Why do we need context? Why isn't explicit I/O good enough?

Sensitivity to context is an important component of intelligent human behavior

Requiring explicit human input and human attention to output is expensive in the user interface

Users may not know what input to give, what output to expect

Input and output may not occur sequentially

Why do we need context? Why isn't explicit I/O good enough?

Systems may be embedded in devices which depend on time or physical location

Systems may be history-dependent

We want to take more advantage of sensory information

What can we do with context-sensitive applications?

Systems may sense the environment

Systems may gather input for themselves

Systems may decide which aspects of a situation are really important

Systems may modify context to facilitate future interactions

Systems may infer user intent from user actions and state

Abstraction in programming languages

`(+ x 3)` is an expression dependent on x

x is the context

`(lambda (x) (+ x 3))`

is an expression which is context-independent [dependent on nothing]

Abstraction in Grammars

Context-free grammars

```
<e-mail> := <person> @ <host>
```

Context-sensitive grammars

```
<number1> + <number2> := Add (<number1>, <number2>)
<string1> + <string2> Concat(<string1>, <string2>)
```

- Data type is context

Context for software agents

Agents can watch user interactions to gather context

Agents can infer user intent from context

Agents can help users deal with "context overload"

- Decide when and where parts of context are relevant

Agents can put useful things into the user's context

Context for computing devices in the physical world

"Things that Think", Ubicomp, Wearables, Smart Rooms

Physical world necessitates focusing on task, not tools

Physical world opens up opportunity to sense context from environment

Context and User Interface Design

Good user interfaces put relevant context "at hand"

The goal of Information Visualization is to provide a visual context

Focus + Context displays help user deal with complexity and ambiguity

Presentation of information can be context-dependent

Context in Learning by Example

The "data description" problem for programming by example

Advice for generalization

Machine Learning and formal approaches to context

Inductive learning

Explanation-based learning

Bayesian, neural, genetic, statistical learning

Sequence Induction

Context for User Modeling

Every program has an Implicit User Model

Explicit user models can be static or dynamic

User models can adapt to user behavior and interacti

Background knowledge as context

The "size matters" approach

The rule-based approach

The mining approach

The incremental learning approach

The reactive approach

Philosophical, linguistic, mathematical approaches to context

Warning: Entering high complexity zone

Situated systems

Circumscription

Activity theory

Pragmatics (from Linguistics)

Psychological and social perspectives

Computers as social actors

Affective input as context

Anthropormorphization