An Intuition for Propagators

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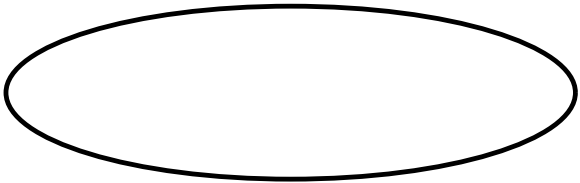
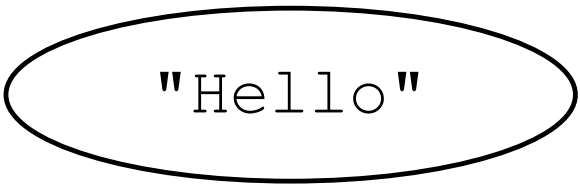
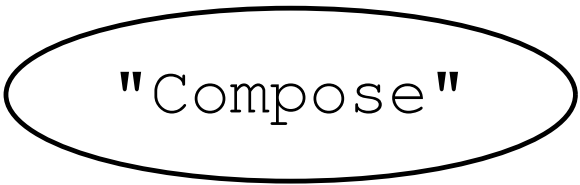
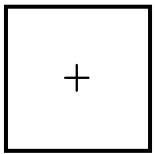
1970s, MIT

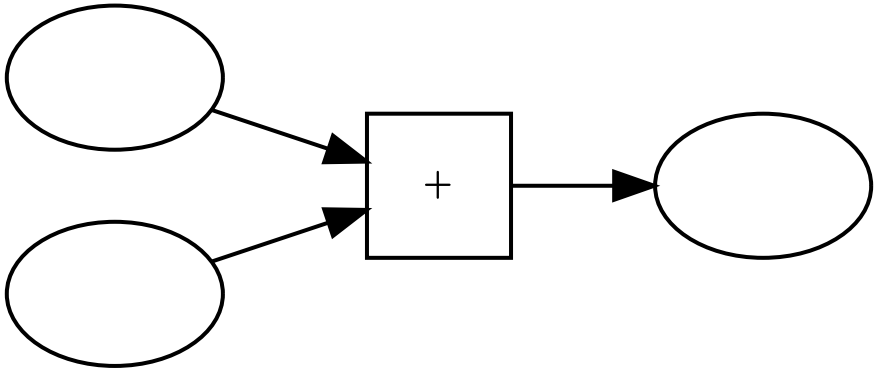
a model of computation for **highly concurrent** machines

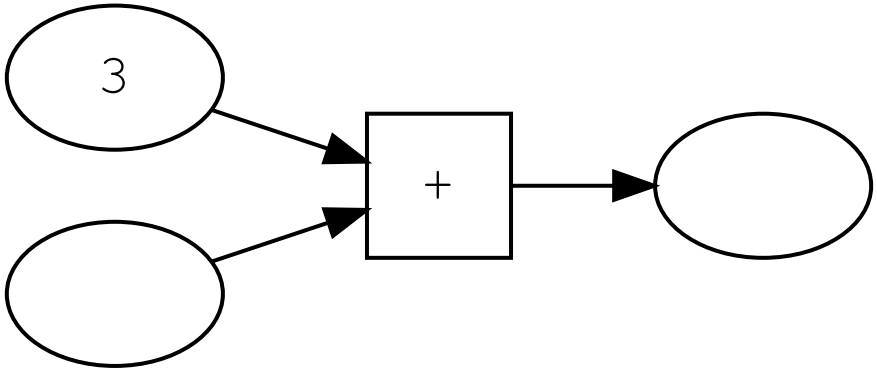



"Hello"


"Compose"



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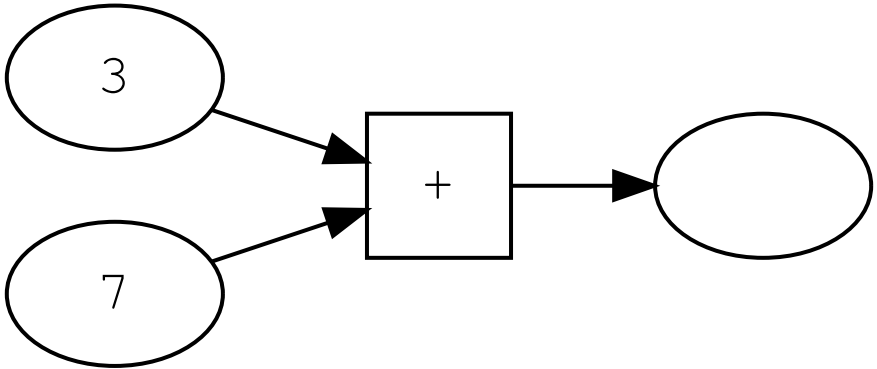
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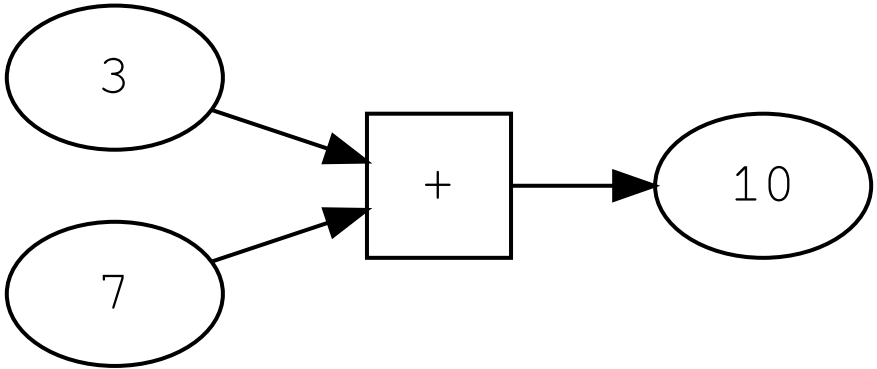
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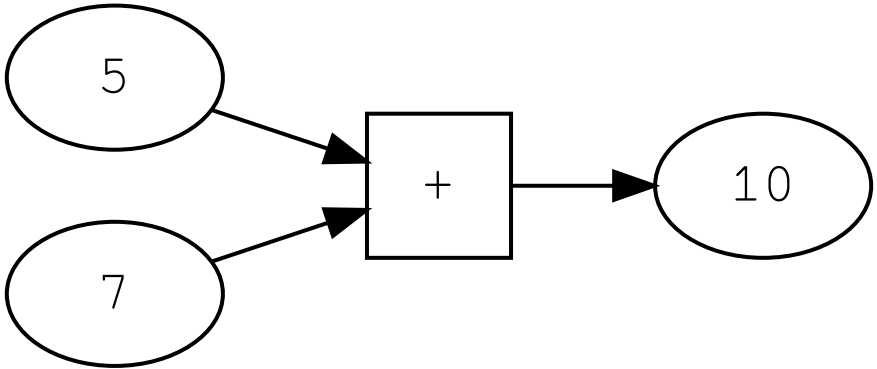
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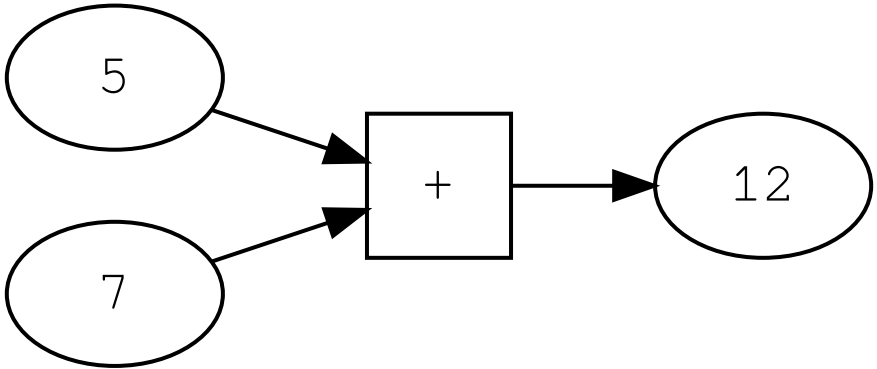
5
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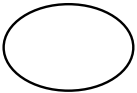
+
12

```haskell
-- types
data Cell a

data Par a
instance Monad Par
```

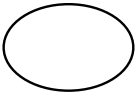
```haskell
-- types
data Cell a

data Par a
instance Monad Par


-- Creating a cell
cell    :: Par (Cell a)
```

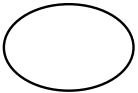
```haskell
-- types
data Cell a

data Par a
instance Monad Par


-- Creating a cell
cell    :: Par (Cell a)


-- Working with Cells
content :: Cell a -> Par (Maybe a)
write   :: Cell a -> a -> Par ()
```

```haskell
-- types
data Cell a

data Par a
instance Monad Par


-- Creating a cell
cell    :: Par (Cell a)


-- Working with Cells
content :: Cell a -> Par (Maybe a)
write   :: Cell a -> a -> Par ()


-- Creating a propagator
watch   :: Cell a -> (a -> Par ()) -> Par ()
```

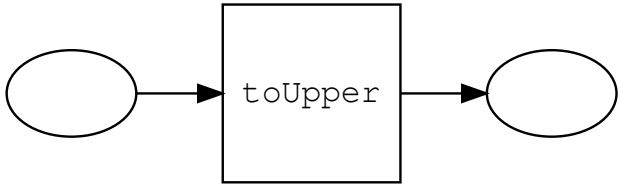


```
do
  input  <- cell
```

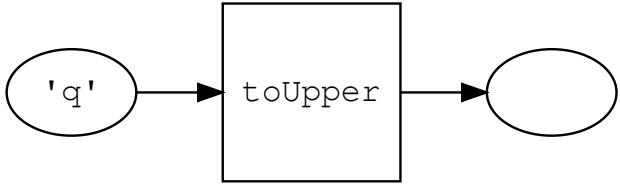




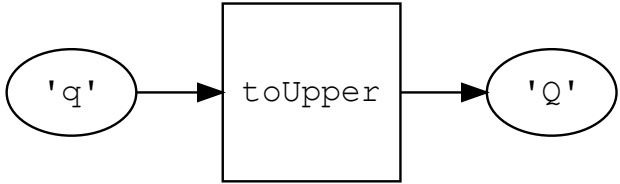
```
do
  input  <- cell
  output <- cell
```




```
do
  input  <- cell
  output <- cell
  watch input (\c ->
    write output (toUpper c))
```

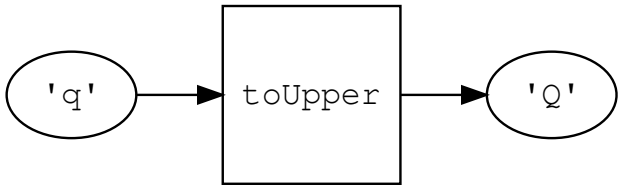



```
do
  input  <- cell
  output <- cell
  watch input (\c ->
    write output (toUpper c))

  write input 'q'
  content output    -- Just 'Q'
```




```
do
  input  <- cell
  output <- cell
  watch input (\c ->
    write output (toUpper c))

  write input 'q'
  content output    -- Just 'Q'
```

```
lift :: (a -> b) -> Cell a -> Cell b -> Par ()
lift f input output =
  watch input (\a ->
    write output (f a))
```




```
do
  input  <- cell
  output <- cell
  lift toUpper input output

  write input 'q'
  content output   -- Just 'Q'
```

Thanks for listening!