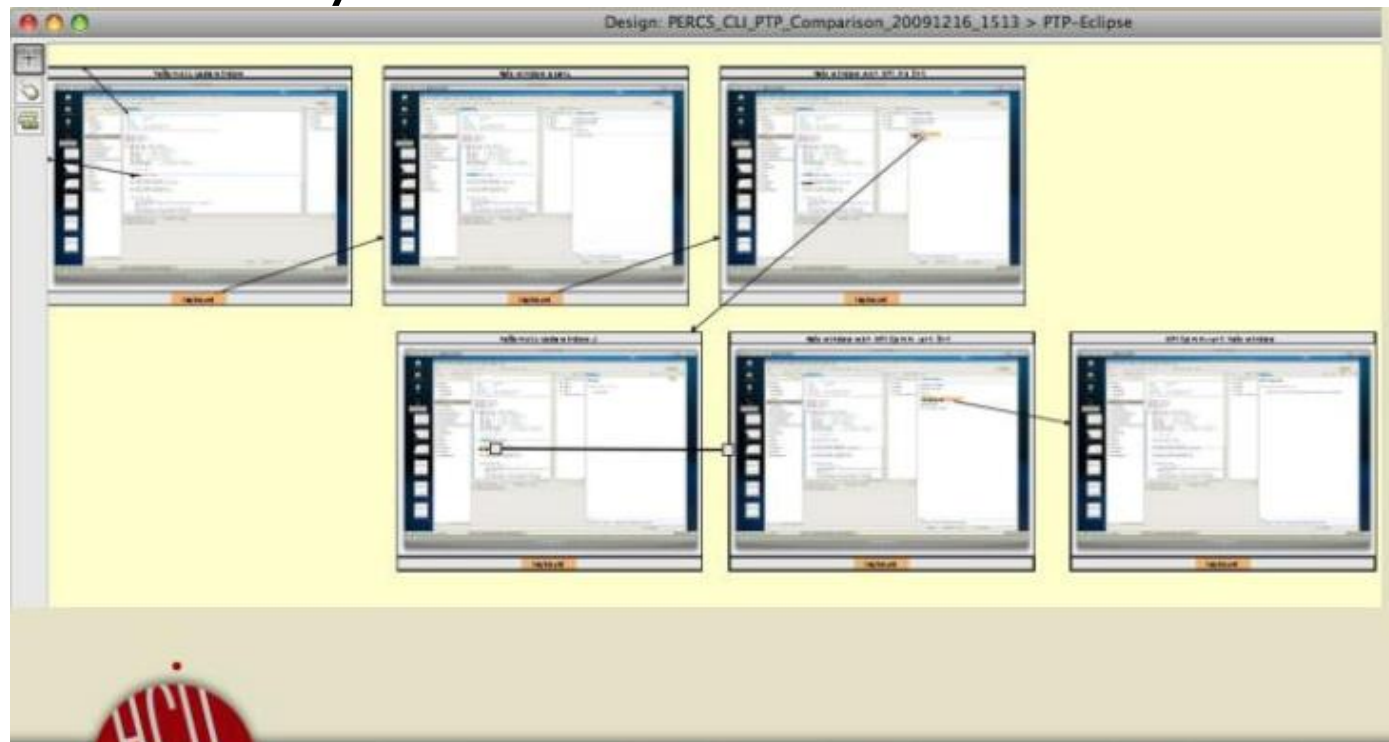


# COGTOOLS

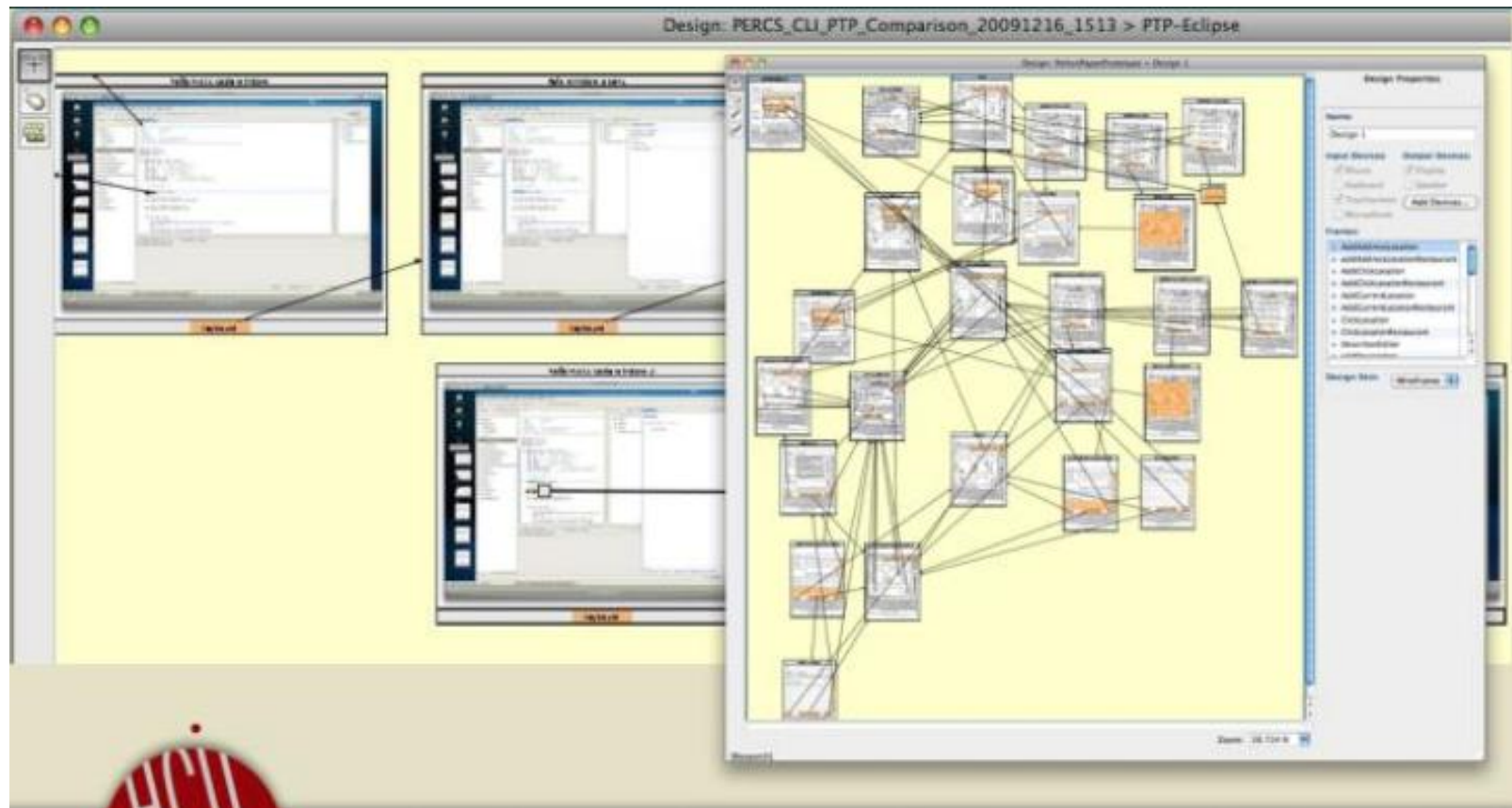
Interação Pessoa Máquina

# COGTOOLS - DESIGN

CogTool is an open source tool where you can describe an environment in a storyboard...



# COGTOOLS - DESIGN



# COGTOOLS - DESIGN

The **design** project is composed by frames

- The **frames** could have different types of **widgets**:
  - buttons
  - textbox
  - list box
  - pull down
  - radio buttons
  - ... and
- multiple **transactions**/actions with
  - mouse selection
  - keyboard typing ...

# COGTOOLS - DEMONSTRATION

## And demonstrate a task

The screenshot displays the COGTOOLS interface. On the left, a window titled "hellompi.c code window 2" shows a code editor with C code. On the right, a panel titled "Script Step List" shows a sequence of actions. The "Prediction" time is 10.462 s. The "Script Step List" table is as follows:

Frame	Action	Widget/Device
hellompi.c code window	Look At	MPI_Init (Text MPI_Init)
hellompi.c code window	Think for 1.200 s	
hellompi.c code window	Move Mouse	MPI_Init (Text MPI_Init)
hellompi.c code window	Left Click	MPI_Init (Text MPI_Init)
hellompi.c code window	Think for 1.200 s	
hellompi.c code window	Type *51*	Keyboard
Help window opens	Type *51*	Keyboard
...with MPI_Init link	Think for 1.200 s	
...with MPI_Init link	Move Mouse	int MPI_Init(int*, char***) (MPI_Init help link)
...with MPI_Init link	Left Click	int MPI_Init(int*, char***) (MPI_Init help link)
hellompi.c code window 2	Move Mouse	MPI_Comm_rank (MPI_Comm_rank text)
hellompi.c code window 2	Left Double-Click	MPI_Comm_rank (MPI_Comm_rank text)
...th MPI_Comm_rank link	Think for 1.200 s	
...th MPI_Comm_rank link	Move Mouse	...MPI_Comm_rank (*) (MPI_Comm_rank text)
...th MPI_Comm_rank link	Left Click	...MPI_Comm_rank (*) (MPI_Comm_rank text)
...rank help window		

Below the table, there are controls for "Mouse hand" (set to Right), "Initial hand location" (set to Mouse), and buttons for "Delete Step" and "Compute". At the bottom left, there are buttons for "Look at Widget" and "Think", and a "[Research]" label.

# COGTOOLS - SCRIPT

CogTool records all the storyboard single-actions in a script

- **white steps** are the user action
- **yellow steps** automatically placed by the tool.

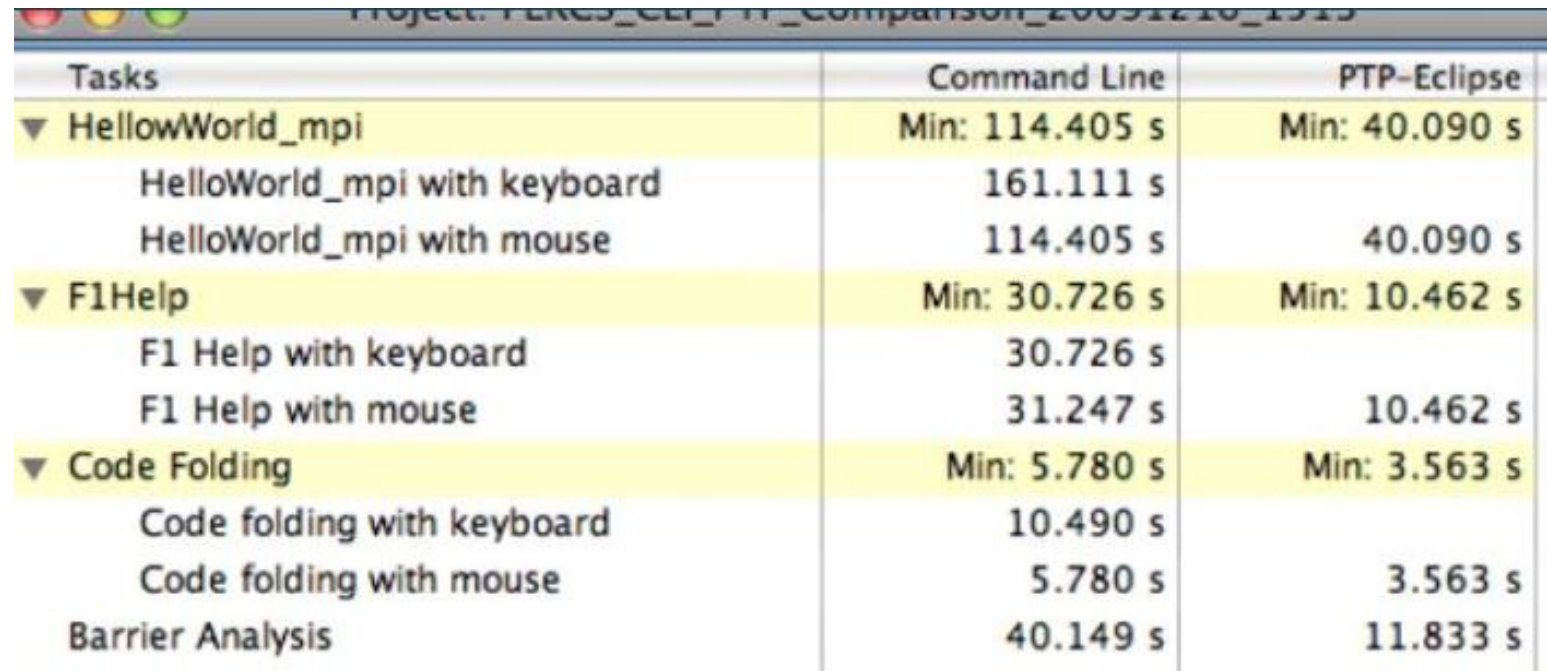
When the script is finished and all tasks are built, then the entire KLM (Key-stroke level mode) is also built.

- After hitting the “Compute” button, CogTool created the ACT-R code implementing KLM.
- By running that code, had produced a quantitative estimate of skilled execution time and a time visualization of what ACT-R code was doing at each moment.

**ACT-R** (Adaptive Control of Thought-Rational) is a cognitive architecture mainly developed by John Robert Anderson at Carnegie Mellon University. ACT-R aims to define the basic and irreducible cognitive and perceptual operations that enable the human mind.

# COGTOOLS

CogTool automatically creates an ACT-R model of a skilled person doing this task and produces predictions of task execution time.



The screenshot shows a window titled 'Project: PEXES\_CGPT\_H\_Comparison\_20091210\_1919'. It contains a table with three columns: 'Tasks', 'Command Line', and 'PTP-Eclipse'. The table lists various tasks and their execution times in seconds. The tasks are grouped into three main categories: 'HellowWorld\_mpi', 'F1Help', and 'Code Folding'. Each category has a 'Min' value and then lists specific task variations with their respective times. A 'Barrier Analysis' row is also present at the bottom of the table.

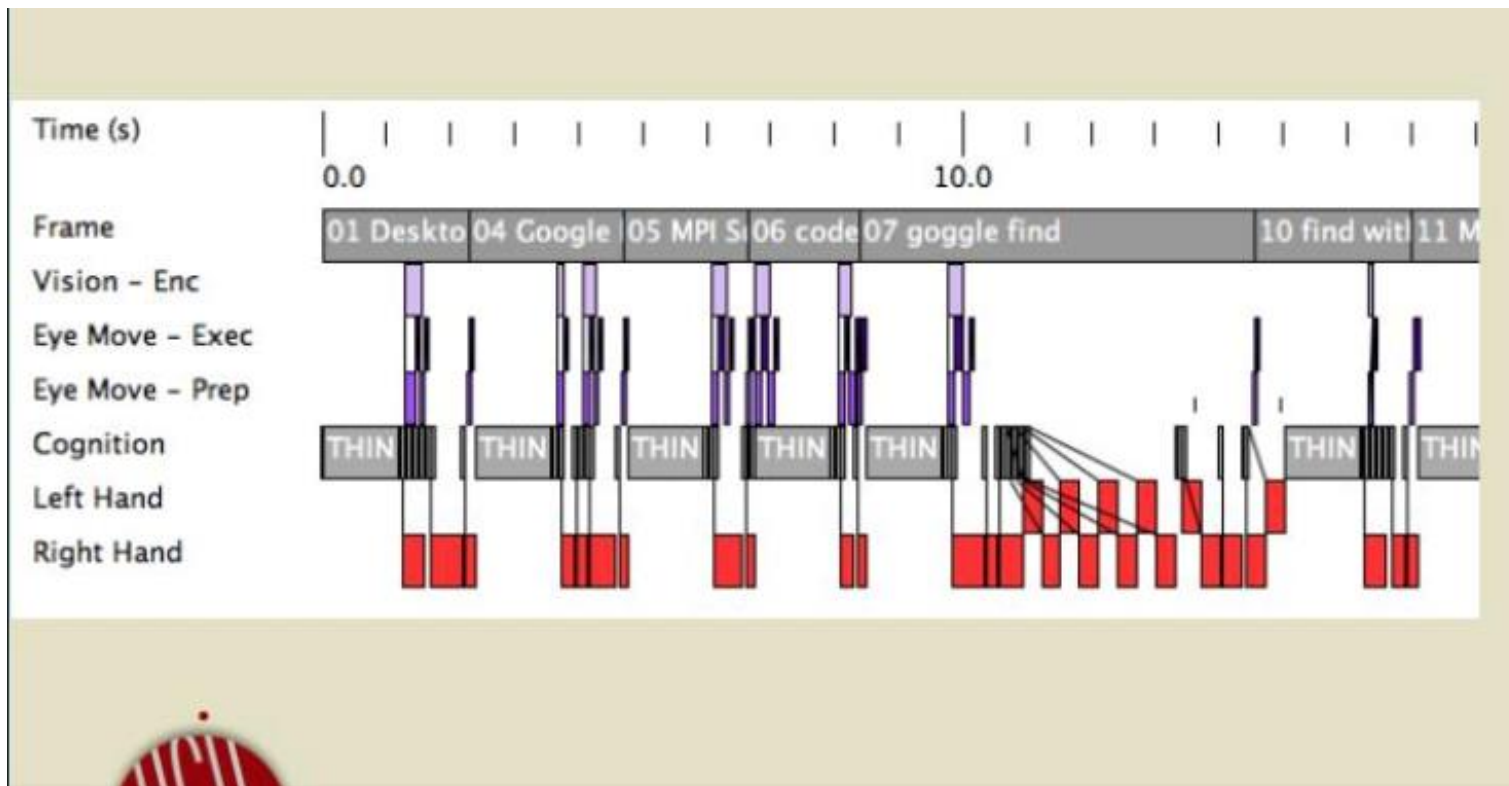
Tasks	Command Line	PTP-Eclipse
▼ HellowWorld_mpi	Min: 114.405 s	Min: 40.090 s
HellowWorld_mpi with keyboard	161.111 s	
HellowWorld_mpi with mouse	114.405 s	40.090 s
▼ F1Help	Min: 30.726 s	Min: 10.462 s
F1 Help with keyboard	30.726 s	
F1 Help with mouse	31.247 s	10.462 s
▼ Code Folding	Min: 5.780 s	Min: 3.563 s
Code folding with keyboard	10.490 s	
Code folding with mouse	5.780 s	3.563 s
Barrier Analysis	40.149 s	11.833 s

\* Based on Card, Moran and Newell's Keystroke-Level Model (1980)



# COGTOOLS - VISUALIZATION

And you can look under the hood to see what ACT-R is doing





# COGTOOLS - VISUALIZATION

CogTool visualizes interactive interaction tasks in a timeline diagram.

Each row of the time line diagram represents a category of perceptual, cognitive, or motor activity:

- Vision
- Eye movement preparation
- Eye movement execution
- Cognition
- Motor activities of the hands

# COGTOOLS - VISUALIZATION

On the script window it is possible to press the button: “visualization”.

Visualization window can be used to compare two demonstrations.

On this captured image it's only represented one design project, where it is possible to see the timeline on the left until screen 6 (for demonstration terms). On the right is the detailed trace of the automatically generated ACT-R model.

# COGTOOLS

## What is prediction of skilled task execution time good for?

Some examples of similar analyses PERCs “time travel” evaluation at IBM

- DARPA set requirement to show 10x productivity improvement over 2002, which we can credibly demonstrate with CogTool

Saved NYNEX from making a \$160 million workstation purchase that would have COST them \$2 million/year in operating costs

IRS procurement of new IT system turned on “value” calculated, in part, using this type of analysis (IBM lost \$700 million contract to AT&T’s \$1.4 billion)

NextGen airspace will have economic consequences of time to execute cockpit tasks

Carlsbad Police reduced injuries and loss of life in their in-vehicle information systems.

- SAE Recommended Practice J2365, Calculation of the Time to Complete In-Vehicle Navigation and Route Guidance Task

# COGTOOLS

Why should researchers at the ACT-R workshop care? If you are not in academia

- Your organization may build systems and this could be directly useful for evaluating them

If you are in academia

- Consulting
  - this may be a quicker way to evaluate new systems than directly coding ACT-R
- Teaching
  - Human Factors or User Interface Design classes and this is one technique you could teach your students
  - Psychology class, part of which may be applied
  - Want a gentle introduction to cognitive modeling to get students excited
- Research
  - Rapid environment construction
  - “Rapid Theory Prototyping”



# COGTOOLS

## Rapid Environment Construction

Use CogTool's storyboarding to construct an environment for your ACT-R model

Export the ACT-R code CogTool creates

Put in your own ACT-R model

The interface for doing this isn't as easy as I would like

The environment isn't yet a true ACT-R device model

Anybody who would like to help and contribute to our open source code, please contact me