MuPAD's graphics system

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Overview

- MuPAD 3.0 (2004): new `plot` library
- uniform interface
- animation
- ~100 “primitives”, ~400 “attributes”
- today's topic:
  - How is it done?
  - How to extend it?

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User's View

- plot “objects” have “attributes”
- all attributes can be changed
  - interactively and programmatically
- defaults per object type (changeable)
- complete plot is a tree
  - scenes, groups, transformations, etc. have children
  - attributes can be inherited
- animation per object by parameter

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Technical View

- most “knowledge” implemented as MuPAD library
- rendering via OpenGL/VRS (3D), in-house code (2D)
- user's tree is converted to XML tree
- if necessary, renderer asks for “re-plot”

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Programmer's View

- Code to be written:
  - meta-information
  - parsing special arguments (no checks required)
  - rendering a still object
    - can ignore most attributes
    - can use other objects

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Lessons Learned

Basic design is sound and easy to use.

Points for improvement include:

- extensibility limited in corner cases
- limited interactivity
- no on-line changes
- advanced export formats hard to add

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Conclusion

MuPAD Pro provides a powerful and easy to understand/use graphics system.

- trees can be a natural way of creating complex mathematical graphics
- restricting programmers improves overall design
- not everything is in place yet