NAME

scn − simple 3D image file format

DESCRIPTION

SCN is a simple 3D grayscale image format. It does not allow unnecessary variations, making clean-slate implementations of SCN readers and writers pretty straightforward. The SCN file has an ASCII-formatted header followed by a raw image data dump.

ASCII HEADER

The ASCII header must contain exactly 4 lines, in this order:

- Signature line with the string "SCN". (SCN must be the 3 first characters in the file).
- Volume dimensions, in voxels, written as 3 integer decimal numbers, separated by one or more spaces (ASCII 32) and/or tabs (ASCII 9). We will denote these three values by W, H and D (for width, height and depth).
- Voxel dimensions, in any unit (but usually millimeters), written as 3 floating-point decimal numbers, separated by one or more spaces (ASCII 32) and/or tabs (ASCII 9).
- Number of bits per voxel (BPV), written as an integer decimal number. This value must be a multiple of 8. Applications must support at least 8- and 16-bit images. Support for other BPV values is completely optional.

  Each of the 4 lines must be terminated by a LF character (ASCII 10). Support for the CR+LF sequence (ASCII 13 followed by ASCII 10), common in some grotesque operating systems, is optional. You can safely reject SCN files with header lines ended with CR+LF. The LF character that terminates the 4th header line is the last character in the header section.

  W, H and D must be positive values representable by a signed 32-bit integer, and thus are restricted to the 0--2147483647 range. Header lines must contain no more than 255 characters each.

RAW VOLUME DATA

Starting from the byte that immediately follows the LF that ended the 4th header line, SCN files contain W*H*D voxel intensity values. Samples are stored in order achieved by traversing the volume in positive X, Y and Z directions, respectively. That is, a 10x5x3 volume would have samples stored in this order:

(0,0,0), (1,0,0), ..., (9,0,0), (0,1,0), ..., (9,4,0), ..., (0,0,1), ..., (9,4,2)

The C code required to traverse the volume in the proper order is

```
for(k=0;k<D;k++)
  for(j=0;j<H;j++)
    for(i=0;i<W;i++)
      output_sample(i,j,k);
```

Each sample occupies an integer number of bytes. For volumes with BPV=8, each byte represents one intensity as an unsigned integer in the 0--255 range. For volumes with BPV=16, each two bytes represent one intensity, as a signed or unsigned integer -32768--32767 or 0--65535 ranges. Whether data should be interpreted as signed or unsigned is up to the application. Multi-byte data must always be stored in little-endian byte order (LSB first, MSB last), regardless of the host architecture’s byte order.

EXAMPLE

Example of SCN header section:

```
SCN
256 256 16
0.9766 0.9766 1.50
16
```

Example hexadecimal dump of a small SCN volume file, for a 2x2x2 volume, voxel size 1.0x1.0x1.0, 16-bit samples and all voxels with the same intensity 512 (hex: 0200):

Position	**Hexadecimal Dump**	**ASCII dump**
00000	53 43 4E 10 32 20 32 20	S C N \n 2 2
00008	32 10 31 2E 30 20 31 2E	2 \n 1 . 0 1 .
00010	30 20 31 2E 30 10 31 36	0 1 . 0 \n 1 6
00018	10 00 02 00 02 00 02 00	\n
00020	02 00 02 00 02 00 02 00	
00028	02	

AUTHOR

This manual page written by Felipe Bergo <bergo@seul.org>. Information about IVS and associated utilities can be found at

http://www.ic.unicamp.br/~afalcao/ivs

SEE ALSO

ascii(7), **scntool**(1), **ana2scn**(1), **scn2ana**(1), **dicom2scn**(1), **ivs**(1)