Implementing General Purpose Applications with the Rule-based Approach

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Why?

- Formal analysis.
- Verification.
- More natural/intuitive approach (Human Mind Model).
- Faster, more reliable transition from *requirements* to *design* to *implementation* (Software Engineering).

What do I need?

- Interactivity.
- Communication with the environment.
- Application Logic and Presentation separation $\leftarrow$ MVC.

Four Layer Architecture

Four Layer Architecture

Inference Engine.

Knowledge Base (Application Logic).

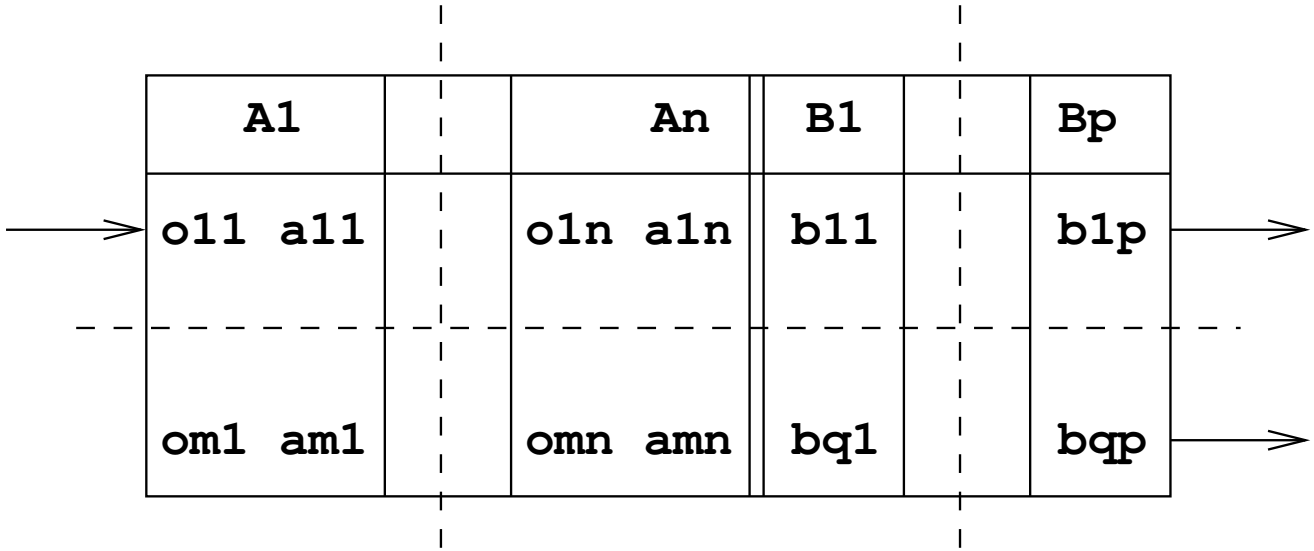
Environment Knowledge Base.

Environment Routines.

Inference Engine

- Beating HeaRT.
- Knowledge representation: rules grouped by contexts.
  - Extended Tabular Trees – XTT^2.
  - XML encoded.
- Inference: Forward Chaining with Context Switching.
- Implemented in Prolog (SWI Prolog).
- Java language integration.

Knowledge representation and visualization: XTT^2



Environment Knowledge Base
Input Output Declarations

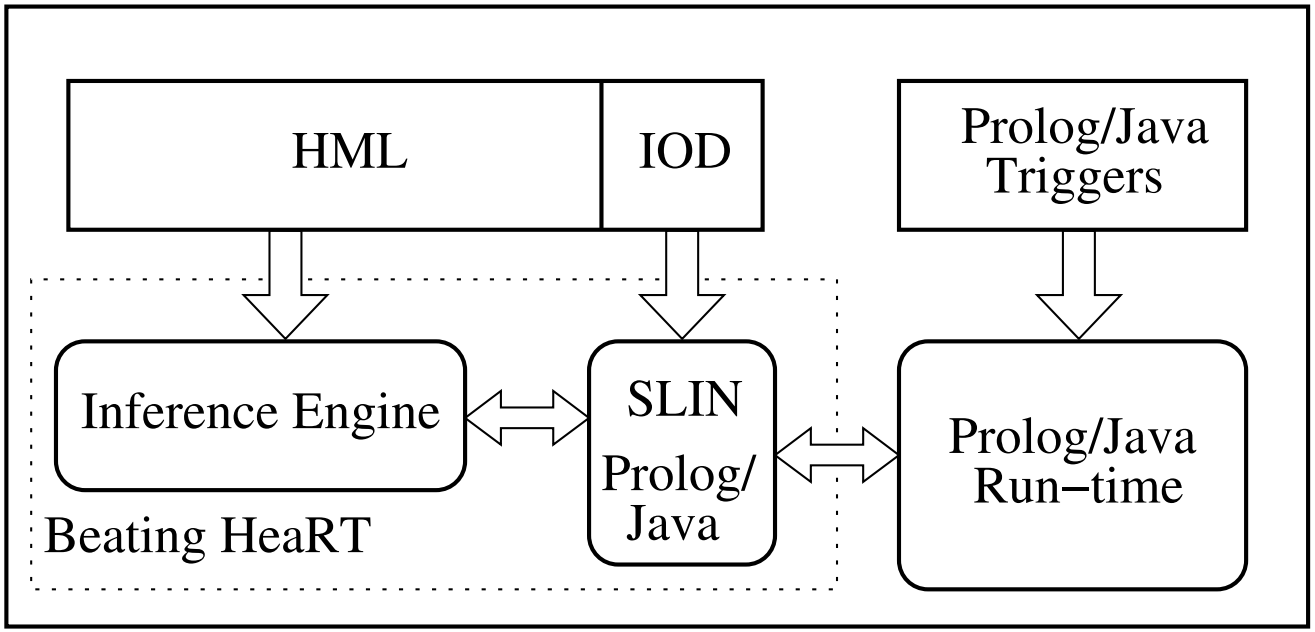
- Well defined *domains* and *class* for each attribute: *state*, *ro*, *wo*, *rw*.
- IOD with Prolog triggers:

```
io(att_12,ro_trigger,get_character).
io(att_10,wo_trigger,write_chars_to_file).
```

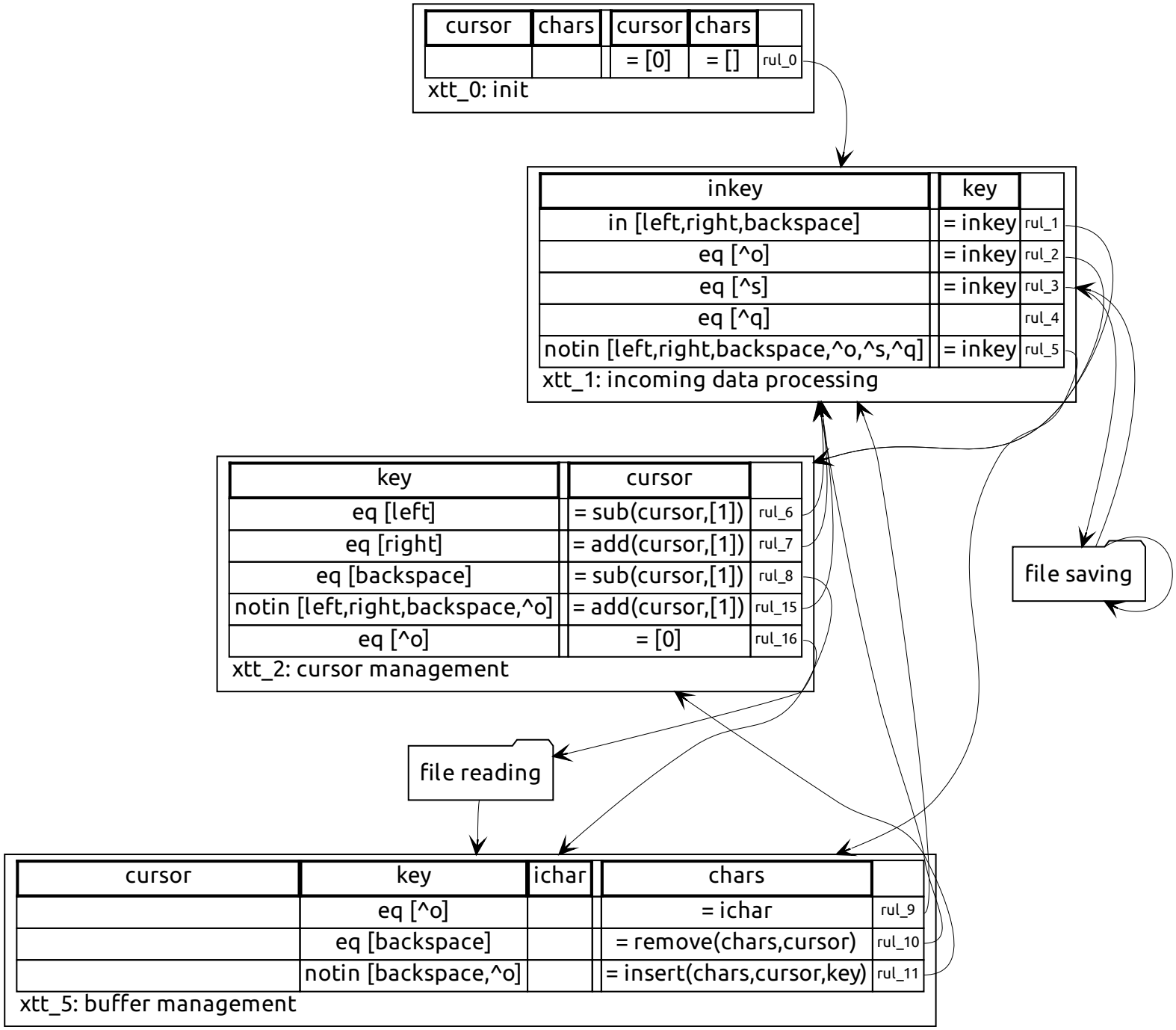
- IOD with Java triggers.

```
io(att_12,ro_trigger,['EditorWindow',get_character,
                      editor]).
io(att_3,wo_trigger,['EditorWindow',display_chars,
                     editor]).
```

Beating HeaRT Architecture



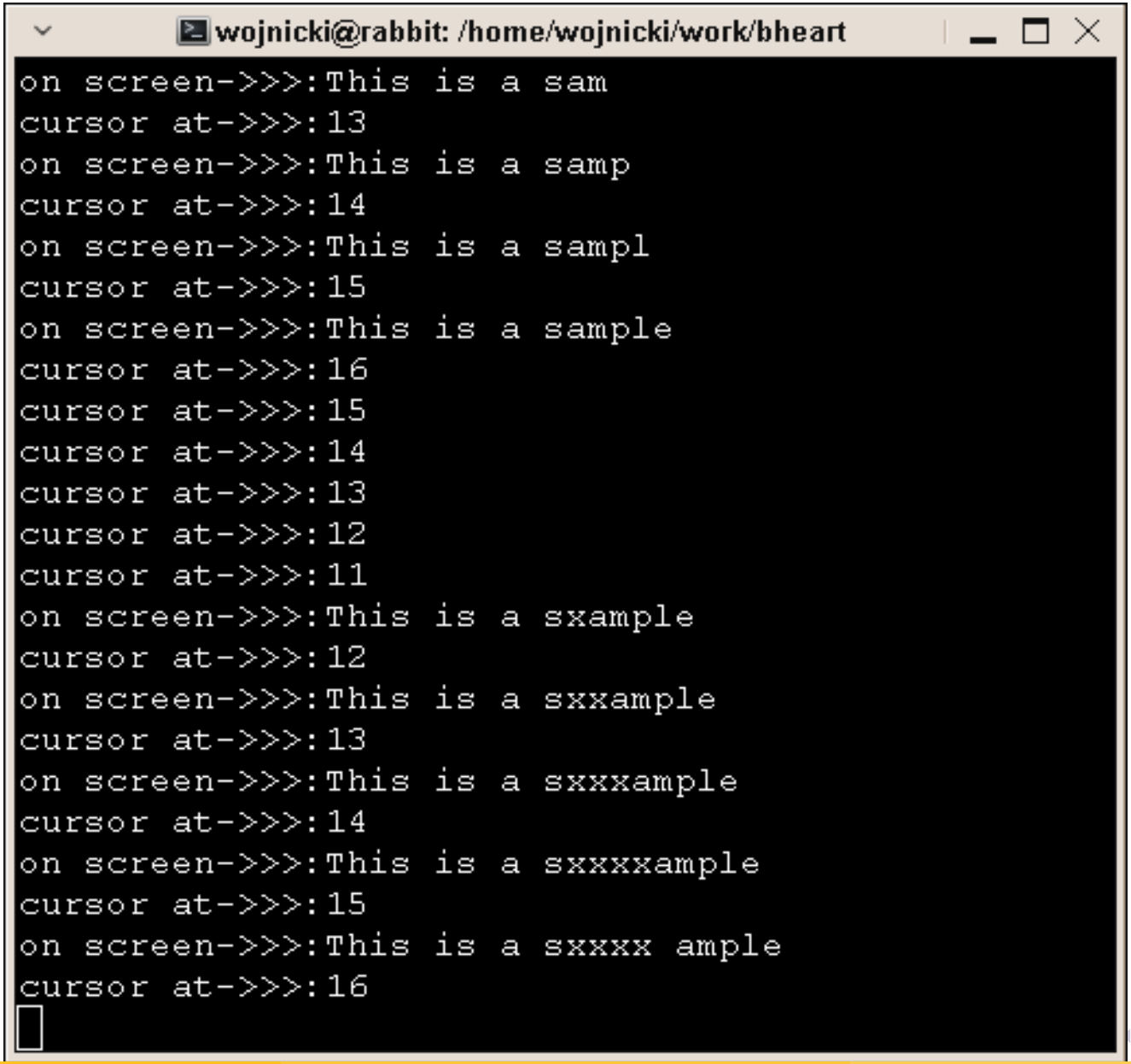
Simple Text Editor



Environment Knowledge Base (IOD): Prolog

```
% inkey attribute
io(att_12,ro_trigger,get_character).
% inchar attribute
io(att_8,ro_trigger,read_chars_from_file).
% outchar attribute
io(att_10,wo_trigger,write_chars_to_file).
% chars attribute
io(att_3,wo_trigger,display_chars).
% cursor attribute
io(att_4,wo_trigger,display_cursor).
```

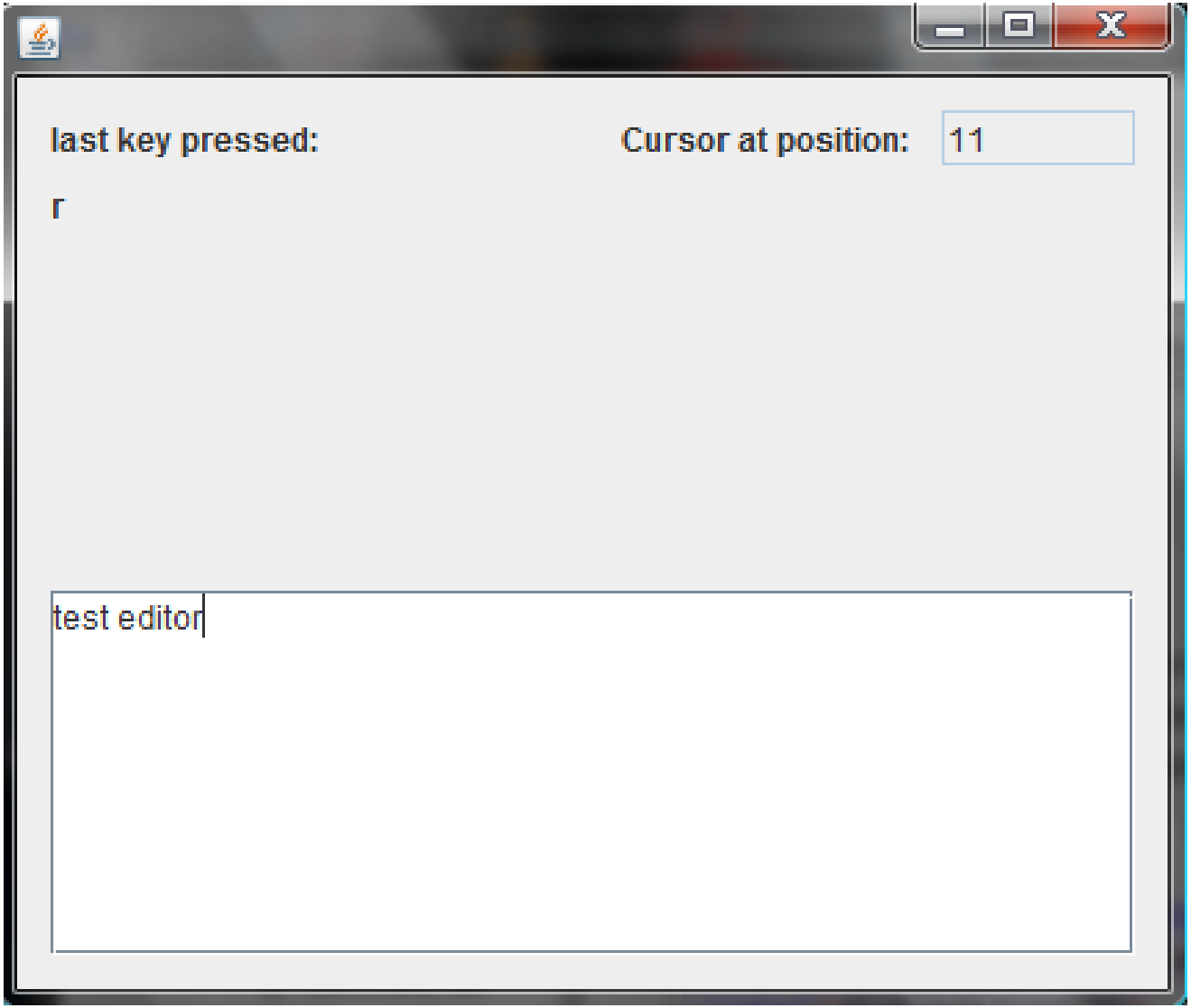
Running...


wojnicki@rabbit: /home/wojnicki/work/bheart
on screen->>>:This is a sam
cursor at->>>:13
on screen->>>:This is a samp
cursor at->>>:14
on screen->>>:This is a sampl
cursor at->>>:15
on screen->>>:This is a sample
cursor at->>>:16
cursor at->>>:15
cursor at->>>:14
cursor at->>>:13
cursor at->>>:12
cursor at->>>:11
on screen->>>:This is a sxample
cursor at->>>:12
on screen->>>:This is a sxxample
cursor at->>>:13
on screen->>>:This is a sxxxample
cursor at->>>:14
on screen->>>:This is a sxxxxample
cursor at->>>:15
on screen->>>:This is a sxxxx ample
cursor at->>>:16

Environment Knowledge Base (IOD): Java

```
% inkey attribute
io(att_12,ro_trigger,['EditorWindow',get_character,editor]).
% inchar
io(att_8,ro_trigger,['EditorWindow',read_chars_from_file,
                     editor]).
% outchar attribute
io(att_10,wo_trigger,['EditorWindow',write_chars_to_file,
                      editor]).
% chars attribute
io(att_3,wo_trigger,['EditorWindow',display_chars,editor]).
% cursor attribute
io(att_4,wo_trigger,['EditorWindow',display_cursor,editor]).
```

Running...



Summary

FLA Approach:

- Inference Engine (Beating HeaRT).
- Knowledge Base (XTT^2).
- Environment Knowledge Base (IOD).
- Environment Routines (Triggers).

Outcome

Implementing rule-based general purpose, interactive applications.

Future Work

- Context-based Reasoning integration (CxBR).
- Tools, tools, tools.
- Cases: case modeling and implementation.
- Trigger library.
- Parallel rule firing.
- RIF/RuleML interoperability.
- Ontology integration.

Are YOU interested?

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