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

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

The abstracted trace

The interaction trace
Context-Aware assistance based on interaction traces

(1) Raw data

(2) Interactive Trace Abstraction

(3) Trace-Based Assistance

User Centricity level

Storage System

Signatures

Traces

Trace Collection System

Transformation System

(SBT Kernel)

Query System

Visualization System

Trace-Based System

User

Computer environment

Interactions

Sensors

ExTaSis

Trace Traces

Interaction Traces

Assistance System

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The Abstraction Process: an Iteration
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)

Task signature:

Case:

Target case

Source cases
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.
Thank you

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