

Apparatus

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“Apparatus is a hybrid graphics editor and programming environment for creating interactive diagrams” (<http://aprt.us>). It’s central fantastic trick is that the diagram elements can be directly manipulated, allowing the diagram and code to be played backwards and forwards. A numerical solver is used to make the magic happen.

The screenshot shows the Apparatus interface with several panels and annotations:

- Top Panel:** Menu items: Symbols, New, Load, Save, Undo, Redo, Delete, Group, Create Symbol.
- Left Panel (Symbols):** Contains icons for Rectangle, Circle, Text, and Group. Annotations include: "Drag in to the canvas to create a variant of the symbol." (pointing to a square icon), "Click to select. Double click to select 'into' a group." (pointing to a circle icon), "Remove symbol." (pointing to a trash icon), "Edit symbol. Rename symbol." (pointing to a pencil icon), and "Create new symbol." (pointing to a plus icon).
- Center Canvas:** A large grey circle is selected. Annotations include: "Create new variable." (pointing to a plus icon), "There will be a circle next to every attribute which influences the geometry of the selected element. Toggle to make the selected element control this attribute." (pointing to a small circle next to the 'X' attribute in the inspector), "Click to select. Double click to select 'into' a group." (pointing to the circle), "Drag to adjust scale of selected element." (pointing to a corner handle of a smaller rectangle), and "Drag to adjust position of selected element." (pointing to a side handle of the smaller rectangle).
- Right Panel (Inspector):** Titled "Outline", it shows a tree view of the selected element (Rectangle). Annotations include: "Rename element." (pointing to the "Group" label), "Drag to reorder outline." (pointing to a drag handle), "Drag to reference this attribute in an expression or click it while typing to insert a reference." (pointing to the "X" attribute), and "Rename attribute." (pointing to the "X" attribute).
- Bottom Right Panel (Inspector):** Titled "Rectangle", it shows various properties. Annotations include: "Create new variable." (pointing to a plus icon), "Drag to scrub." (pointing to the "X" attribute), and "Type javascript." (pointing to the "Fill Color" attribute).

What works:

- Powerful causal linkages between visual and parametric elements.
- Solver magically brings these bidirectional linkages to life.
- System has a lot of expressive power.
- Clear linkage between visual and inspector relationships.
- Combination of direct manipulation and coding.

I wish:

- Multiple representations—outline, inspector view, constraints—were more consolidated, ideally as manipulables in the main canvas.
- More responsive performance.
- An ecology of reading and writing:
 - Easy to embed diagrams and make content for them to live in.
 - Easy to share components.
- Complex network of causal and hierarchical relationships was somehow less dizzying.
- Improved graphics tools, e.g. color picker.
- Simulations: feedback loops and time.