BoundingBall ddd
Display ddd[][1] vs ddd[][0]
ModifyGraph mode=3
Make/n=360 xxx,yyy
yyy=v_centerY+V_radius*cos(p*2*pi/360)
xxx=v_centerX+V_radius*sin(p*2*pi/360)
AppendToGraph yyy vs xxx
```

### References

Glassner, Andrew S., (Ed.), *Graphics Gems*, 833 pp., Academic Press, San Diego, 1990.

# BoxSmooth

**BoxSmooth** ***box***, ***srcWave***, ***smoothedWave***

The BoxSmooth operation replaces *smoothedWave* with a smoothed copy of *srcWave*. The waves must both exist.

The BoxSmooth operation is used primarily by Igor Technical Note #20 and its variants. For most purposes, use the more flexible **Smooth** operation instead of BoxSmooth.

### Parameters

*box* is the number of *srcWave* points averaged to form each *smoothedWave* point. If you specify an even number, the next-higher odd number is used.

### Details

BoxSmooth is equivalent to the **Smooth** operation with the /B flag, except that BoxSmooth does not compute the result in-place like Smooth does. This command:

```
BoxSmooth box, srcWave, smoothedWave
```

is equivalent to:

```
Duplicate/O srcWave, smoothedWave
Smooth/B/DIM=-1/E=3/F=0 box, smoothedWave
```