Genome Vectorizer

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Genome Vectorizer?

- Redesigned version of GenomePixelizer
- Added feature of dragging
- Detection of duplicate genes.
- Genome study: rapidly growing field

- “I visualize things in my mind before I have to do them. It's like having a mental workshop.” Jack YoungBlood
Motivation

• Complex biological problems
• Tremendously large database of information
• Demand for visualization tools
• Unclear and large amount of data
Biological Background

- Gene: Unit of hereditary made up of DNA (Deoxy Ribonucleic Acid)
- The DNA bundles up to form a chromosome. DNA is made up of molecules A, G, C, T.
- HOMOLOGY: Similarity in characteristics of organisms
- Homology sheds light on issues of common ancestry
- Gene Comparison: Performed by aligning genes
- Percentage of similarity between genes is represented by distance
Previous Work

• Idea is not new
• Many tools already present
• They provide high interactivity but lack in user friendliness
• Concentration of too many connecting lines between the chromosomes make analysis difficult.
• This tool lets the user drag each chromosome out for detailed analysis.
• Previous version of the same tool did not allow for dragging
Functionality
Dragging Capability
Implementation

- Files used: -> input.xml

Part 1: Chromosome Information

```xml
<chromosome id="1" size="20">
  <gene color="orange">
    <gne_name>Gene_K</gne_name>
    <gne_location>6.2</gne_location> <gne_orientation>C</gne_orientation>
  </gene>

  <gene>
    <gne_name color="orange">Gene_W</gne_name>
    <gne_location>6.4</gne_location>
    <gne_orientation>C</gne_orientation>
  </gene>
  ...
</chromosome>
```
Implementation

• Part 2: Distance matrix

<matrix>

<row>
  <gene_a>Gene_A</gene_a>
  <gene_b>Gene_E</gene_b>
  <dist>0.9857</dist>
</row>

<row>
  <gene_a>Gene_A</gene_a>
  <gene_b>Gene_U</gene_b>
  <dist>0.9286</dist>
</row>

<row>
  <gene_a>Gene_A</gene_a>
  <gene_b>Gene_Y</gene_b>
  <dist>0.8429</dist>
</row>

...
Code Design

- **parser.xsl** - parses out information about chromosome and genes using XPath queries and sends it to drawingtools.xsl. It also parses out information about distance matrix and sends it to draw_matrix.xsl.

- **drawingtools.xsl** - contains XSL templates and SVG code for drawing grid, chromosomes, and genes and for displaying synteny between genes.

- **draw_matrix.xsl** - draws genes distance matrix.

- **loadxmlDoc.js** - loads XML document into DOM structure.
Future Work

- Creation of a parser to add data dynamically to the input.xml file
- Adding chromosomes dynamically and connecting to databases online
Thank You