The Ptolemy Project

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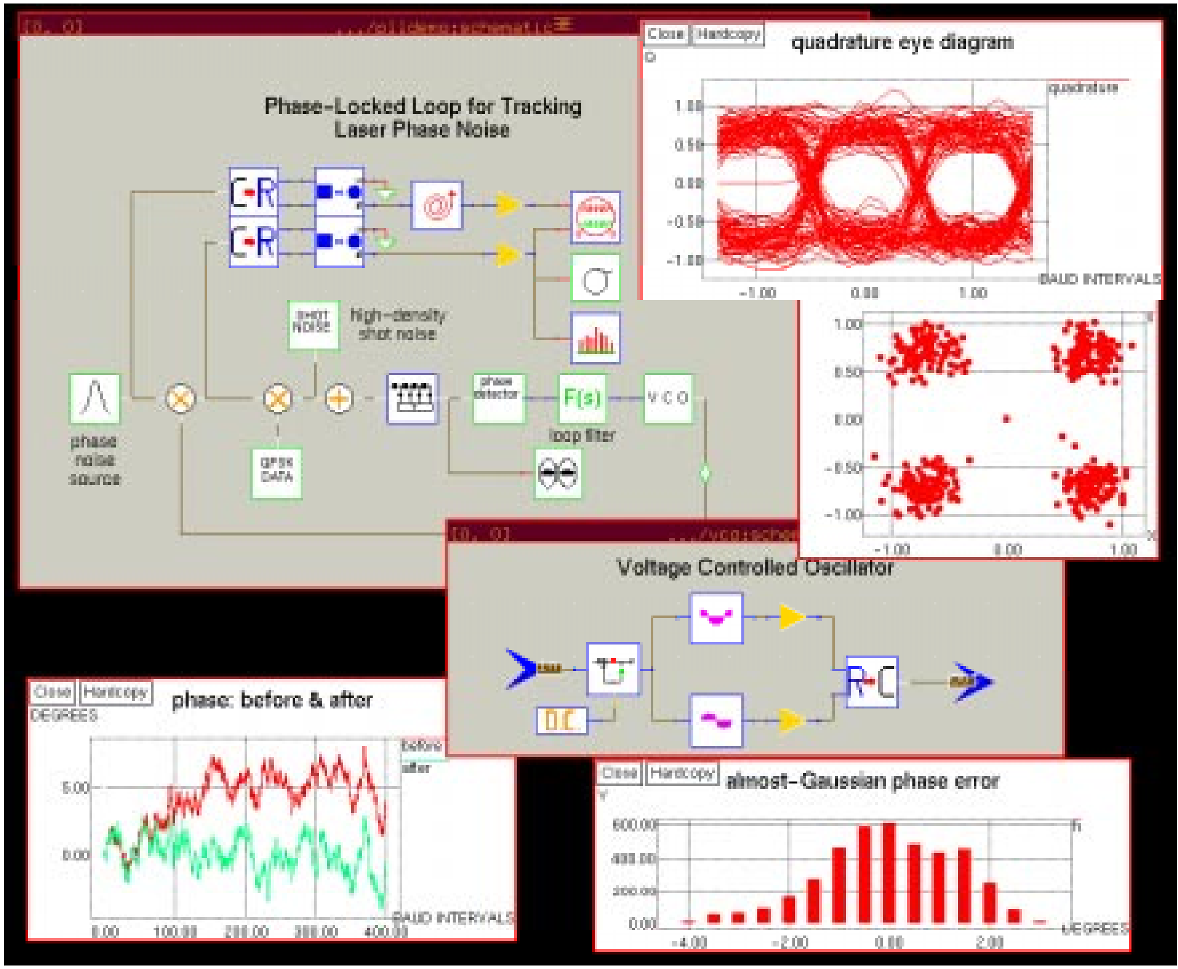
Design of Reactive and Real-Time Systems

Ptolemy Research

- Visual, system-level heterogeneous design.
- Animated interactive and real-time simulation.
- Formal methods for dataflow systems.
- Programming language semantics.
- Software and hardware synthesis.
- Parallel architectures, partitioning, and scheduling.



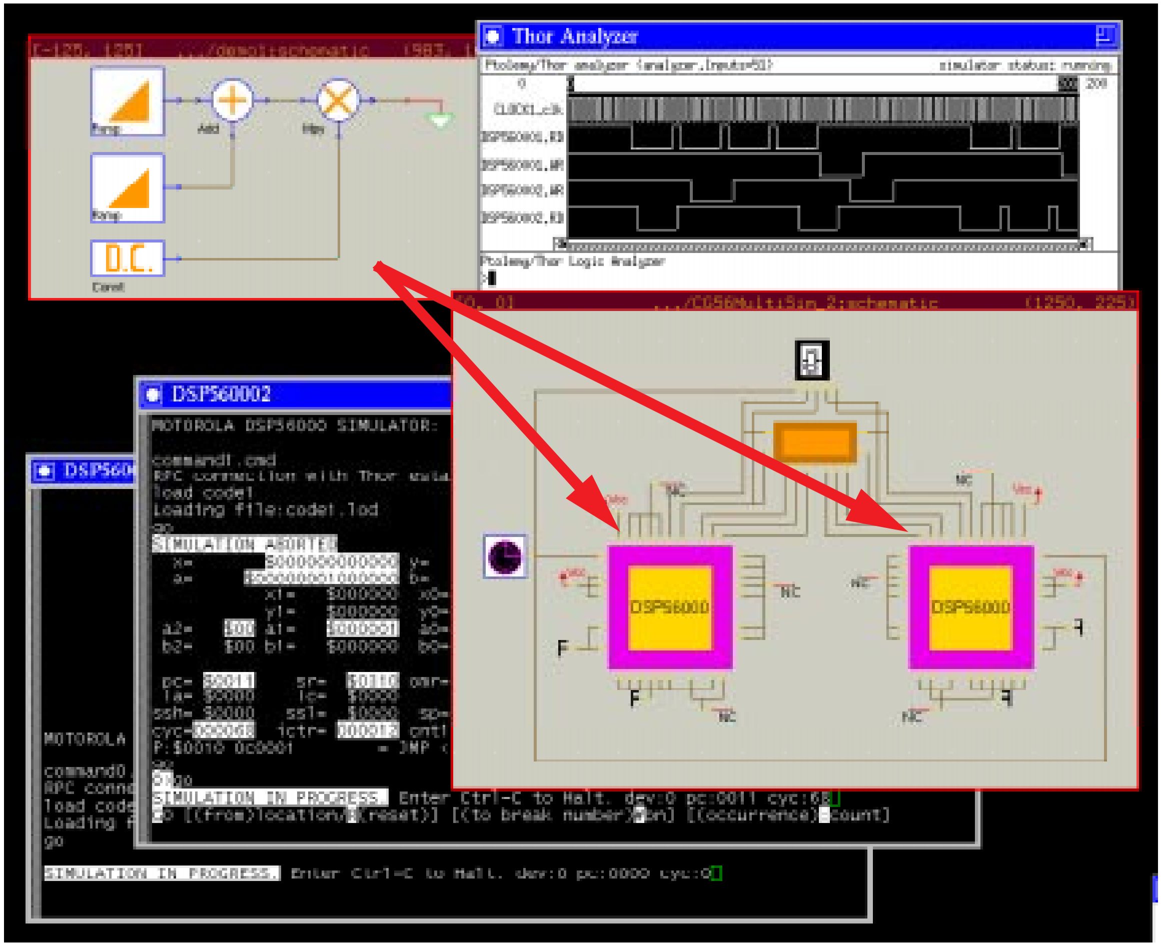
Application designed by John Barry

This highly multidisciplinary project addresses system-level design and implementation of reactive and real-time systems.

Implementation Technology

Hardware/ Software Synthesis in Ptolemy

- Design of heterogeneous embedded systems.
- Design of applications for real-time workstations.
- Synthesis of software from dataflow graphs.
- System-level hardware design.
- Cosimulation of hardware/ software systems.


(-125, 120) .../demo1:schematic (983,
Ramp
Add
Mpy
Ramp
D.C.
Const
Thor Analyzer
Ptolemy/Thor analyzer (analyzer.inputs=5)
simulator status: running
0
200
CLOCK1_clk
DSP56001.RD
DSP56001.WR
DSP56002.WR
DSP56002.RD
Ptolemy/Thor Logic Analyzer
(0, 0) .../CG56MultiSim_2:schematic (1250, 225)
DSP56000
DSP56000
NC
F
DSP56002
DSP560

```
MOTOROLA DSP56000 SIMULATOR:

command1.cmd
RPC connection with Thor simula
load code1
Loading file:code1.lod
go
SIMULATION ABORTED
   x=          $000000000000 y=
   a=        $00000000100000 b=
              x1=    $000000  x0=
              y1=    $000000  y0=
 a2=   $00 a1=    $000001  a0=
 b2=   $00 b1=    $000000  b0=

 pc= $0011    sr=  $0110 omr=
 la= $0000    lc=  $0000
ssh= $0000   ssl=  $0000  sp=
cyc=000068  ictr= 000012 cnt1
P:$0010 0c0001         = JMP (
go
0>go
SIMULATION IN PROGRESS. Enter Ctrl-C to Halt. dev:0 pc:0011 cyc:68
go [(from)location/(reset)] [(to break number)bn] [(occurrence)count]
```

```
MOTOROLA

command0.
RPC conne
load code
Loading f
go
SIMULATION IN PROGRESS. Enter Ctrl-C to Halt. dev:0 pc:0000 cyc:0
```

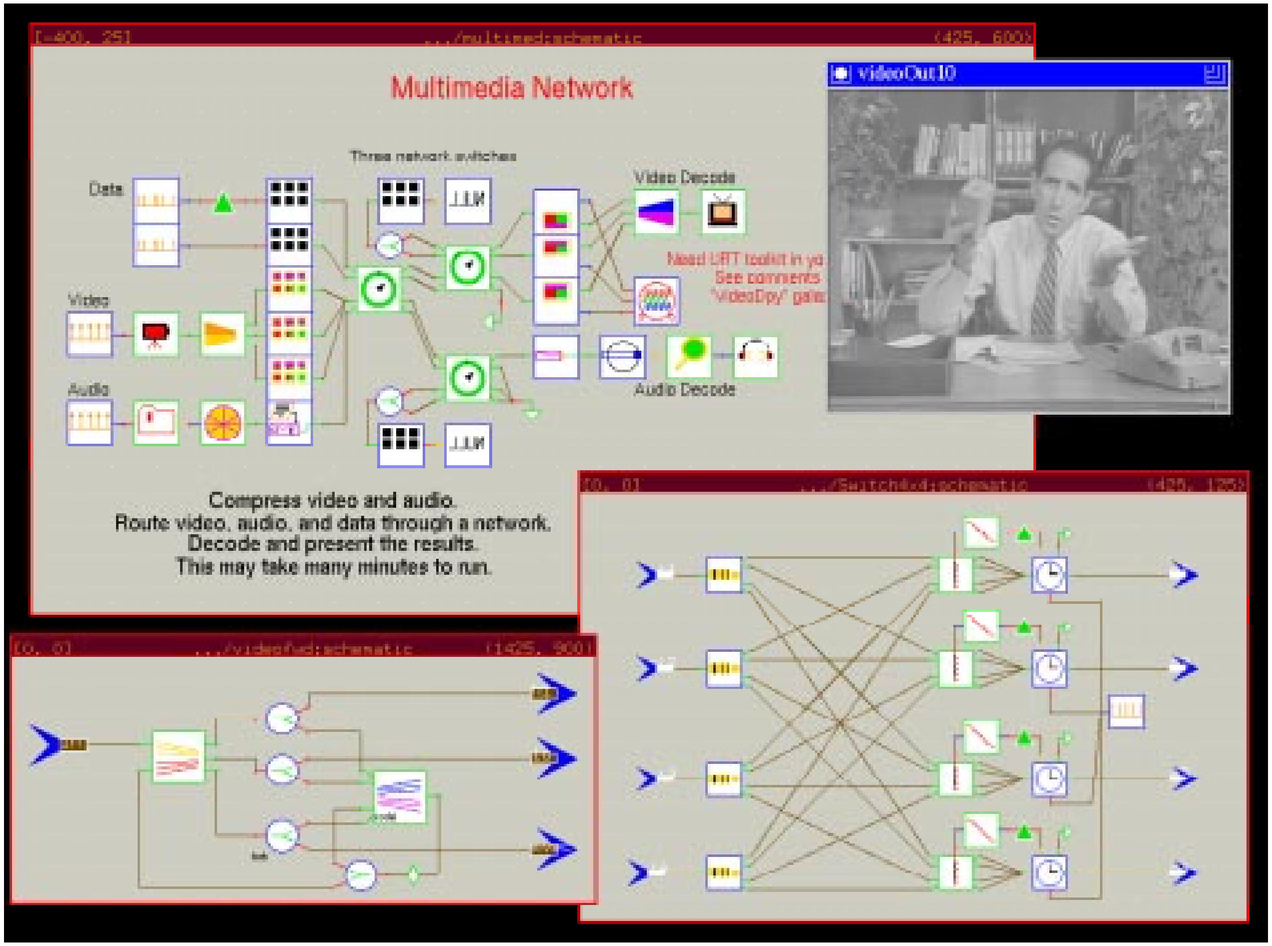
Application designed by Asawaree Kalavade

The design philosophy in Ptolemy is heterogeneous, allowing for effective use of specialized design tools within a general system-level design environment.

Heterogeneous Modeling and Design

Ptolemaic Principles

- Extensible, object-oriented kernel.
- No model of computation is implemented in the kernel.
- Models of computation are implemented in modular *domains*.
- A domain interacts with another without knowing its semantics.



Compress video and audio.
Route video, audio, and data through a network.
Decode and present the results.
This may take many minutes to run.

Application designed by Paul Haskell

Multiple models of computation may be used in the same system. Here, dataflow is used for signal processing, while a timed discrete-event system models a communication network.