VRML

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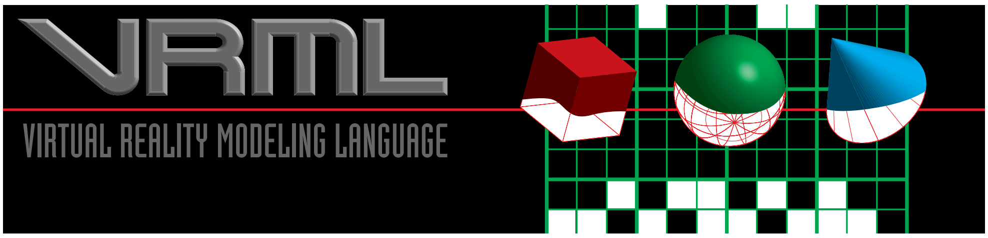
VRML

Virtual Reality Modeling Language

A describtion language for 3D vector graphics and 3D realtime animation.



- Description langauge (text based file format)
- Vectorbased 3D graphics
- Realtime animation
- Internet enabled

... VRML

History

- 1994: First idea
- 1995: Specification of VRML 1.0, based on SGI Inventor
- 1995: First Browsers
- 1996: VRML 1.0 Browsers stabilize
- 1996 aug: Specification of 2.0, extension, animation and scribting language
- First VRML 2.0 browsers
- 1996 nov: Specification of external interface
- Future: Stabilization of VRML 2.0 browsers, Multi-user capabilities, ISO standardization

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- VRML is developed on the Internet: Especially Silicon Graphics has been involved. Now also Sony, Netscape, Microsoft. `http://www.vrml.org`
- VAG: VRML Architecture Group `http://vag.vrml.org`
- Consortium

USES OF VRML

- ➪ Virtual toy
- ➪ Illustration
- ➪ Scientific visualization
- ➪ Maps (Virtual Cities)
- ➪ 3D user interfaces (Databases)
- ➪ Training
- ➪ Computer games
- ➪ Multi-user environment

Construction

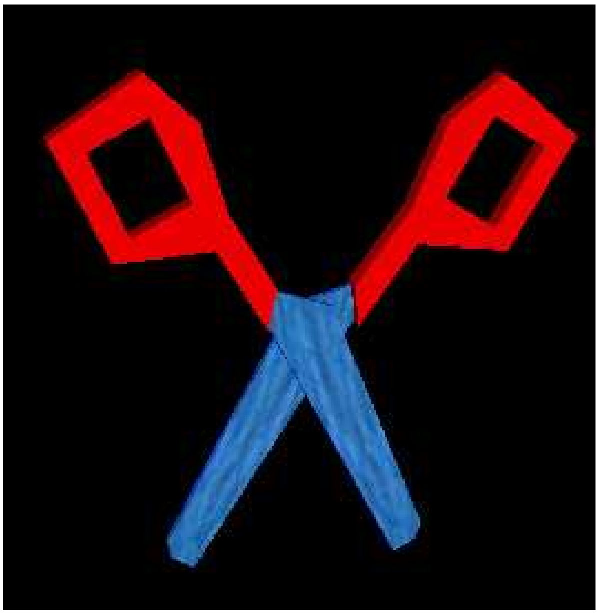
- ➪ Authoring program (fx. SGI CosmoWorld)
- ➪ Generation from program (mathematical, database)
- ➪ Other program, then conversion (fx. AutoCad and DxfToIv)

ELEMENTS OF VRML

- **Geometry.** Points, lines, polygons. generalized cylinder, meshes, text. **Color**: emissive, ambient, diffuse, specular, texture, movie-texture, transparency.
- **Sound.** WAVE files, MIDI files. Spatial.
- **Sensors.** Proximity, Time, Touch, Plane.
- **Special.** Anchor, Billboard, Collision, Inline, Switch, LOD, Viewpoint, ...
- **Interpolators.** key value to: Color, coordinate, orientation, ...
- **Script (internal).** Javascript or Java program.
- **ROUTEs.** from an event to an event.
- **Instancing.** DEF, USE, PROTO, EXTERNPROTO.
- **EAI.** External Authoring Interface. From Java program to VRML-browser. *createVrmlFromURL*, *addRoute*, *deleteRoute*.

THE LANGUAGE

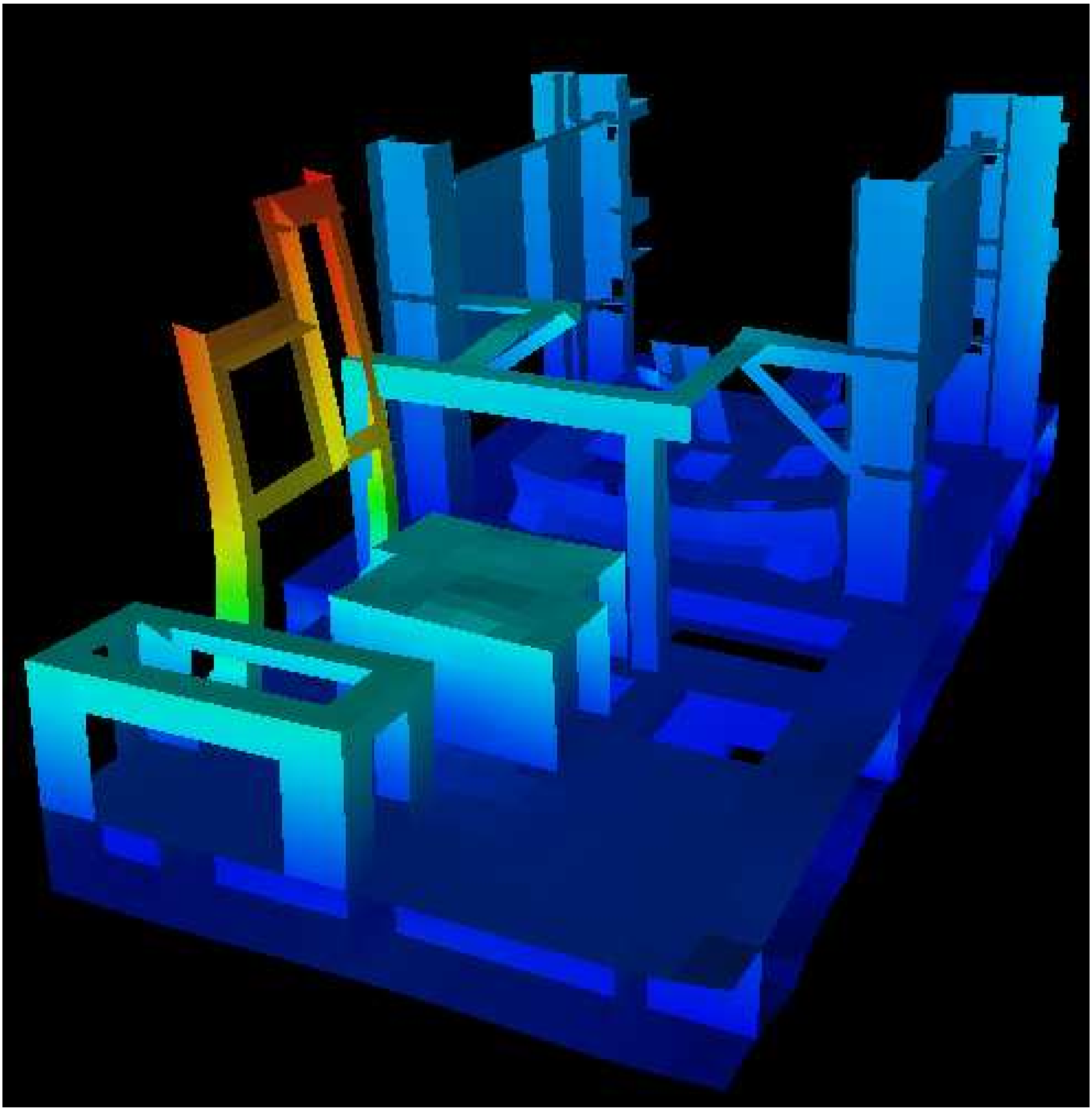
```
#VRML V2.0 utf8

Transform {
        children [
                WorldInfo {
                        title   "Pruning a neural network"
                        info    ["Finn Aarup Nielsen, DSP IMM DTU, 1996"]
                }
                NavigationInfo {
                        headlight       TRUE
                        speed           2.0
                        type            "EXAMINE"
                }
                Collision {
                        collide         FALSE
                }
                Viewpoint {
                        jump            FALSE
                        orientation     1 0 0 -0.85
                        position        30 40 20
                        description     "Center"
                }
                Inline  { url "prun2.wrl.gz" }
        ]
}
```



```
#VRML V2.0 utf8
PROTO Scissor [ eventIn SFRotation      rotationClip ] {
  Transform {
    translation     0 0.7 0
    scale           0.1 0.1 0.1
    rotation        0 0 1 1.57
    children [
      Transform {
        rotation 1 0 0 1.57
        children [
          Shape {
            appearance DEF METAL-APPEAR Appearance {
              material Material {
                specularColor   1 0 0
                diffuseColor    0 1 0
                emissiveColor   0 0 1
              }
              texture ImageTexture { url "../twod/water.jpg" }
           }
           geometry Cylinder { height  0.7 }
         }
       ]
      }
      DEF LEG-XFORM Transform {
        rotation        IS rotationClip
        children [
          Shape {
            appearance USE METAL-APPEAR
            geometry IndexedFaceSet {
              coord Coordinate {
                point [
                  -9.5 0.5 0,
                  ...
                ]
              }
              coordIndex [
                0,1,2,3,4,5,-1,
                ...
              ]
            }
          }
          ...
        ]
      }
      Transform {
        rotation 1 0 0 3.14159
        children [ USE LEG-XFORM ]
      }
    ]
  }
}
```

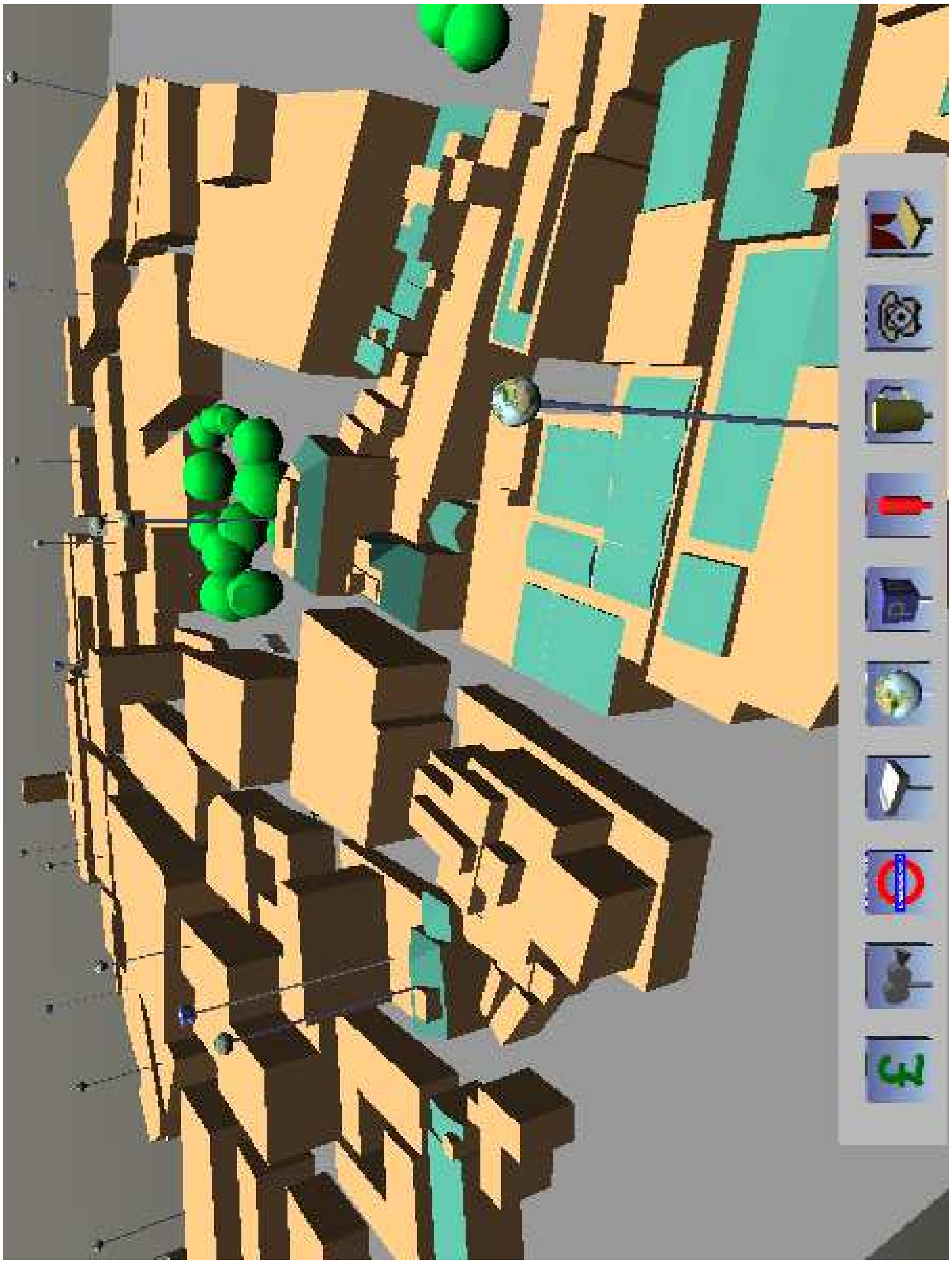
VRML EXAMPLES

Robert Lipman: Finite element analysis



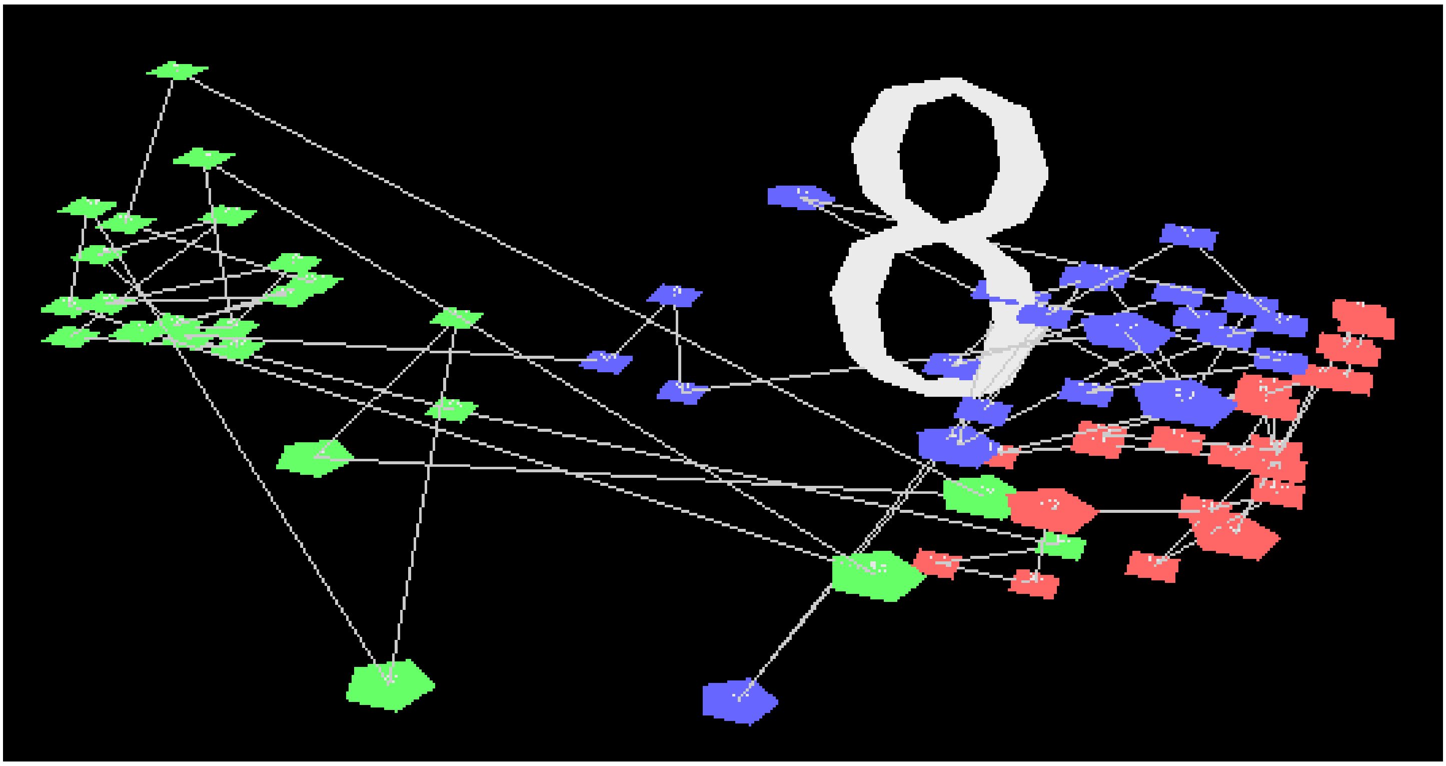
... VRML EXAMPLES

Vassilis Bourdakis: London



SCIENTIFIC VISUALIZATION

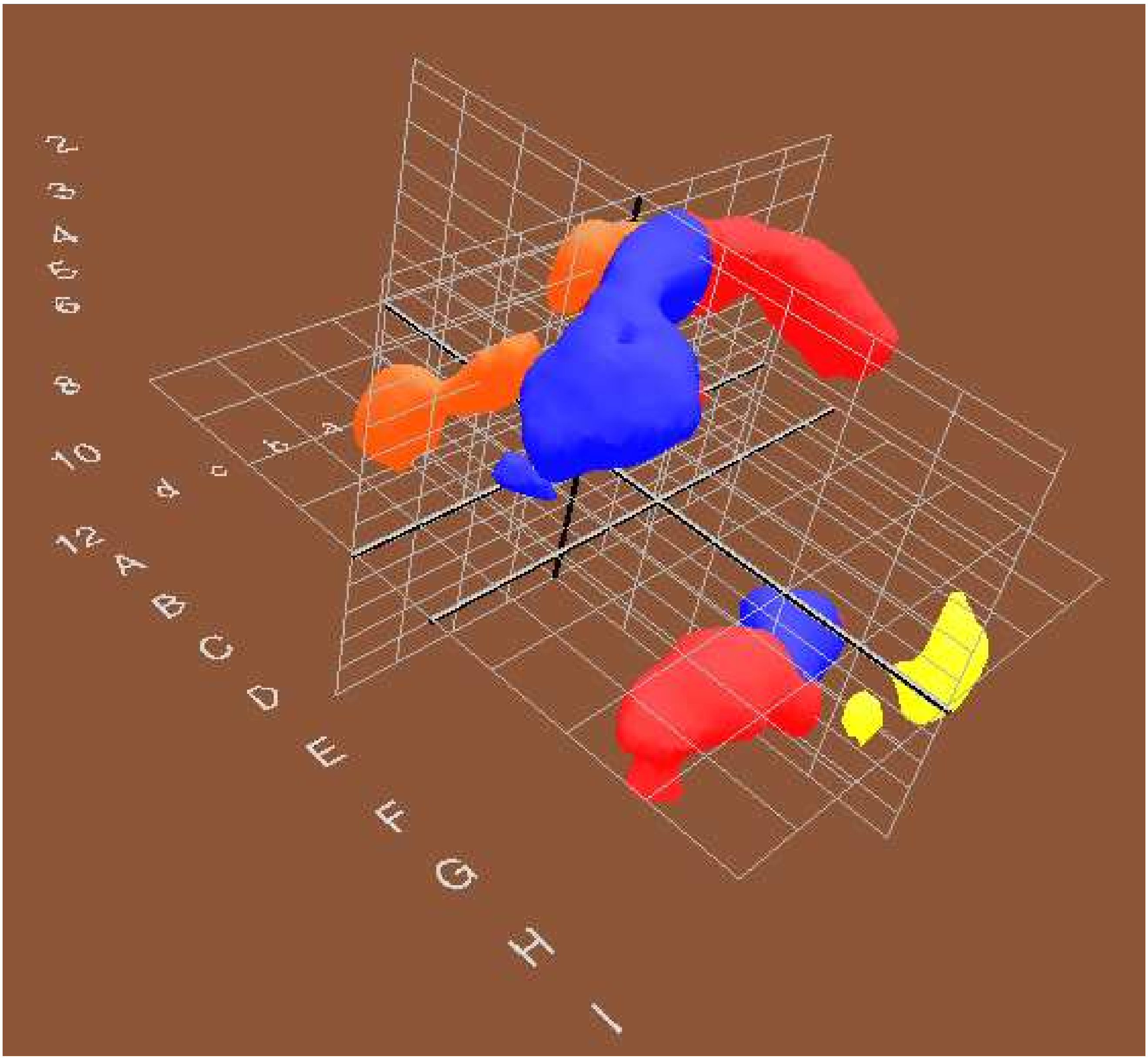
- Gain 2 extra dimentions: 3D + animation.
- Scene graph: Hierarchical organization of the objects – good for glyphs



FUNCTIONAL BRAIN IMAGING

➪ Only surfaces in VRML, — no volumes.

➪ Library of objects can be included in one file.



... FUNCTIONAL BRAIN IMAGING