Schematic:

A Concurrent Object-Oriented Language for Parallel and Distributed Computation

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What's Schematic?

- Schematic ≈

  Scheme

  + Concurrency primitives (*future* and *channels*)

  + Safe mutable data (*concurrent objects*)

Opportunities for Schematic (1)

People already has parallel machines

- Myrinet
- DEC memory channel
- SUN global works

$\Rightarrow$ People wish to have a parallel programming language

Opportunities for Schematic (2)

People must deal with concurrency anyway...

- –GUI
- –Distributed programming
- ⇒People wish to have multi-threads + thread-safe data structure

Basics of Schematic (1)

- *Any* function or method can be:
  - –called by
    - synchronous calls: `(f x)`
    - asynchronous calls: `(future (f x))`
  - –executed on any processor (≈RPC)

Basics of Schematic (2) — Concurrent Objects

- Concurrent objects *behave as if* methods are serialized
- Concurrent *writes* are (partially) serialized, but *reads* are not

SchematicTk: Concurrent Object-Oriented GUI

- Schematic + Tk toolkit
- Similar to STklos, but widgets are *concurrent* objects
  - distributed over the network
  - retain the atomicity of methods

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Concurrent Object-Oriented GUI—Basic Idea

- An event = a future (thread)
- A widget = a concurrent object
- Consequences:

  multiple events run concurrently and safely

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Current Status

- A prototype on top of
  - Scheme->C compiler
  - Tk 4.0
- runs on
  - AP1000 parallel computer
  - SUN clusters

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Experiments

- Parallel (on AP1000 and SUN clusters)
  - RNA secondary structure
    - prediction (tree search)
    - visualization (*N* body)
- Distributed (on SUN clusters)
  - Some Two-Players Games

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Research Projects

- Compilation framework for dynamic threads
- SchematicTk
- Low-level libs by Schematic
  - Non-blocking I/O
  - Global GC

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Contributors

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