Functional Programming from sensors to actuators

vLambda

Master thesis project
Thomas Vanhelden with COMmeto

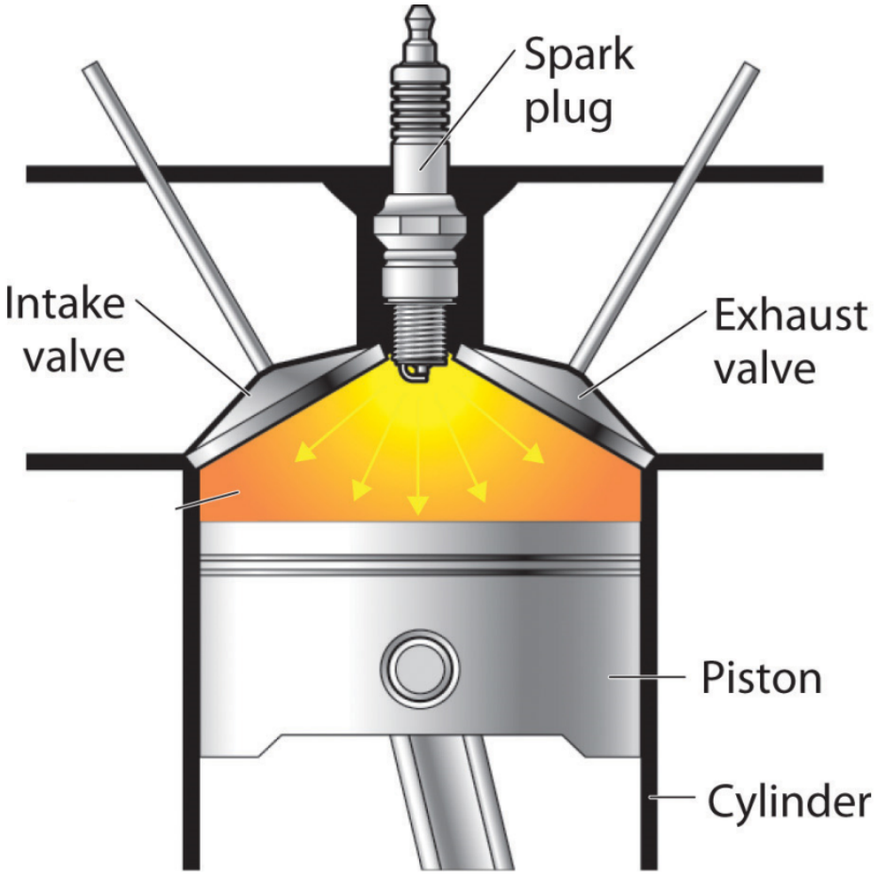
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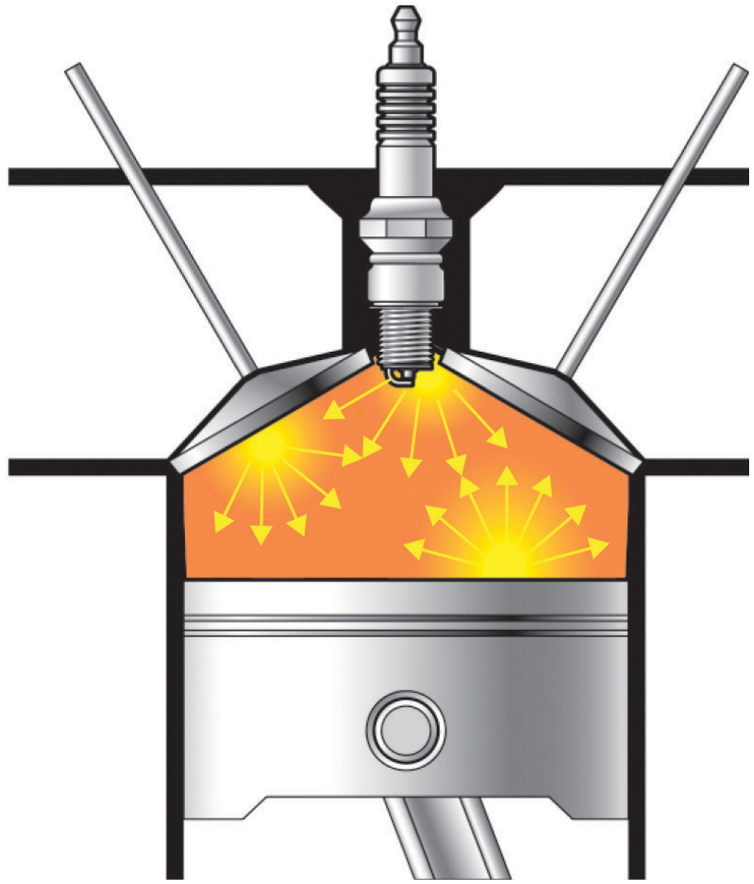
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Background

Engine Knocking



(a) Normal combustion

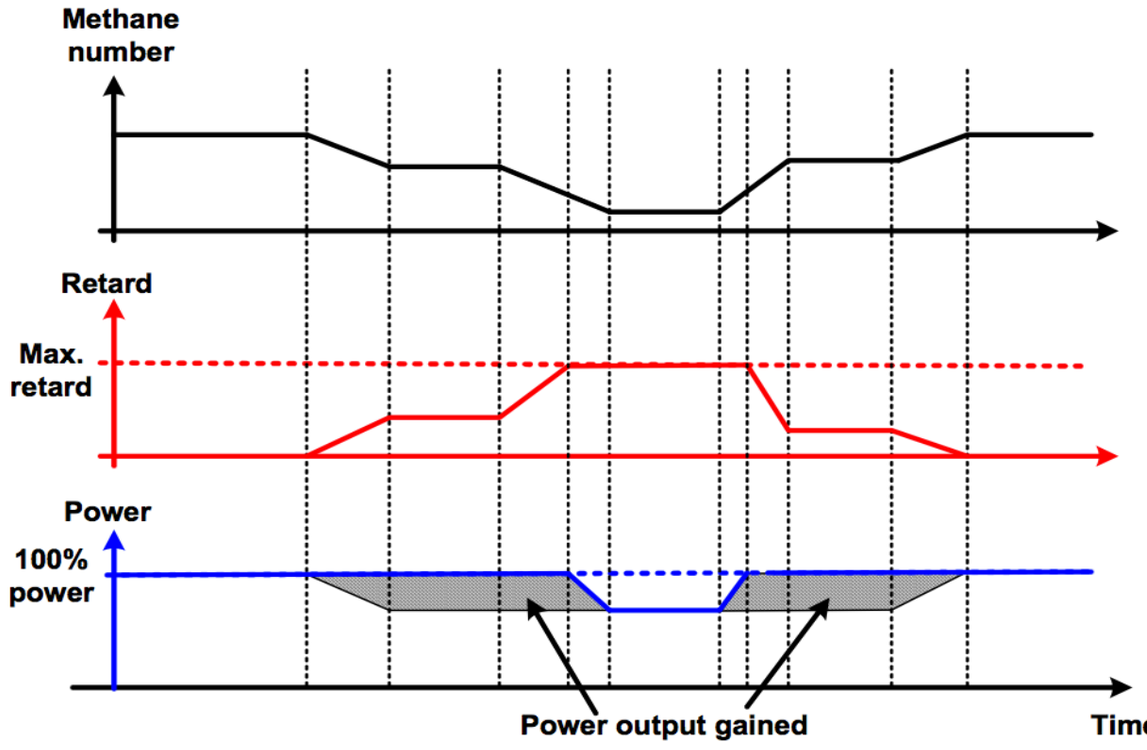


(b) Premature combustion

✘ reduced efficiency
✘ engine wear/damage

Anti **K**nocking **R**egulator

Danish
Electro
Instruments
Factory





Use sensor data to predict & prevent knocking

AKR Software

written by



in



OOP

AKR Software

written by

COMmeto

in



OOP

master thesis by

Thomas Vanhelden

in



FP

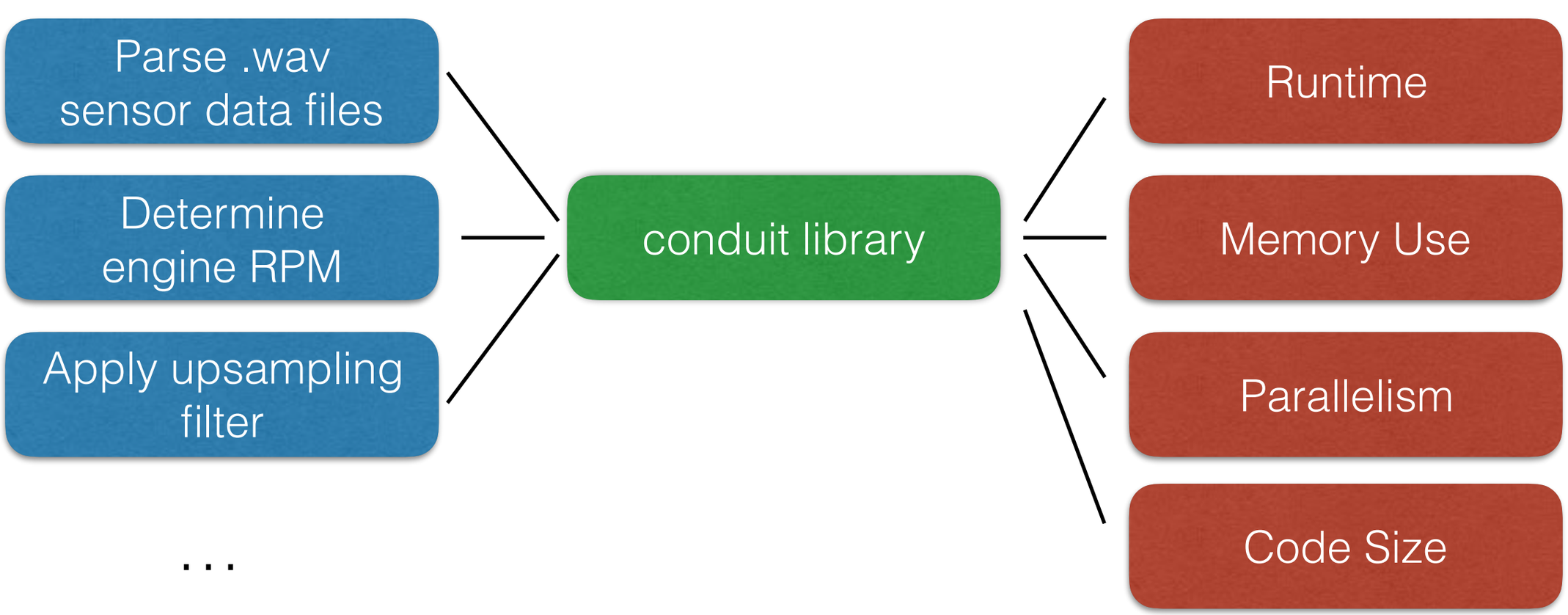
Approach

Approach

Identify Subtasks

Implement in Haskell

Evaluate Criteria



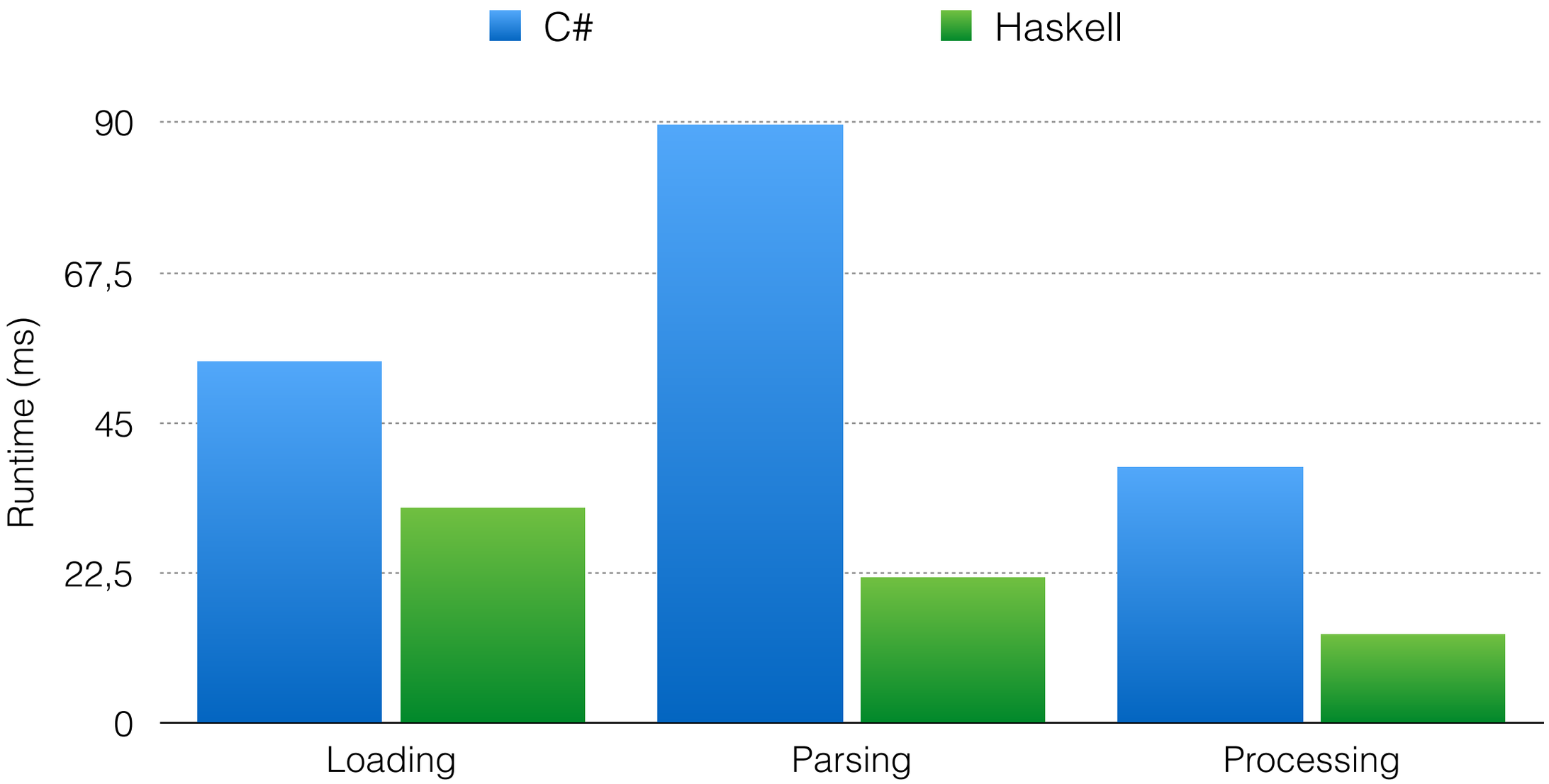
Conduit

pull-based Haskell data streaming library

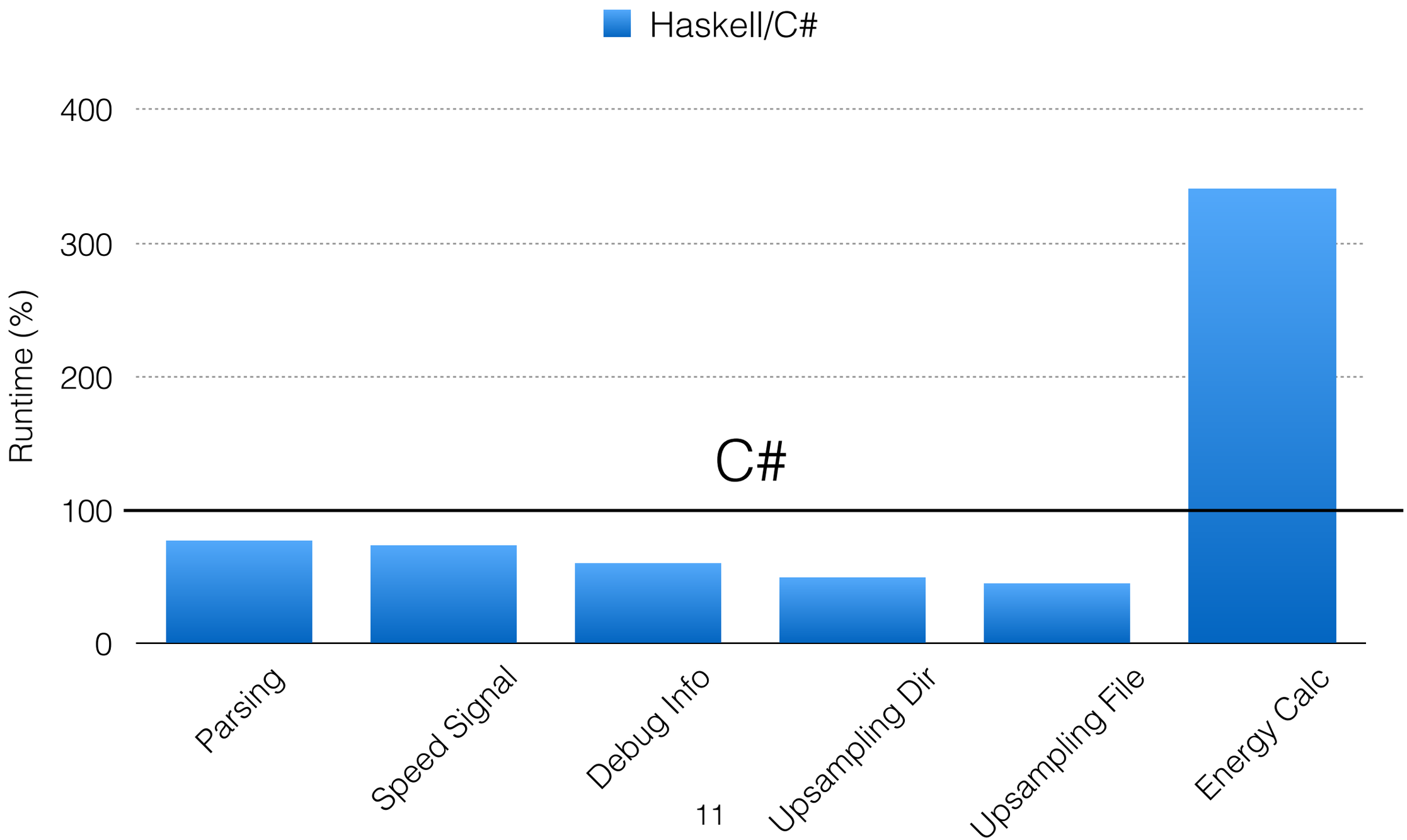
```
main :: IO ()
main = do
runConduit
    $ yieldMany [1..]
   .| takeC 10
   .| mapC (* 2)
   .| takeWhileC (< 18)
   .| mapM_C print
```

Results

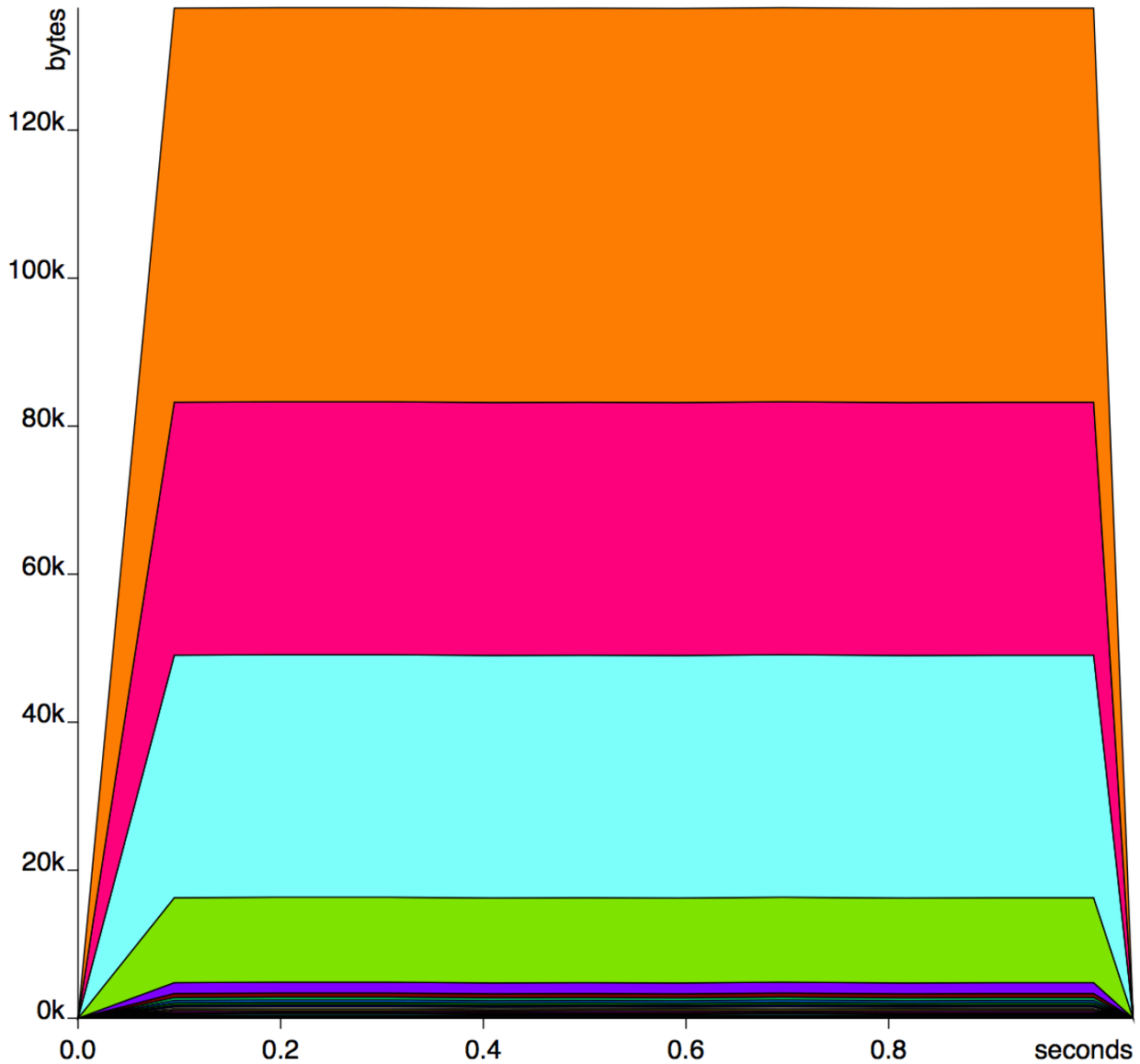
Runtime of RPM Calculation



Runtimes of Various Tasks



Streaming
in Constant Memory



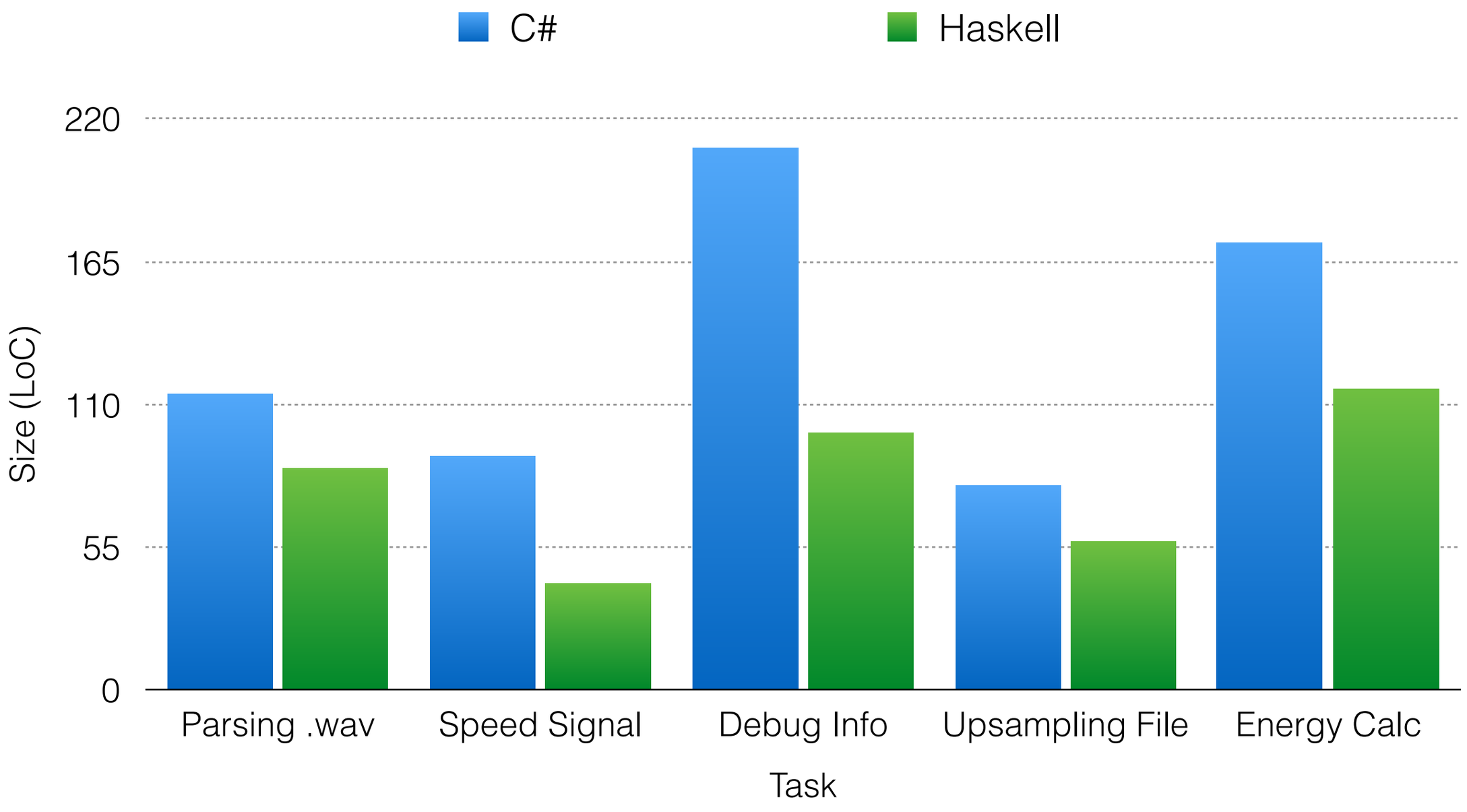
Trivial Parallelism is Trivial to Get

```
upsampleDirectory coefs dir =
  let files = getFilesFromDirectory dir
  in  for_                  files (upsample coefs)
```

Trivial Parallelism is Trivial to Get

```
upsampleDirectory coefs dir =
  let files = getFilesFromDirectory dir
  in  forConcurrently_ files (upsample coefs)
```

By the way: Code Size





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Questions?

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