

Cyclone pointcloud export format - Description of ASCII .ptx format

Description:

PTX is an ASCII based interchange format for point cloud data. It utilizes the concept of separate scans, each with points defined in their own coordinate system and a ?Registration? of all of those point clouds into a single coordinate system. The point data for each cloud is stored in its original coordinate system and a matrix of transforms for each point cloud are provided as header information.

Version:

all Cyclone versions

Solution:

A PTX file can have one or more point cloud. Each point cloud starts with a header. Each following line then describes one point in the cloud.

Cyclone exports PTX with 7 columns when the cloud has RGB values from the digital camera (x, y, z, intensity, red, green, blue). Red, Green, Blue have the integer range [0, 255].

A cloud in PTX has 4 columns (x, y, z, intensity) when the cloud does not have RGB values. PTX intensities use the decimal range [0, 1]. Individual values on the same line are separated by a blank space. The coordinate unit is always in meters.

PTX can only be used on "[gridded](#)" clouds (directly from scans), not unordered or unified clouds. Each cloud is "fully populated", in that even missing points are represented (as a line with "0 0 0" for the XYZ coordinate). This gives the importing software enough information to restore the original scan-line ordering of the cloud (for example, to estimate normal vectors).

PTX point cloud header:

number of rows

number of columns

st1 st2 st3 ; scanner registered position

sx1 sx2 sx3 ; scanner registered axis 'X'

sy1 sy2 sy3 ; scanner registered axis 'Y'

sz1 sz2 sz3 ; scanner registered axis 'Z'

r11 r12 r13 0 ; transformation matrix

r21 r22 r23 0 ; this is a simple rotation and translation 4x4 matrix

r31 r32 r33 0 ; just apply to each point to get the transformed coordinate

tr1 tr2 tr3 1 ; use double-precision variables

The first four lines of three numbers each are the position and primary axes of the scanner after any registration/transformation. The next four lines of four numbers each may look similar in some cases, but if you have a non-identity UCS when the PTX was exported, the numbers will look different. If the cloud was untransformed by a registration (or not registered), the first four lines of three numbers each would be 0,0,0; 1,0,0; 0,1,0; 0,0,1. The 4x4 matrix may not be identity if there is a UCS applied.

Note that a cloud that was registered may have a 4x4 identity matrix due to a UCS that is set to that scanner's registered position.

For both formats, in a point cloud with color (i.e., the R G B values are present for each point in that cloud), the RGB value (0, 0, 0) is reserved to mean "no color". An example where this might happen would be if a digital camera did not cover that point. That point then has "no color", even though other points may have color.

Example:

```
4.148210 12.076586 1.381819 0.461036 89 87 112
4.147804 12.075443 1.382720 0.458854 89 87 112
4.148891 12.078566 1.384060 0.461967 87 86 111 End coordinate list (cloud #1)
40 Scan 40 x 40degree (cloud #2)
40
4.151261 1.736411 -8.110131 Begin transformation (cloud #2)
-0.434947 -0.017233 -0.900291
-0.240839 0.965618 0.097871
0.867650 0.259394 -0.424143
-0.434947 -0.017233 -0.900291 0
-0.240839 0.965618 0.097871 0
0.867650 0.259394 -0.424143 0
4.151261 1.736411 -8.110131 1
4.146983 12.074142 1.134998 0.488502 76 74 91 Begin coordinate list (cloud #2)
4.147541 12.075727 1.136227 0.486915 76 74 91 Format: X Y Z intensity R G B
4.147919 12.076833 1.137371 0.486976 76 74 91 Intensity range: 0 - 1
4.148849 12.079544 1.138655 0.485328 76 74 91
4.146931 12.073991 1.139137 0.486076 76 74 91
4.148440 12.078399 1.140532 0.488441 79 76 93
```