

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Electrical Engineering and Computer Science

6.5150/6.5151 Spring 2025
Problem Set 9

Issued: Wed. 16 April 2025

Due: Fri. 2 May 2025

Note: This is the last problem set for this term. You have a term project to work on. Also, this problem set is optional for students enrolled in 6.5151.

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?