Definition of bucket format (`*.bck`) used in *BrainVISA/Anatomist*

Yann Cointepas

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1 Introduction

This document describes the format used by *BrainVISA* and *Anatomist* [1] to represent a series of 3D coordinates along with corresponding values. For historical reason this format is called *bucket* format. The aimed audience is programmers who wish to read or generate buckets files with their own software.

2 Syntax

The format description is written with the following elements. A ***field*** (written in bold and italics) represent an element that can be splitted in other elements. All fields are described in section 4. In *ascii* mode fields can be separated by ***spaces***.

Characters strings are represented in `verbatim` between quotes. For example, `'string'` represent six *ascii* characters (each one coded on one byte).

3 Format description

A *mesh* file contains the following fields :
mode
textureType
voxelSize
numberOfTimeSteps
timeSteps

4 Fields description

mode**:** The format can be written either as an *ascii* text file or as a *binary* file. The ***mode*** is used to identify the representation it can have three values :

[1] See `http://brainvisa.info` for more information about *BrainVISA/Anatomist*.

- `'ascii'`: the file is in text format.
- `'binarABCD'`: the file is in binary format and uses *big-endian* byte order for numbers (such as Motorola or Sun processors for example).
- `'binarDCBA'`: the file is in binary format and uses *little-endian* byte order for numbers (such as Intel processors for example).

dataType*:** The file format was created with the possibility to store several data types. However, in a single bucket file, all values must be of the same type. Recognized types are described below. The ***dataType field defines the data type. In *ascii* mode his field contains `'-type'` followed by ***spaces*** and the data type name (see below). In *binary* mode, it is a ***string*** containing the data type name.

voxelSize*:** Contains x, y, z and t voxel sizes. In *ascii* it is `'-dx'` ***FLOAT `'-dy'` ***FLOAT*** `'-dz'` ***FLOAT*** `'-dt'` ***FLOAT***. In *binary*, it is four ***FLOAT***.

numberOfTimeSteps*:** The bucket format can represent several series of coordinate/value at different time steps. kwnumberOfTimeSteps contains a ***U32 representing the number of time steps. In *ascii* it is `'-dimt'` ***S32***.

timeSteps*:** This field contains ***numberOfTimeSteps times the following structure :

instant*:** A ***U32 representing a time instant. In *ascii*: `'-time'` ***S32***.

numberOfPoints*:** Number of (coordinate,value) pairs. In *ascii*: `'-dim'` ***32.

pointsAndValues*:** a series containing ***numberOfPoints times a ***coordinate value*** pair (***space***-separated in *ascii* mode).

coordinate*:** A 3D coordinate. In *binary* it is three ***S32. In *ascii* mode it has the following syntax: `'('` ***S32*** `','` ***S32*** `','` ***S32*** `')'`.

value*:** The content of this field depends on the value of ***dataType. See below.

U32*:** A 32 bits wide unsigned integer (between 0 and 4294967295). In *ascii* mode it is written as a decimal number. In *binary* mode it is represented on four bytes with the choosen byte order (see ***mode above).

FLOAT*:** A 32 bits wide real number (maximum 3.40282347e+38). In *ascii* mode it is written as a decimal number. In *binary* mode it is represented on four bytes with the choosen byte order (see ***mode above).

string*:** In ascii mode it is a serie of non-space ascii bytes, in binary mode it is and ***U32 containing the string size followed by the string content (ascii bytes series).

vectorOf*<field>:** where ***field is a field type. It represents a fixed length vector of elements of type ***field***. It contains the size of the vector (i.e. the number of elements) as a ***U32*** followed by the elements.

spaces*:** Valid only in *ascii* mode (in *binary*, a ***space can be considered as an empty ***string***). One or more byte with one of the ascii value for a space, a tabulation or a carriage-return.

`'VOID'`: Valid only in *ascii* mode (in *binary*, a ***space*** can be

5 Data types

The field ***dataType*** defines the type of value associated to each ***coordinate***. Here is a list of the possible values for ***dataType*** and the corresponding value structure.

6 Examples

Here is an example of an *ascii* bucket file.

```
To be continued...
```