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An Approach to User-Centric Context-Aware Assistance based on Interaction Traces

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Fifth International Workshop on Modelling and Reasoning in Context
Delft, Netherland

Issues about Context-Aware Assistance

- Context (Abowd & Dey, 1999):
    - *A context is any information that can be used to characterize the situation of an entity. An entity is a person, place, or object that is considered relevant to the interaction between a user and an application, including the user and applications themselves.*

- Three main issues about being context-aware:
    - A *priori* context modelling is not flexible enough;
    - Infering user-centric contextual information is challenging;
        - What, where, who, when, **why, how**... (5W1H, Hong *et. al*, 2007)
    - Abstracting relevant information from sensored data.

Outline

- Definitions

- User-centric abstraction method of interaction traces

- Context-aware reasoning for assisting from abstracted interaction traces

- Conclusion

Definitions (1/2)

- ## Interaction Trace:
  - A sequence of *events*, each having *relations* with contextual *entities*;
  - Built from the sensors in the Alfresco platform.

- ## Trace Model:
  - A set of concepts and relation types, expressing knowledge about elements in the interaction trace.

An interaction trace / model
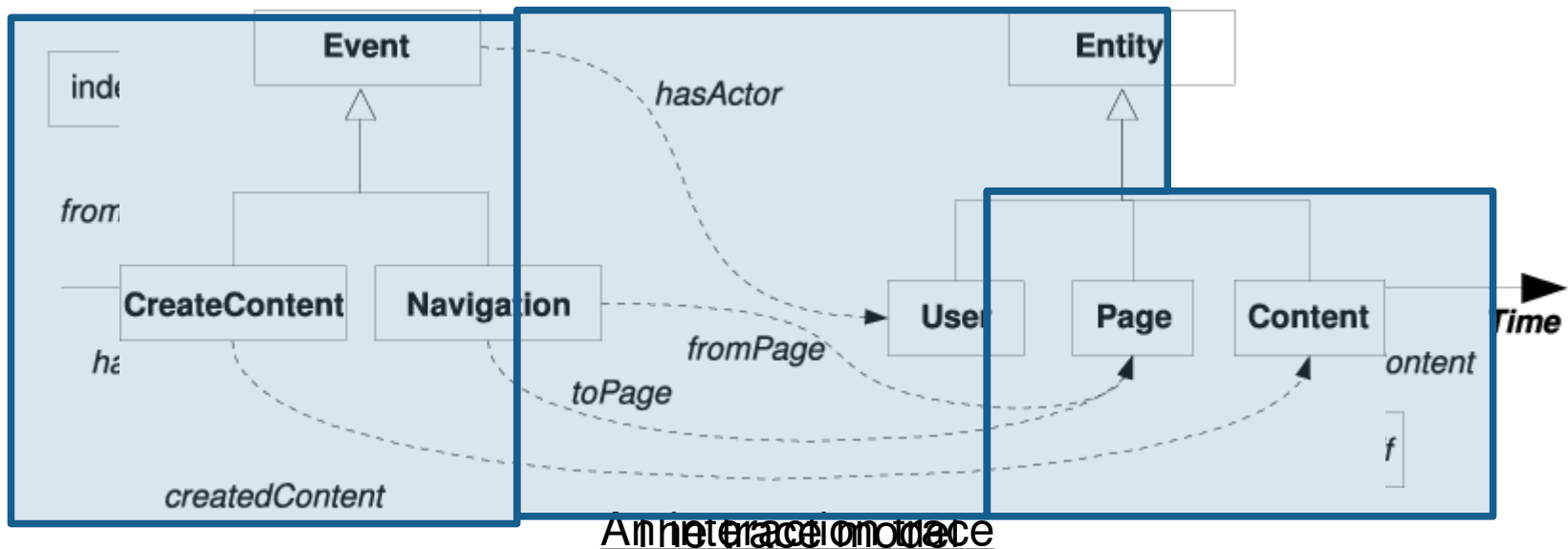
Definition (2/2) : Task Signature

- A Task Signature is a structure that represents a typical task in which a user can be engaged :
  - A task signature is a set of event declarations, entity declarations, relations, and temporal constraints.
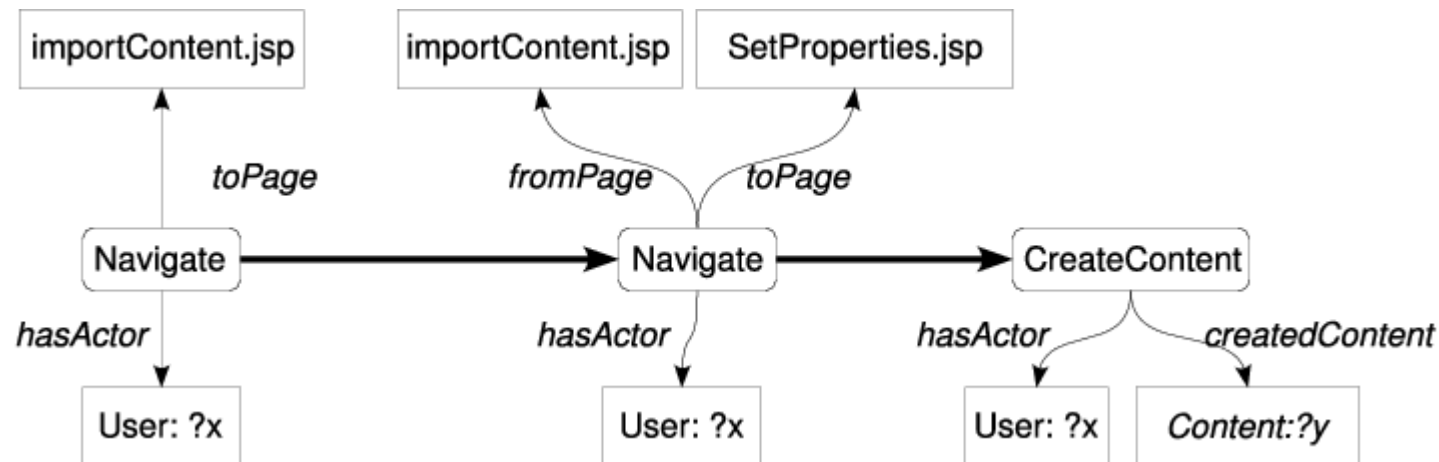
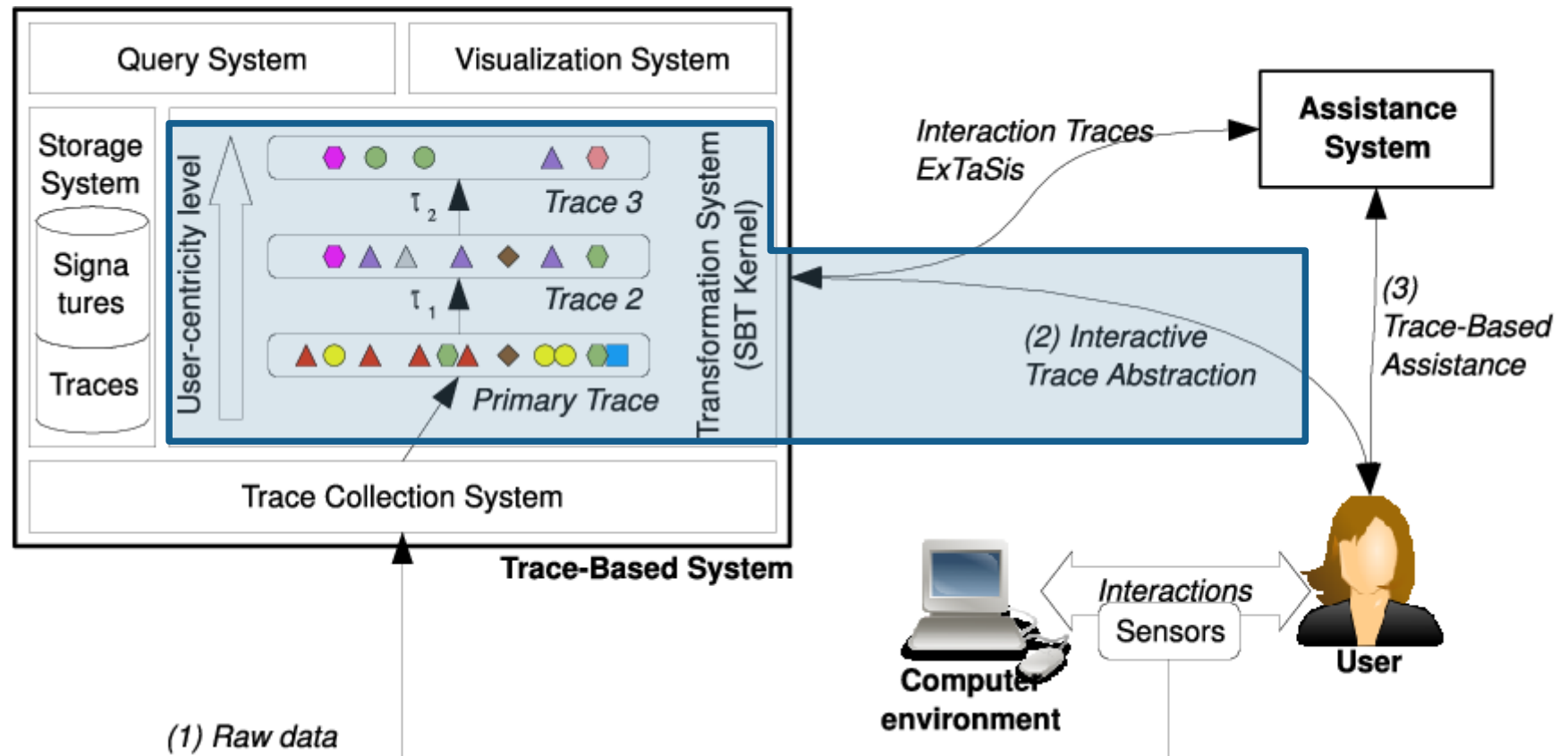Task signature : « adding a content to the platform »

Abstraction

An abstraction consists in replacing every task signature occurrences with a single, more abstracted, event of a new type.
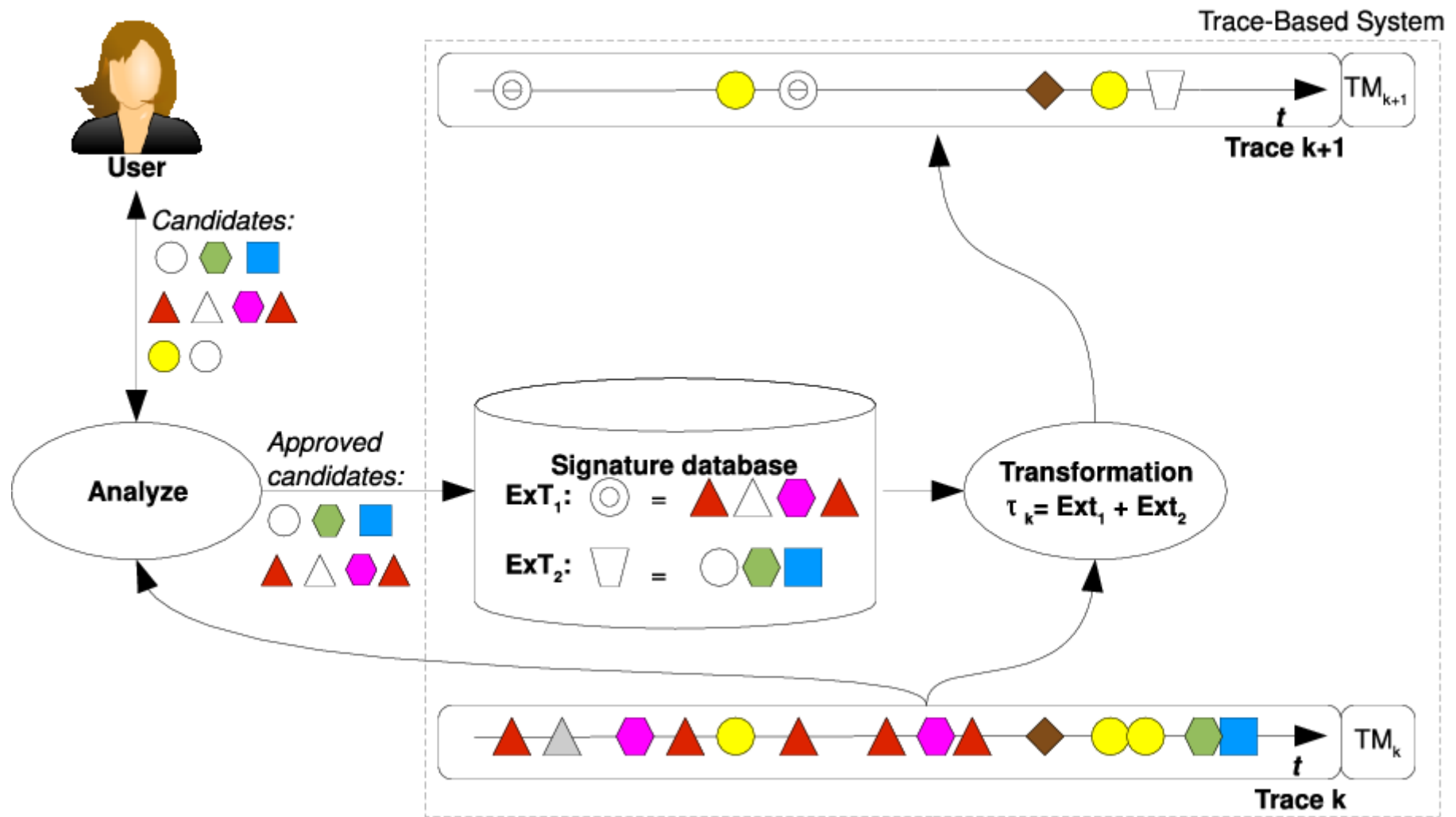

The abstracted trace
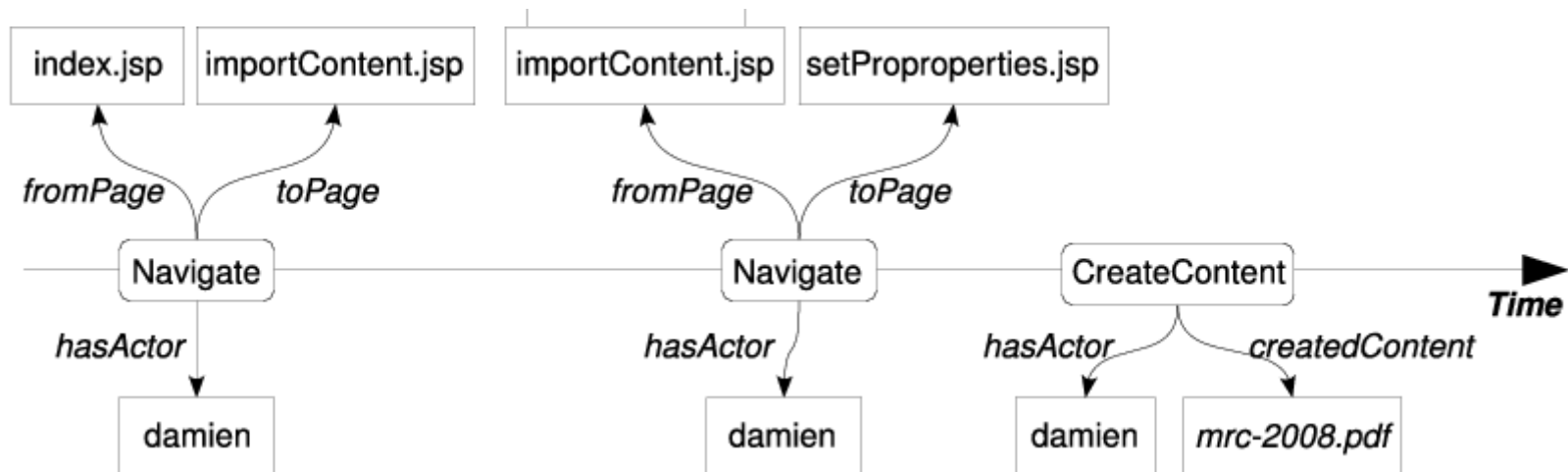
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Context-Aware assistance based on interaction traces

The Abstraction Process: an Iteration

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Task Signature-Based Assistance Systems

- ## Task automation:
  - Being able to perform the user's current tasks automatically.

- ## Recommendation:
  - Suggesting interesting resources or actions to the user.

- ## Storytelling:
  - Telling the story about contextual objects.

- ## Use-based indexation:
  - Retrieving documents through a usage request.

- ## User reflexivity:
  - Displaying the interaction trace to the user, so as to support his meta cognitive processes.
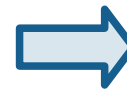
Trace-Based Reasoning (TBR)

Trace Model

Signature DB

?

today - 3 today - 2 yesterday today now
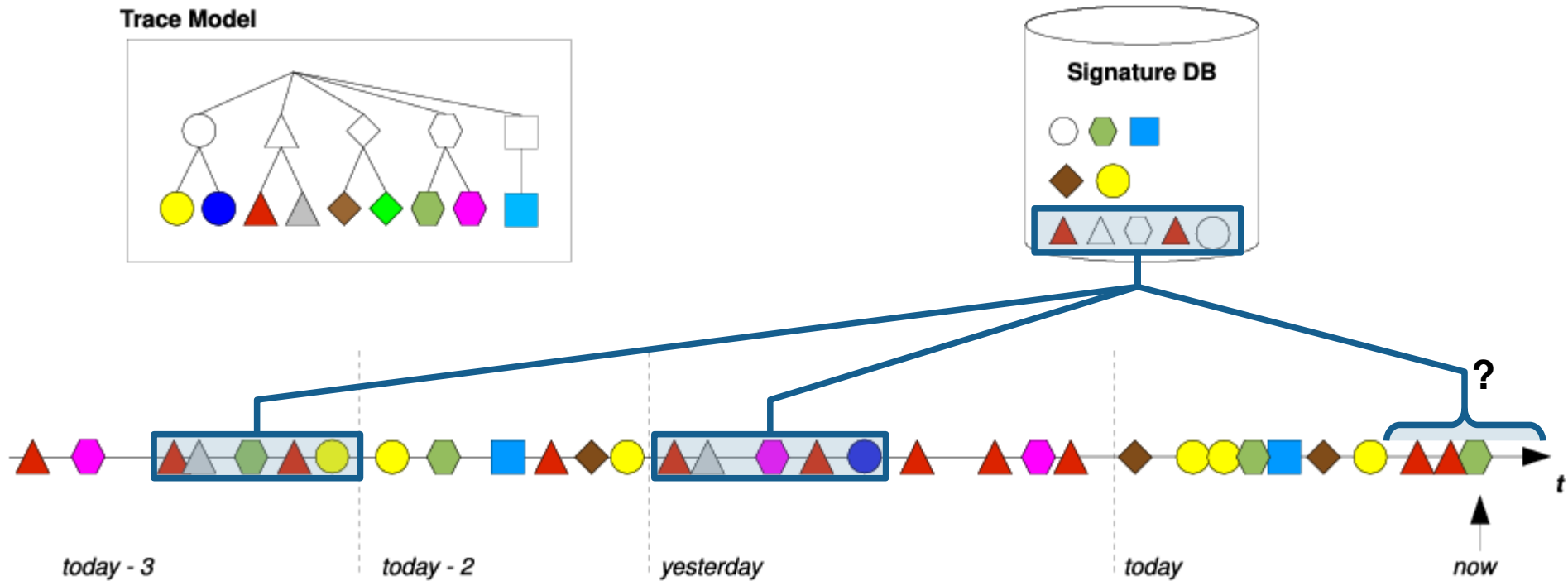
Task signature:

Case:

Pb Sol

Target case

Source cases

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Connections with Case-Based Reasoning (CBR)

- **Trace-Based Reasoning (TBR)...**
  - enables the recognition of new situations;
  - is based on the emergence of case definitions as task signatures;
  - handles the issue of updating problem definitions.

- **Case-Based Reasoning (CBR)**
  - A case is defined as on context objects;
 - The case definition has to be known a priori.

Conclusion

- Our context-aware assistance approach:
  1) Tracking the user's interactions with the environment;
  2) Abstraction is performed by the user itself, with the help of an analyzing agent;
  3) Assisting systems perform Trace-Based Reasoning (TBR) on the resulting abstracted user-centric traces.

- The approach is:
  - Contextual
  - User-centric
  - Flexible
  - Dynamic

Future Works

- Formalisation:
  - Interaction trace;
  - Trace model;
  - Task signature;
  - Trace-Based Reasoning.

- Implementation:
  - Task signature extraction;
  - User task signature management system.

- An example of TBR assistance system.

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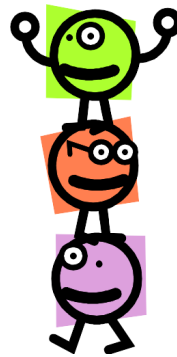
Thank you

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