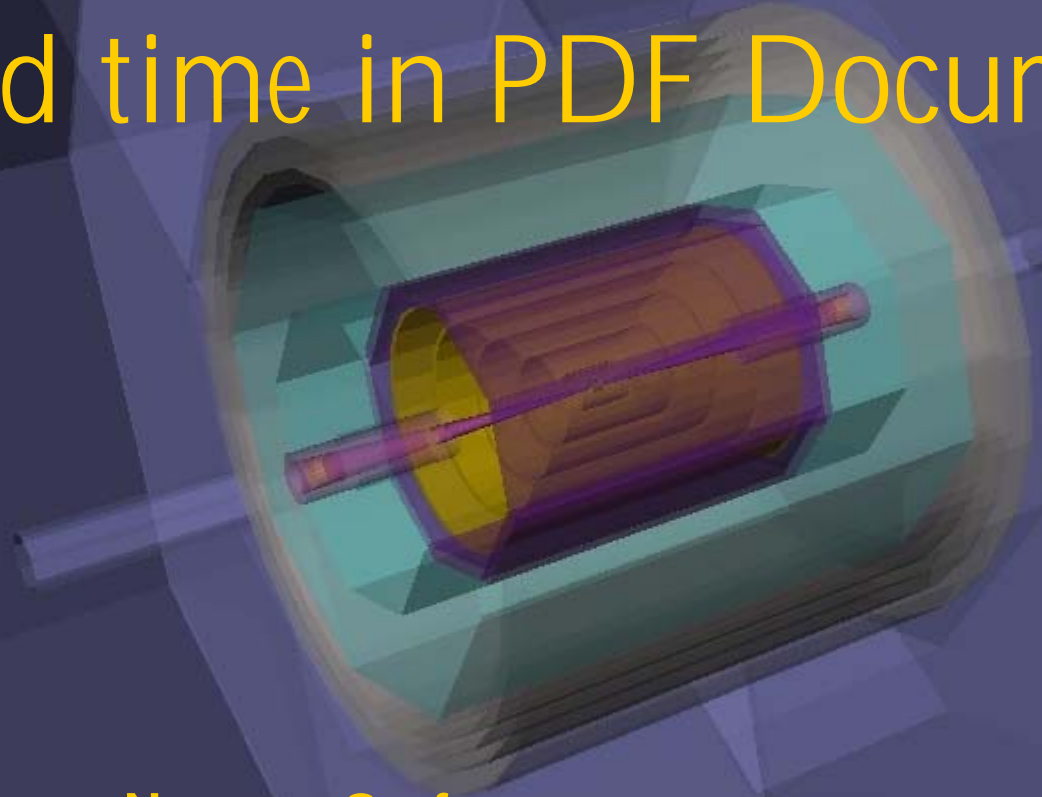


Extra Dimensions

3D and time in PDF Documentation



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Dresden
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Introduction

- Nuclear Science and Medical Imaging are replete with multi-dimensional information which is often poorly represented by the two dimensions of presentation slides and print media.
- Past efforts to disseminate such information to a wider audience have failed for a number of reasons, including a lack of standards which are easy to implement and have broad support.
- Adobe's Portable Document Format (PDF) has in recent years become the de facto standard for secure, dependable electronic information exchange. It has done so by creating an open format, providing support for multiple platforms and being reliable and extensible.
- By providing support for the ECMA standard Universal 3D (U3D) file format in its free Adobe Reader software, Adobe has made it easy to distribute and interact with 3D content.
- By providing support for scripting and animation, temporal data can also be easily distributed to a wide audience.

U3D

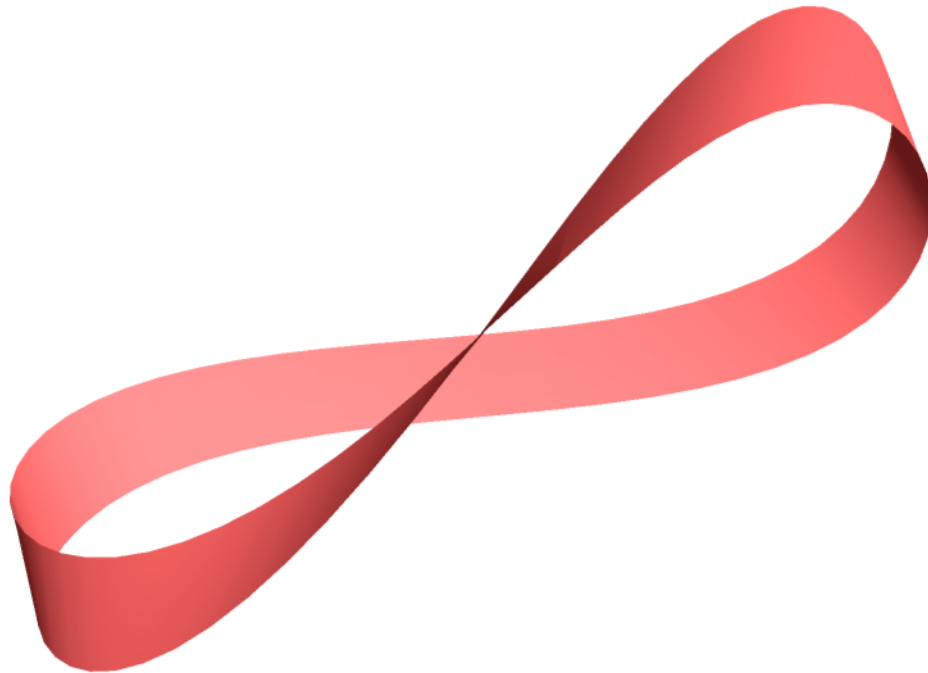
- The Universal 3D (U3D) format is an ECMA standard designed by the 3D Industry Forum (3dif).
- Aims to “*simplify the transformation of complex 3D data into a format that can be streamed, compressed and viewed on affordable, nonproprietary software/hardware platforms while providing a high quality viewing experience*”.
 - [Intel white paper](#)
 - [ECMA Standard](#)

Yet another “killer 3d app?”

- The goal is not new, there have been many proposals in the past, e.g. VRML, and current proposals under development, e.g. X3D.
- However, U3D serves as one of the 3D representations within PDF.
 - de facto standard for document interchange.
 - free reader available on multiple platforms.
- Adobe Acrobat can capture or convert 3D.
- A number of third-party programs are also available to convert standard CAD and 3D file formats into 3D PDF.

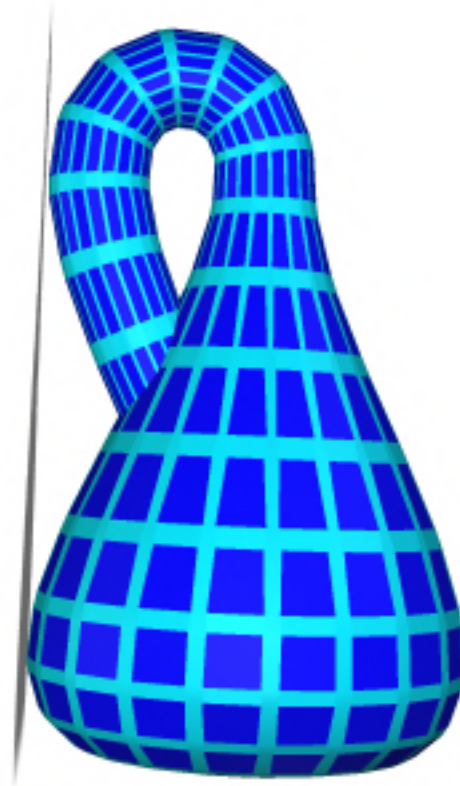
Interactive 3D models

- Acrobat Reader, as of version 7, allows interaction with embedded 3D content.
- e.g. Möbius strip



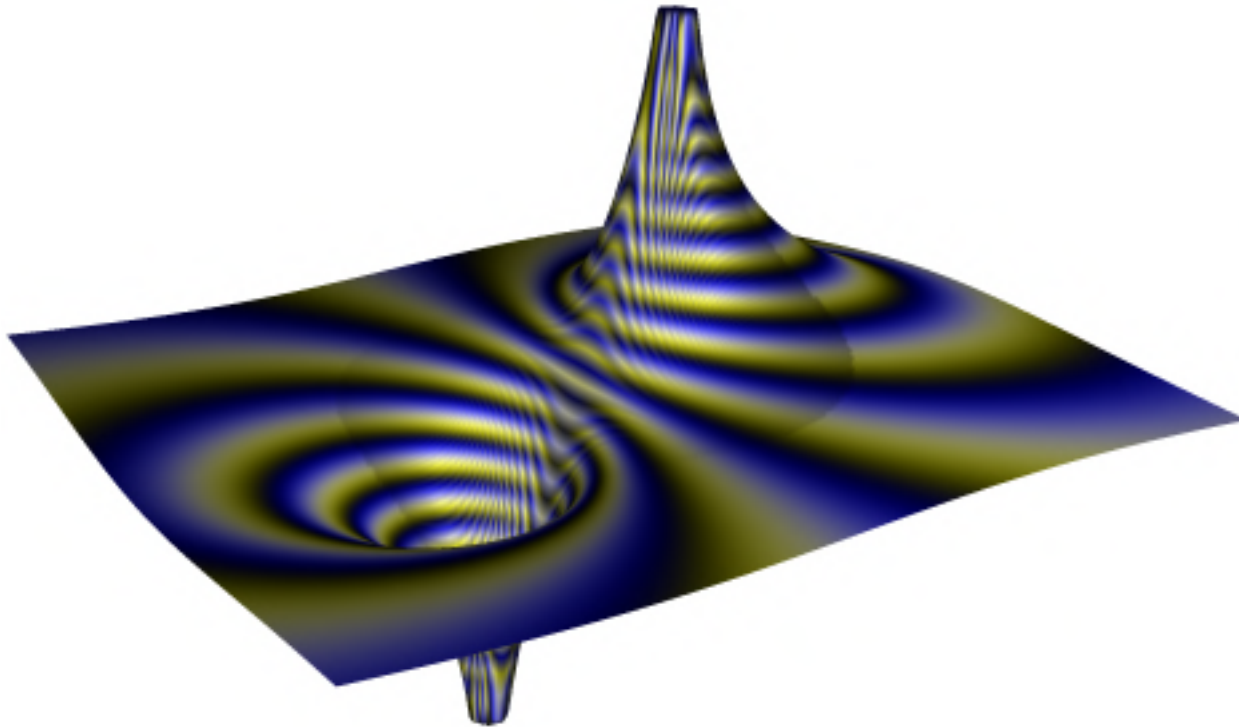
Interactive 3D Models

- Klein Bottle

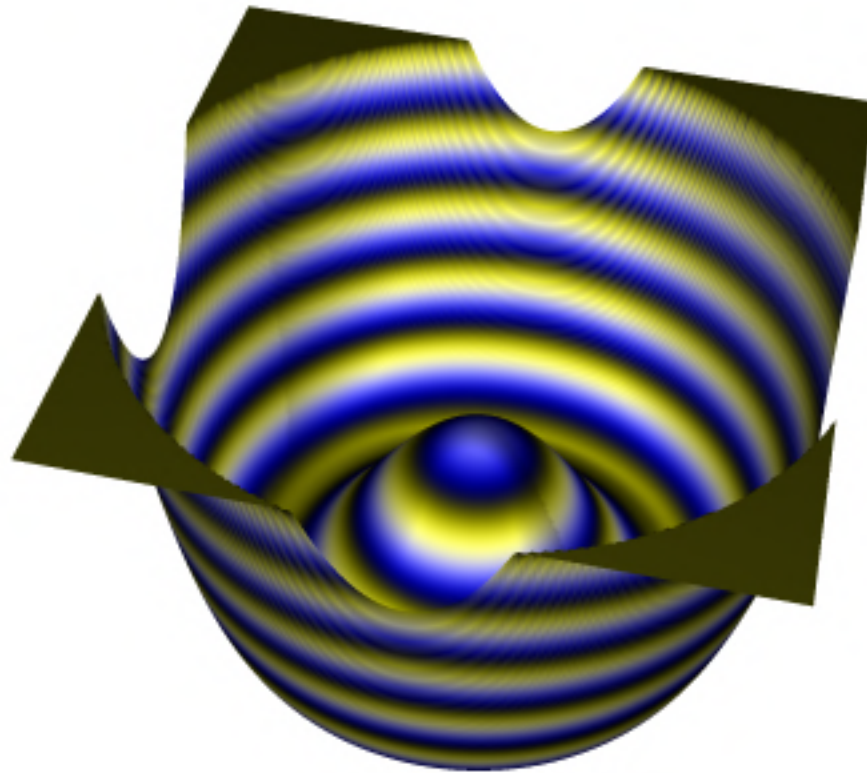


Interactive 3D Models

- Magnetic Dipole Field
 - 40,000 points, 80,000 faces



Higgs Potential



Javascript: Linking to Views

- Can use scripting to control views
 - e.g. conic sections.

Parabola

Hyperbola

Circle

Ellipse



Animation

- Assembly sequence example

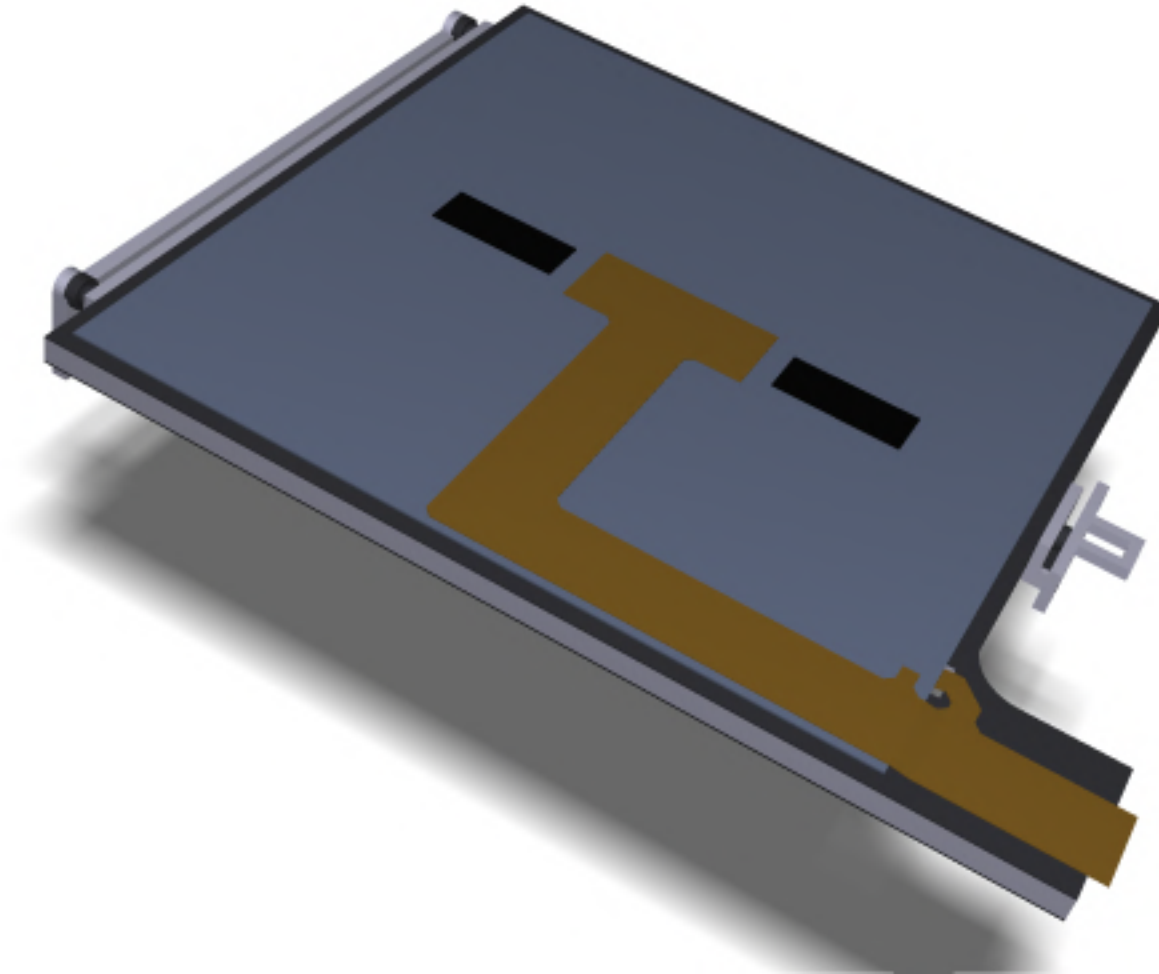
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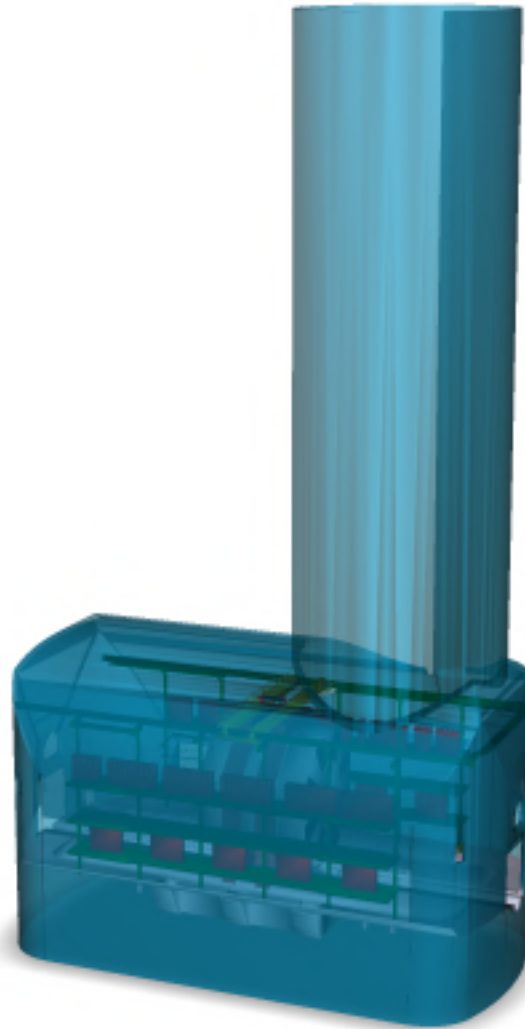
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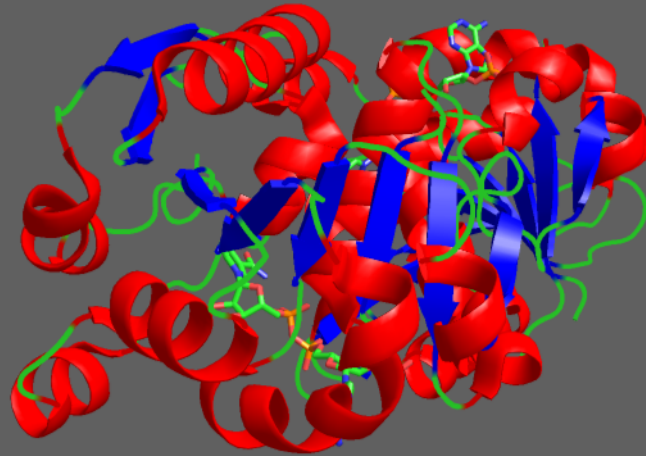
E



Detector Visualization



Steap3 Dimer captured from PyMol



Summary

- The de facto standard PDF file format and the free Adobe Reader provide a dependable, platform-independent format for documenting 3D spatial and temporal content.
- Users have the ability to interact with the scenes, customize the viewing experience, and can exchange commentary via PDF markup.
- Level of detail in 3D models can be customized, enabling re-export to CAD systems without loss of detail.
- Ability to embed 3D and enable time evolution of information in standard PDF documents opens up whole new dimensions of information transfer.