Towards An Open Trace-based Mechanism

position paper

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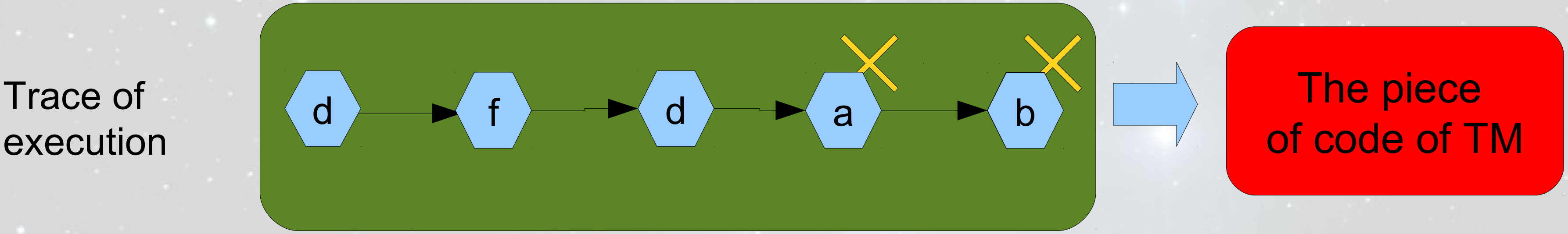
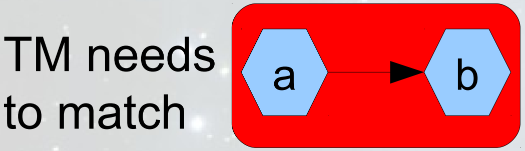
A Trace-based Mechanism (TM) in a nutshell

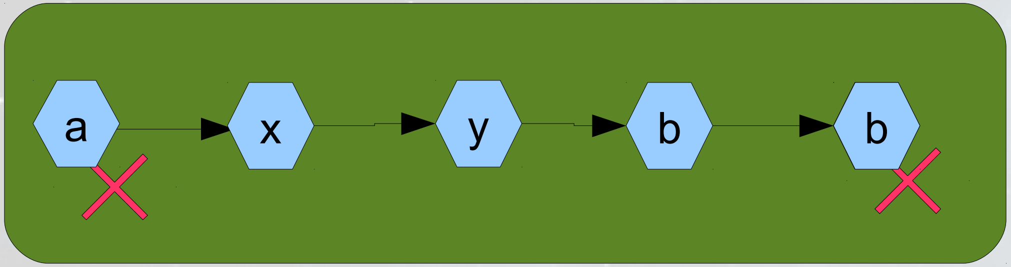
A TM observes
the execution of the software and executes a piece of code
when this TM matches a specified sequence of events.



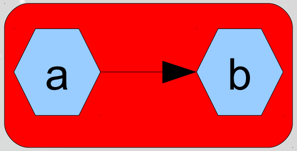


Matching a sequence

Trace of execution



TM needs to match

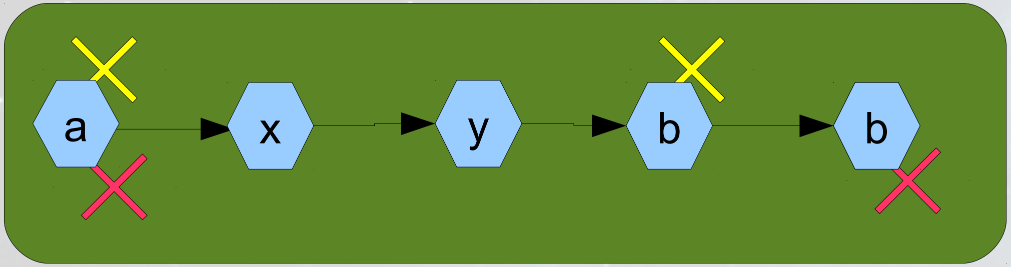


Is it a valid match?

It depends because
different TMs have different semantics to define sequences

Strategies for multiple matching

Trace of execution



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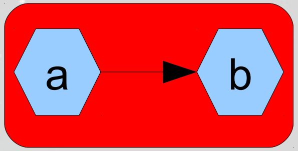
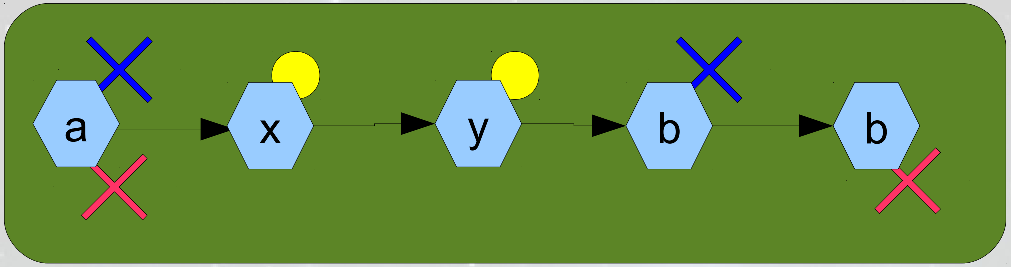


Is there another match?

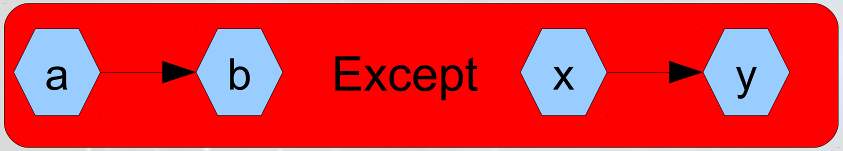
It depends because
different TMs have different strategies for multiple matching

The life cycle of sequences

Trace of execution



TM needs to match



Most TMs cannot control the life cycle of sequences

Current TMs

Tracematch [Allan+@OOPSLA05],
Alpha [Herzeel+@ILC07],
Halo [Ostermann+@ECOOP05],
PTQL [Goldsmith+@OOPSLA05],
...

Specific and non-configurable features

What happens if developers have specific needs?

Is it a solution to “code around”?

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Towards an Open TM (OTM) model

We identified three points of openness in a TM:

- Sequences definition. For example:
  - Regular expressions
  - Context-free languages
  - ...

- The multiple matching strategy. For example:
  - To match several sequences at the same time
  - To match only one sequence at the same time
  - ...

- The life cycle of the sequences. For example:
  - To remove all sequences if some condition is satisfied (*except example*)
  - To match all sequences if some condition is satisfied
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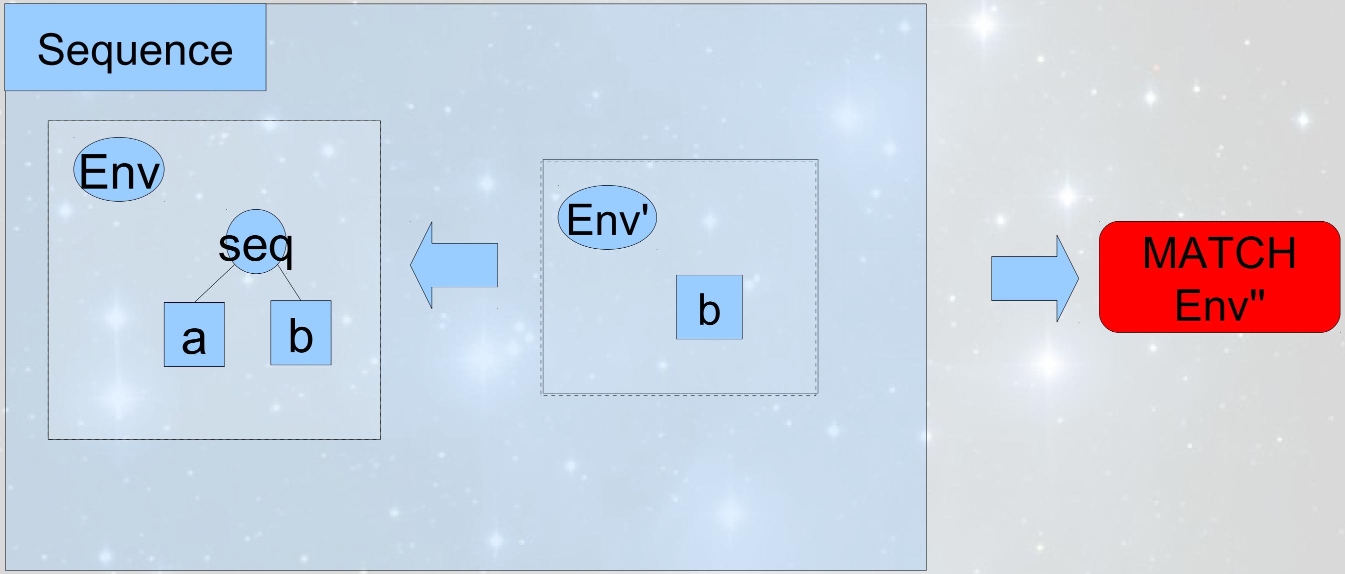
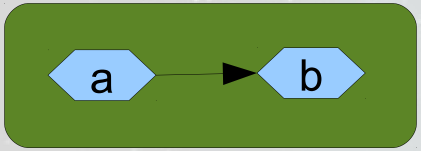
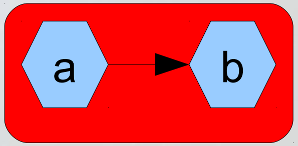
OTM model



Trace of execution

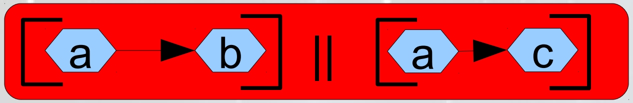


TM needs to match

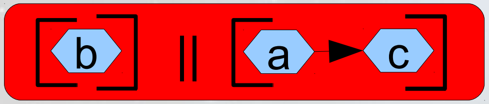


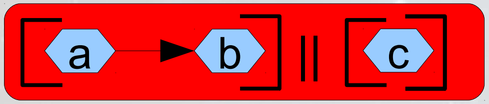
Nondeterminism support

- Some operators to define sequences, like *OR*, are not deterministic. For example:



- If a happens, then two different histories of the matching of the same sequence are generated.

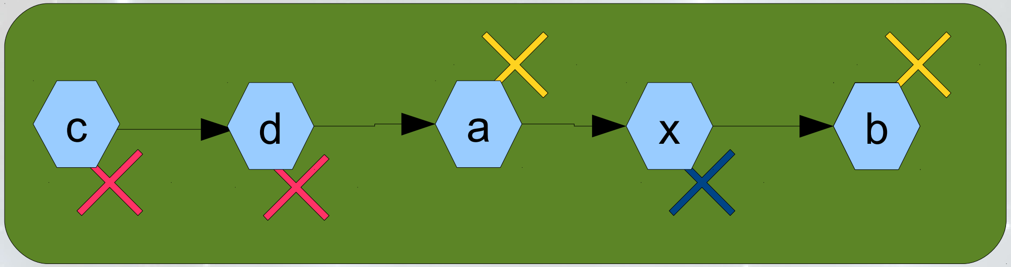




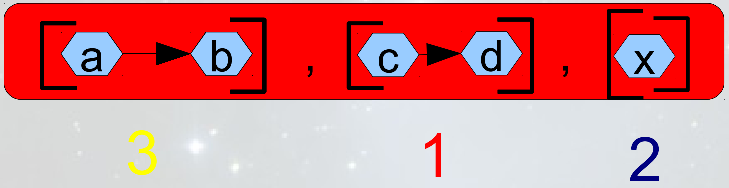
Example: The AnyOrder Operator

The *AnyOrder* operator matches several sequences in any order.

Trace of execution



TM needs to match



Towards an Open TM (OTM) model

We identified three points of openness in a TM:

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- The multiple matching strategy. For example:
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- The life cycle of the sequences. For example:
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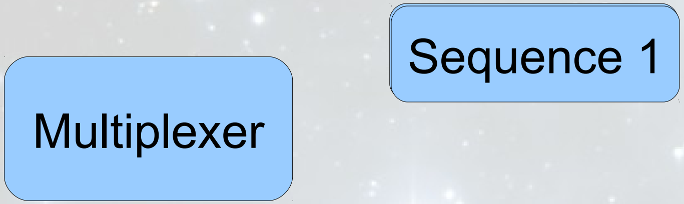
Extending OTM

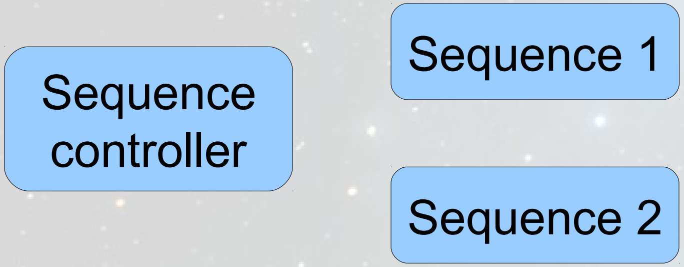
- We add a *multiplexer* entity to define strategies for multiple matching.



Multiplexer

Sequence 1

- We add a *sequence controller* entity to control the life cycle of the sequences.



Sequence controller

Sequence 1

Sequence 2

Conclusions

- We explored the points where a TM can be opened:
  - Sequences definition
  - Multiple matching strategies
  - Life cycle of sequences
  - Any others?

- We designed an open TM model, taking into account these points

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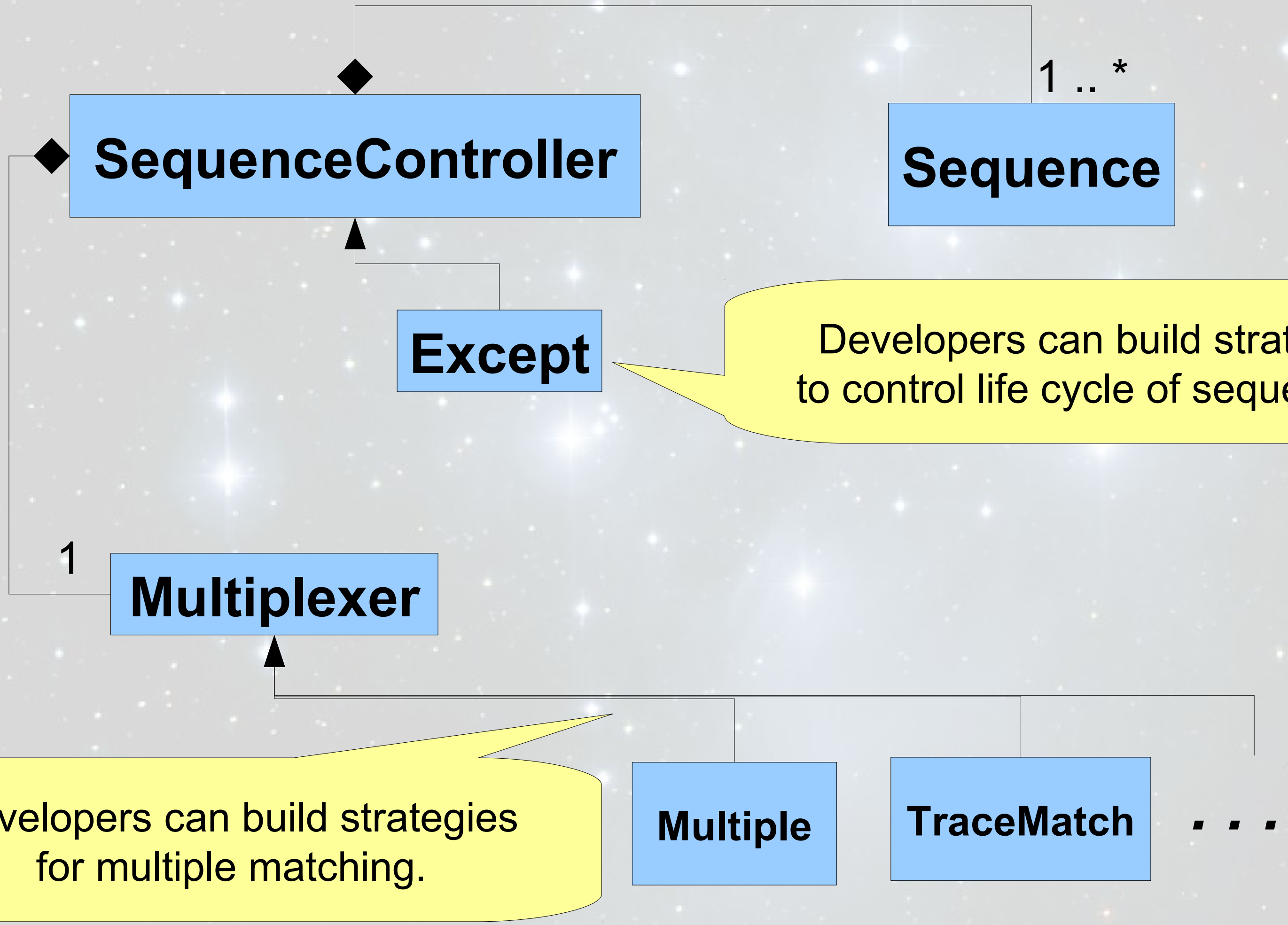
Thank you!

Future work:

- Extend AspectScript[1] to support the OTM model.

[1] AspectScript: Expressive Aspects for the Web. ***Wednesday, March 17th at 12:30***

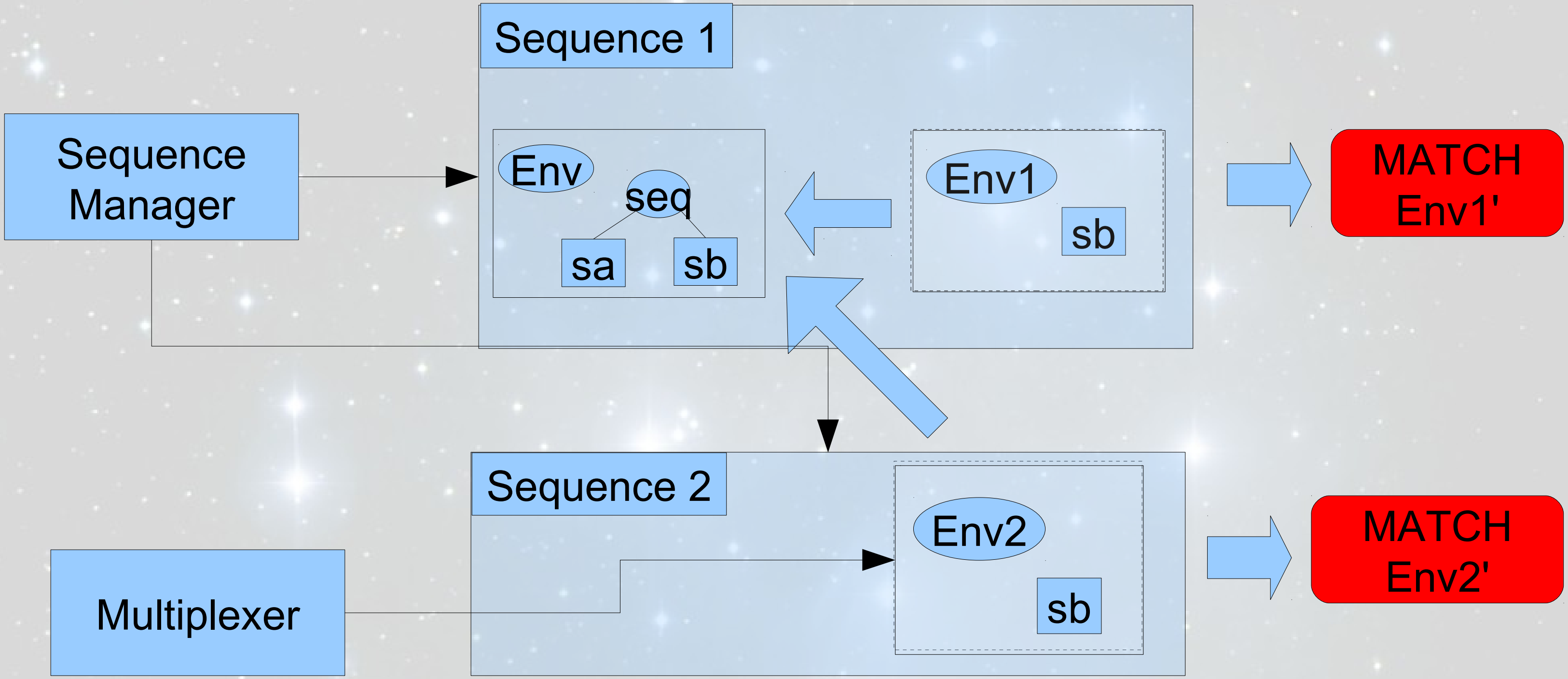
The class diagram of our open TM



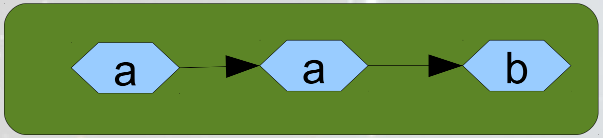
Developers can build strategies to control life cycle of sequences

Developers can build strategies for multiple matching.

A Open TM



Trace of Execution



TM needs to match