Systems Design Laboratory

Designing Graphical Interfaces with SVG

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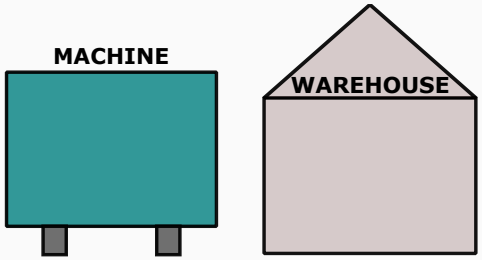
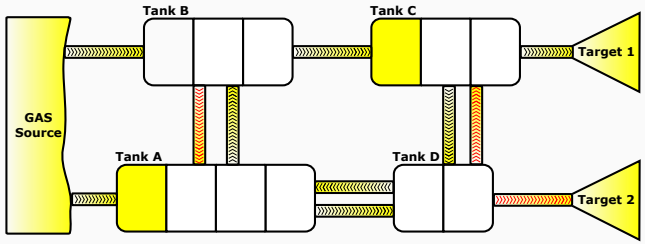
Graphical Interfaces - Examples

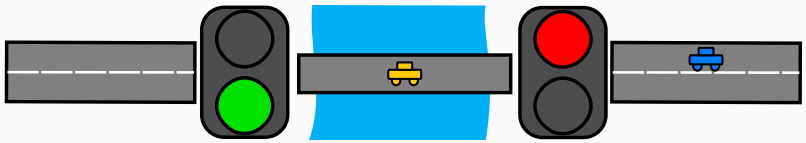
Machine Warehouse



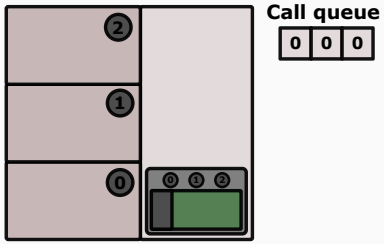
Gas Tanks



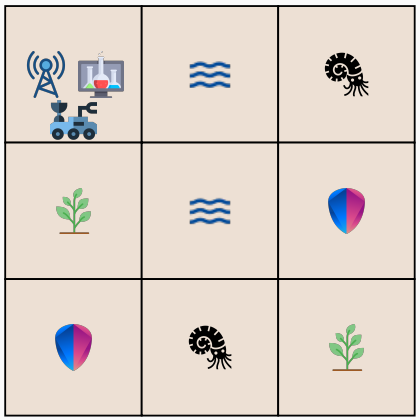
Traffic Lights



Elevator



Rover Sample Collection



Sample collection:

0

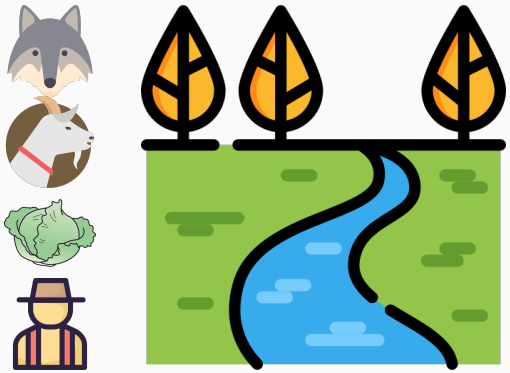
0

0

0

Sample analysis

Wolf-Goat-Cabbage



Scalable Vector Graphics (SVG) - Concepts Behind the Name

- *Scalable* = increasing or decreasing the graphics uniformly
- *Vector* = geometric objects (no "pixel information")
- *Graphics* = a rich, structured description of vector and mixed vector/raster graphics

In vector graphics, a mathematical description of a drawing is given by means of coordinates, vectors, objects, etc. In order to display it on a computer screen, the vector description is converted to pixels to achieve maximum sharpness for all possible display resolutions. SVG is the international World Wide Web (W3C) Consortium standard for 2D. https://www.w3.org/TR/SVG11/

SVG - Main Features

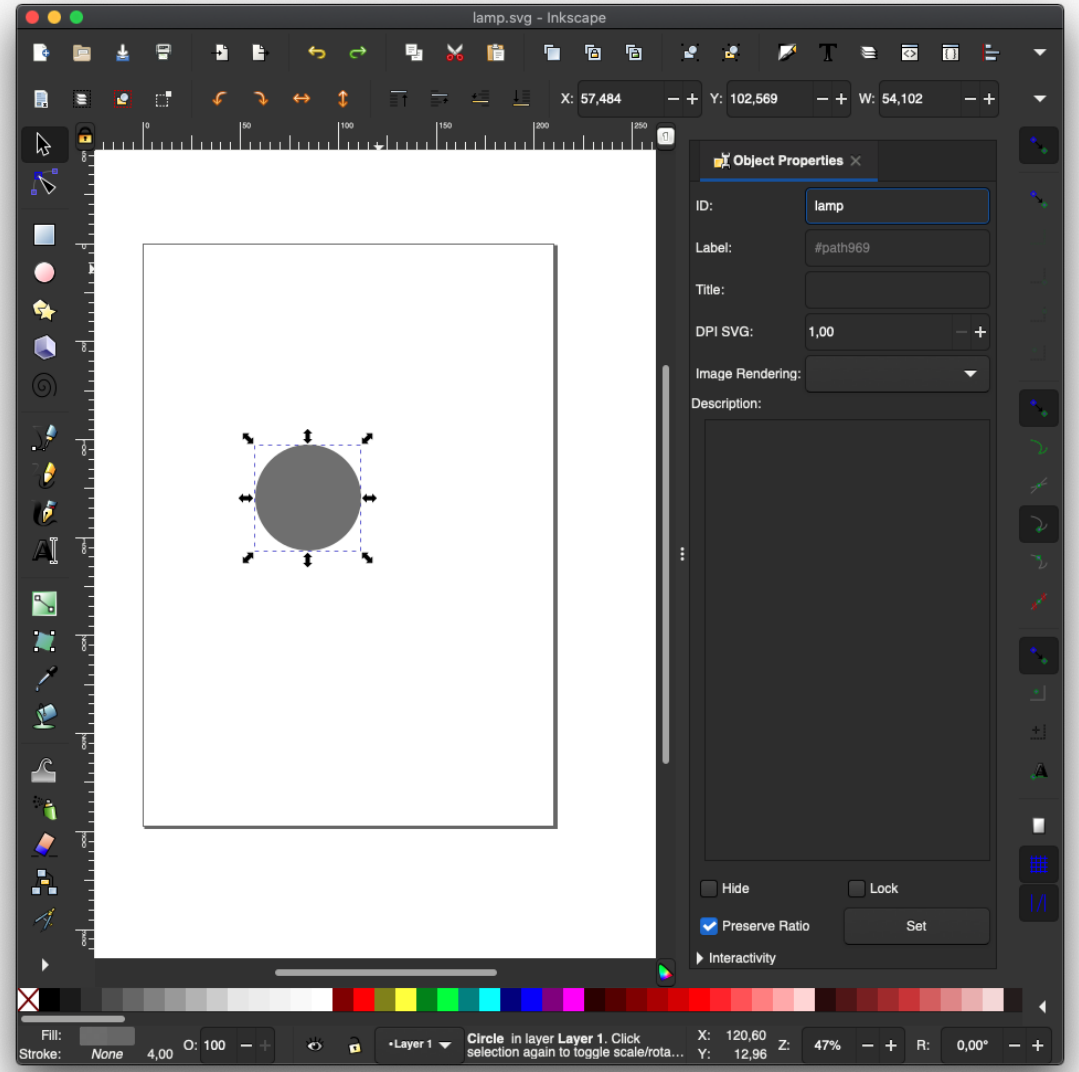
- SVG is a language for describing two-dimensional graphics in XML
- SVG allows for 3 types of graphic objects:
  1) vector graphic shapes (e.g., paths consisting of straight lines and curves)
  2) images
  3) text
- Graphical objects can be grouped, styled, transformed and composited into previously rendered objects
- SVG drawings can be interactive and dynamic

SVG - Inkscape

https://inkscape.org

- Inkscape is a free and open source vector graphics editor for GNU/Linux, Windows and MacOS
- Inkscape uses the standardized SVG file format
- It can import and export various file formats, including SVG, AI, EPS, PDF, PS and PNG
- It has a simple interface
- It has a growing international user community, and many learning materials exist to help get you started with your creations https://inkscape.org/learn/
- Inkscape is a member of the Software Freedom Conservancy, a US 501(c)(3) non-profit organization. Contributions to Inkscape are tax deductible in the United States.

SVG - Inkscape

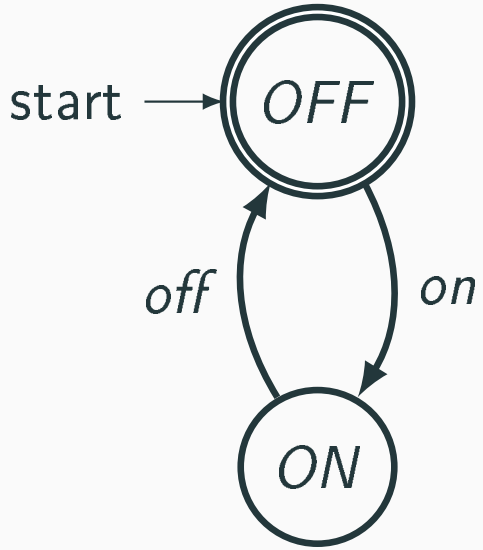


- Create a circle in Inkscape
- Edit Object Properties
- ID = "lamp"
- Save it as `plant.svg`

SVG - ESCET - A Lamp Example

A Plant Automaton with an intuitive "on/off semantics"

```
plant lamp:
  controllable on;
  controllable off;

  location OFF:
    initial; marked;
    edge on goto ON;

  location ON:
    edge off goto OFF;
end
```



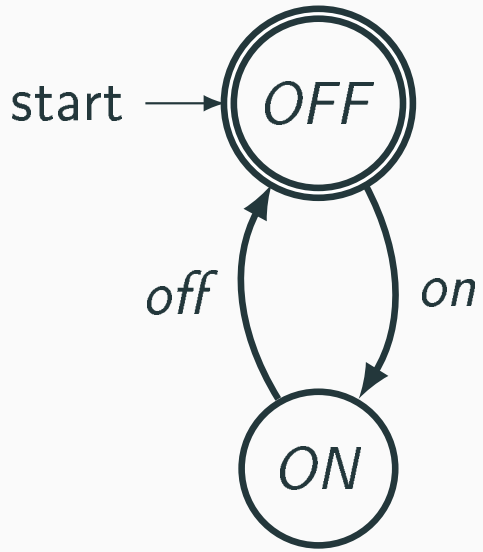
$\Sigma := \{on, off\}$

We would like to "connect" the CIF specification to the `plant.svg` file so that:

- **when the lamp is on the circle becomes yellow and**
- **when the lamp is off the circle becomes gray**

SVG - CIF - Filling Objects

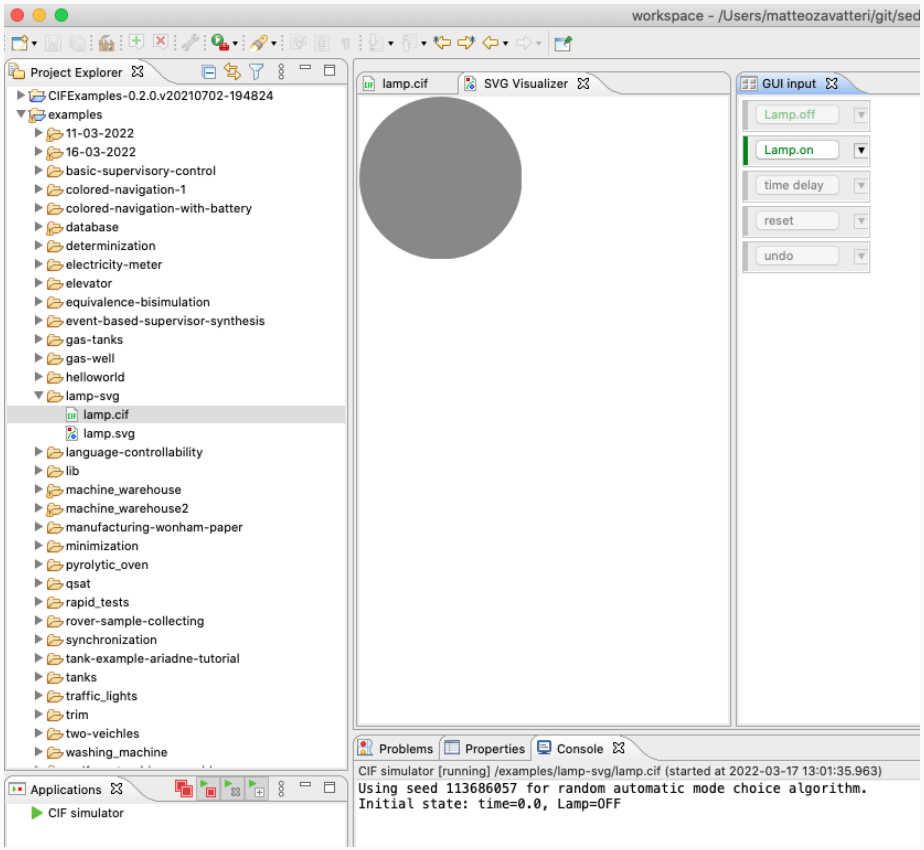
```
plant Lamp:
  controllable on;
  controllable off;

  location OFF:
    initial; marked;
    edge on goto ON;

  location ON:
    edge off goto OFF;
end
```

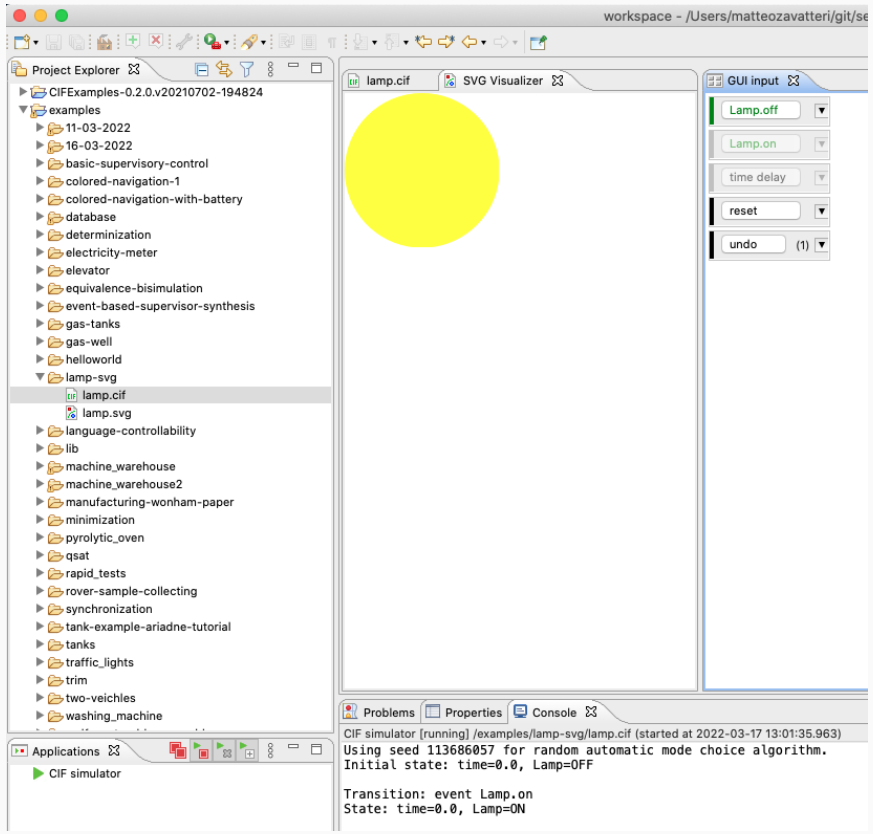


$$\Sigma := \{on, off\}$$

```
svgfile "lamp.svg";
svgout id "lamp" attr "fill" value if Lamp.ON : "yellow"
                                  else "gray"
                                  end;
```

SVG - CIF - Filling Objects

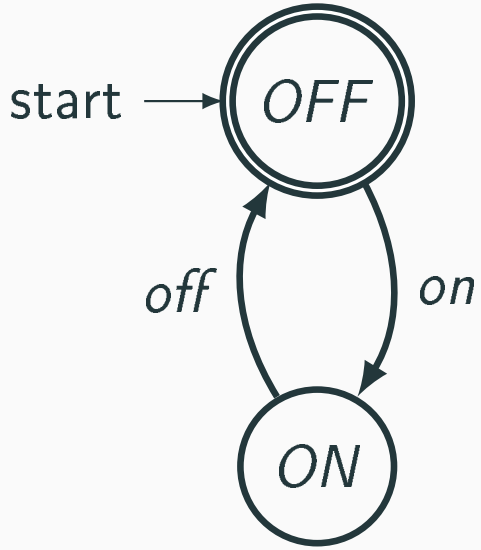




`fill`: **changes the color of an object**

SVG - CIF - Moving Objects

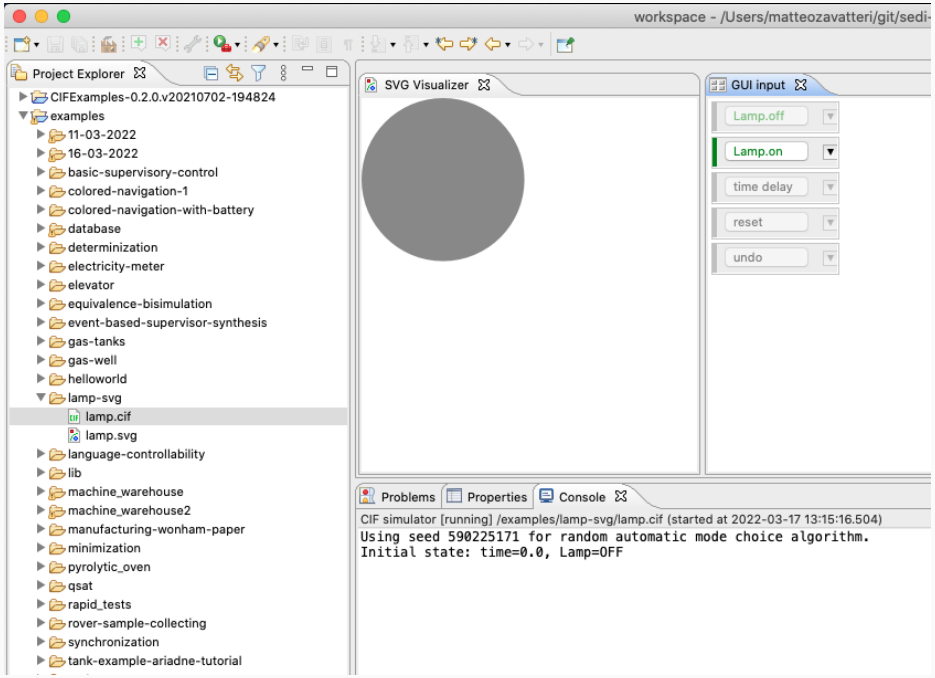
```
plant Lamp:
    controllable on, off;

    location OFF: initial; marked;
        edge on goto ON;

    location ON:
        edge off goto OFF;
end
```

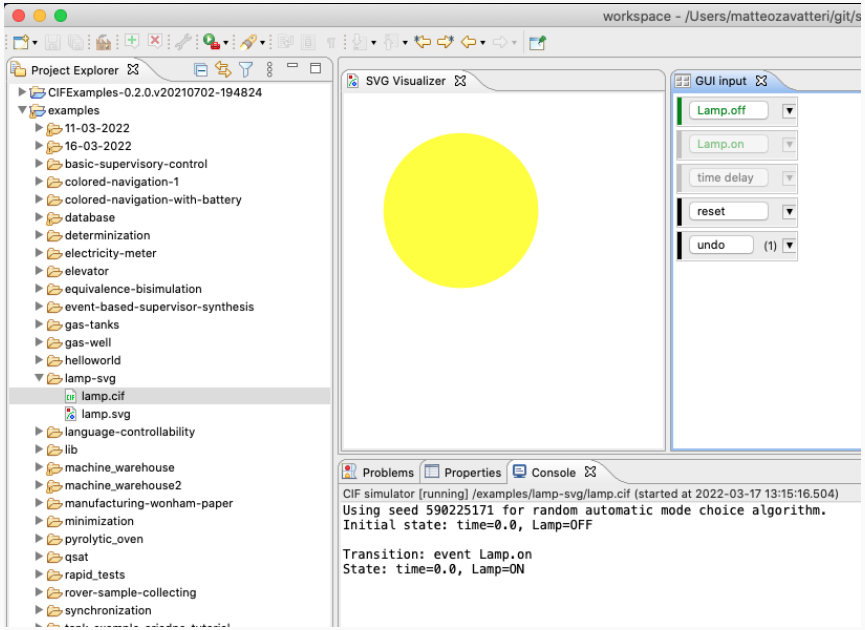


$$\Sigma := \{on, off\}$$

```
svgfile "lamp.svg";
svgout id "lamp" attr "fill" value if Lamp.ON : "yellow"
                                   else "gray"
                                   end;
svgout id "lamp" attr "transform" value if Lamp.ON : "translate(10,10)
                                   else "translate(0,0)"
                                   end;
```

SVG - CIF - Moving Objects





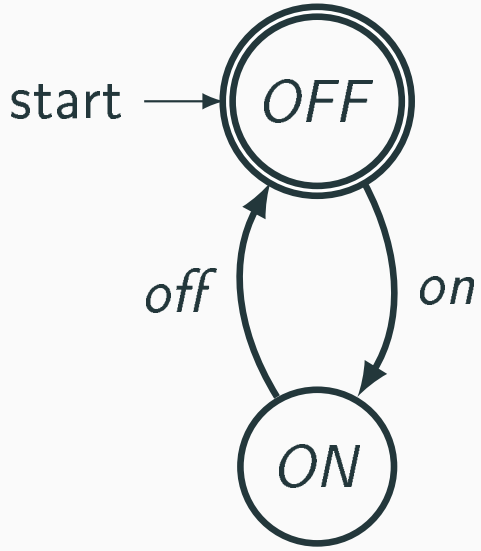
`translate(x,y)`: **shifts an object of `x` and `y`**

Remember to "group" complex svg objects if you want to move them altogether

See also `https://jenkov.com/tutorials/svg/svg-transformation.html` for more transformations

SVG - CIF - Displaying Objects

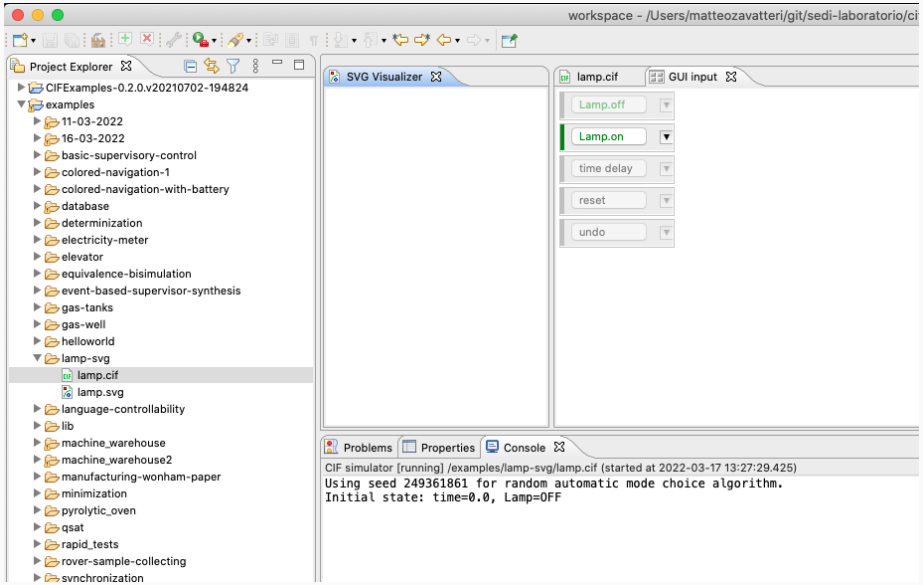
```
plant Lamp:
    controllable on, off;

    location OFF: initial; marked;
        edge on goto ON;

    location ON:
        edge off goto OFF;
end
```

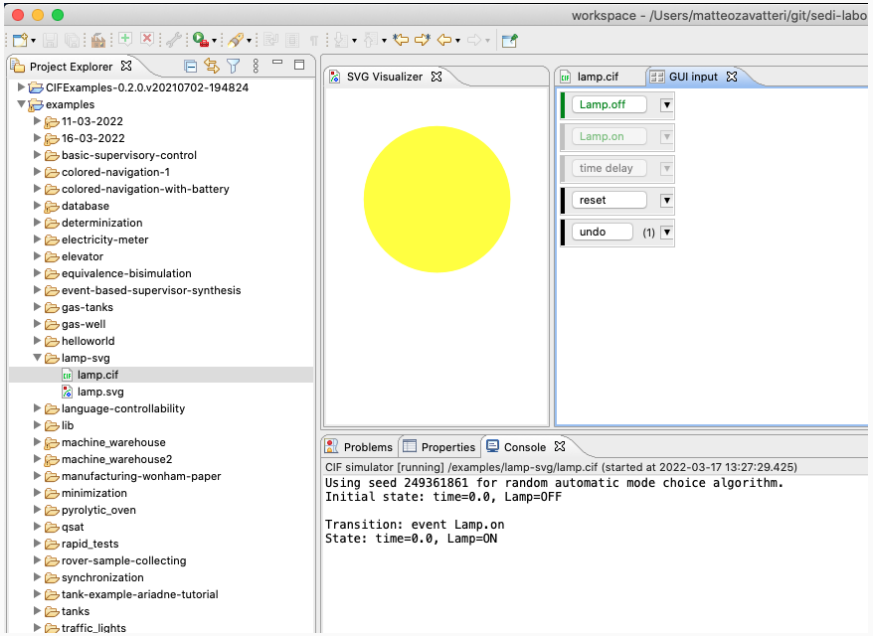


$$\Sigma := \{on, off\}$$

```
svgfile "lamp.svg";
svgout id "lamp" attr "fill" value if Lamp.ON : "yellow"
                                   else "gray"
                                   end;
svgout id "lamp" attr "transform" value if Lamp.ON : "translate(10,10)"
                                   else "translate(0,0)"
                                   end;
svgout id "lamp" attr "display" value if Lamp.ON : "inline"
                                      else "none"
                                      end;
```

SVG - CIF - Displaying Objects





`display`: **hides/shows an object**