

Semantic and Visual Encoding of Diagrams (SaVED)

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Background

- Diagrams as geometric models
 - Hydrostatics, astronomy, geography
- Derive geometric properties from their models
- Diagram construction is a dynamic process
 - View a snapshot of that process
 - Manually perform the entire construction

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2

Our Contributions

- **We observe**
 - several properties of diagrams from Greek Mathematical texts.
- **We develop**
 - a programming language that explicitly encodes these properties
- **We produce**
 - a corpus of diagrams for Archimedes, Floating Bodies, Book I
- **We interact**
 - with diagrams in uniquely-digital ways

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3

Properties | P. Lang. | Corpus | Interface

Properties of Ancient Greek Mathematical Diagrams

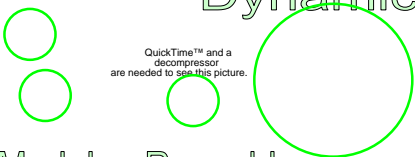
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4

Properties | P. Lang. | Corpus | Interface

Semantic Properties
Meaning? Dynamic
Modular, Reusable




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5

Properties | P. Lang. | Corpus | Interface

Presentational Properties
Multiple Versions
Logically Impossible



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6

A Programming Language for Diagrams

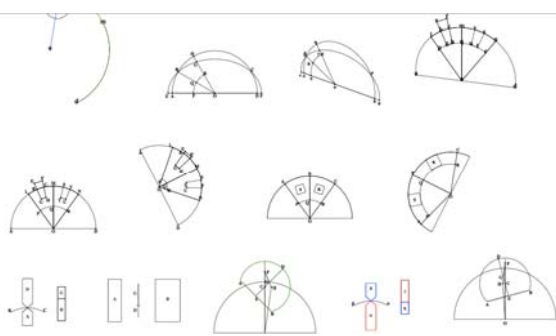
SaVED Markup

- Dynamic meaning
 - type casting
- Previously-defined objects
 - Variable declaration and assignment
- Previously-defined constructions
 - Subroutines
- Multiple Editions
 - Logical and presentational layer

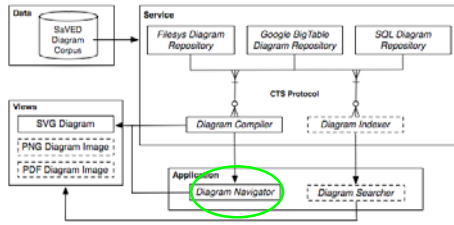
Compilation

The diagram illustrates the compilation process. On the left, there are two blocks of SaVED Markup code. The top block is a `<diapre:value>` containing a `<point>` element with attributes `id="o"` and `diapre:parom_id="0"`. The bottom block is a `<dialog:do>` element containing a `<circle>` element with attributes `id="o"` and `ref="c2:o"`. An arrow labeled "SaVED Compiler (semantic:3.1, heath:3)" points from these code blocks to a "Rendered SVG" diagram on the right. The rendered diagram shows a circle with a center point 'O' and a radius line 'r'. The circle is divided into segments labeled with letters A through S. Below the rendered diagram is a block of SVG Source code, which includes a `<circle>` element with a `class="tlg0552.tlg008:center_of_earth"` and a `<text>` element with a `class="tlg0552.tlg008:radius"`.

A Machine-Actionable Corpus of Diagrams



Uniquely-Digital Diagram Interfaces



Conclusions

- **We observed** several logical and presentational properties of diagrams
- **We developed** SaVED, a programming language that explicitly encodes these properties
- **We produced** an archival-quality corpus of diagrams for the Archimedes Palimpsest Project
- **We can interact** with diagrams in uniquely-digital ways: dynamic navigation, search and dependency graphs

Thank You!
Questions?

<http://www.cs.dartmouth.edu/reports/abstracts/TR2009-654/>
<http://www.episteme.ws/>