MASSACHVSETTS INSTITVTE OF TECHNOLOGY
Department of Electrical Engineering and Computer Science

6.5150/6.5151 Spring 2024
Problem Set 8

Issued: Wed. 10 April 2024   Due: Fri. 26 April 2024

This is the LAST PROBLEM SET for 6.5151! Whew!
   You have two weeks to work on this problem set.
   There will be one more problem set for 6.5150 students only.

Everybody: Please work on your projects. Draft project reports
   are due on Wednesday, 1 May 2024. You will present your
   projects on the week of May 6 through May 10. Final project
   reports are due Friday May 10.

   We cannot accept late problem sets or papers after the last
   class, which is Tuesday May 14.

Readings:

   SDF Chapter 7: Propagation

   Radul & Sussman, "The Art of the Propagator,"
   http://dspace.mit.edu/handle/1721.1/44215.
   This is a preliminary paper about the ideas in the propagator
   system. It is NOT about the system we are using , which is
   entirely new. However, this paper accurately captures the
   philosophy of the system and explains a simple implementation.

   Alexey Radul's PhD thesis dissertation: "Propagation Networks:
   A Flexible and Expressive Substrate for Computation"
   https://dspace.mit.edu/handle/1721.1/49525. This is more
   detail and more worked out than the "Art" paper above, but it
   is much longer. It is also not about the system we are using.

Technical note:
   Get the propagator system as usual: (manage 'new 'propagation).
But you also need to tell the system about which primitive
propagators and which merge procedure is to be used. This
requires a call to setup-propagator-system. You will also need
to execute (initialize-scheduler) for each experiment, to clear
out the history of the previous experiment.

The default setup of the propagator system, when built new by the
   manager is with numeric arithmetic:

      (setup-propagator-system numeric-arithmetic)

To Do

Exercise 7.1: Making writing propagator networks easier SDF p.340
  In class you will actually see how to do this problem!

Exercise 7.2: An electrical design problem   SDF pp.340-341

  As with many of my exercises, most of the solution to this
  exercise is in the code you can find in the sdf directory we
  gave you!

  I also abstracted much of the boilerplate for setting up the
  propagator system since writing the code in the sdf directory.

```
(setup-propagator-system
   (extend-arithmetic interval-extender numeric-arithmetic))
```

  This will install the extension of numeric arithmetic with
  intervals and will set up the primitive propagators to use that
  arithmetic.

Exercise 7.a (not in SDF):

Formulate and solve the following "Liars" puzzle (adapted from
Phillips 1934) using propagators:

Alyssa, Cy, Eva, Lem, and Louis meet for a business lunch at
SoSoService. Their meals arrive one after the other, a
considerable time after they placed their orders. To entertain
Ben, who expects them back at the office for a meeting, they
decide to each make one true statement and one false statement
about their orders:

Alyssa: "Lem's meal arrived second. Mine arrived third."
Cy: "Mine arrived first. Eva's arrived second."
Eva: "Mine arrived third, and poor Cy's arrived last."
Lem: "Mine arrived second. Louis's arrived fourth."
Louis: "Mine arrived fourth. Alyssa's meal arrived first."

What was the real order in which the five diners received their
meals?