

What's in the Context?

Jacek Gwizdka

jgwizdka@acm.org

Interactive Media Laboratory, Department of Mechanical and Industrial Engineering,
University of Toronto, Toronto, Canada

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Introduction

The amount of accessible information increases every day, at the same time stream of electronic communication and associated information grows steadily. It becomes overly difficult to find information related to the current situation, difficult to handle communication according to task at hand. The promise of context-aware computing is to alleviate these problems.

Understanding different types of contexts and of possibilities created by their use is of foremost importance to the area of context-aware computing. This position paper addresses particularly the first workshop question: "What is context?" discussing types of context. We then present several possible classes of context use along with a few illustrating examples.

What is Context? Different views at context classification

Schilit et al. (Schilit et al, 1994) define context-aware applications as "software that examines and reacts to an individual's changing context". Following this general definition the authors list three types of context information: location, nearby people and accessible computing devices (see also Schilit, 1995). We take Schilit et al. definition as a starting point, but extend possible types of context information. First, we shall make basic distinction between context that is *internal* or *external* to the user. Internal context describes state of the user. It can be composed of work context (e.g. current projects and their status, status of to-dos, project team), personal events (i.e. events experienced by user. These events are internalized external events), communication context (i.e. state of interpersonal email communication), emotional state of the user. External context describes state of the environment. It can be composed of location, proximity to other objects (both people and devices), and temporal context.

Internal context is more difficult to sense than external context, in some cases it can only be inferred from external information. Perhaps due to these difficulties, internal context seems to be somewhat neglected in research efforts up-to-date. However, both internal and external contexts can be an important addition to user input, especially in mobile devices with limited user interface.

Another distinction that can be made is where the *context model* belongs (Winograd, 1999). Context model is a description of dependency between context states and their interpretation by the system. Context model can be application-specific (e.g. task-specific vocabulary, model of information triggering based on context (Pascoe 1998)), device-specific, or user-specific (e.g. handwriting characteristic specific to a user, communication preferences of a user). Internal context does not necessarily belong to a user, it is not synonymous with user model. Similarly, external context can belong to a user, for example, a model of handling communication based on location can be user-specific.

Uses of context information

Based on a review of related work and on our own work in the area, use of context can be classified into four main classes:

1. Context as additional input

Examples: Information retrieval and filtering – contextual information (Schilit et al. 1994)

2. Context modifying input (context-based interpretation)

Examples: Proximate selection (Schilit et al. 1994)

Location dependent interpretation of user input language

Personalized context-dependent message handling (Personalization Technologies Lab 1999)

3. Context in user-system feedback loop

Examples: Context provided by system during browsing information by user (Lamming 1994; events - Bovey 1996)

4. Context as trigger

Examples: Triggering information by context (Brown 1998, Pascoe 1998)

Context triggered actions (Schilit et al. 1994)

The following figures illustrate schematically different types of context use.

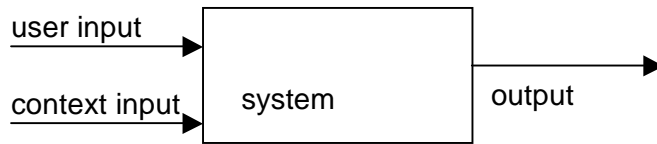


Figure 1. Context as additional input.

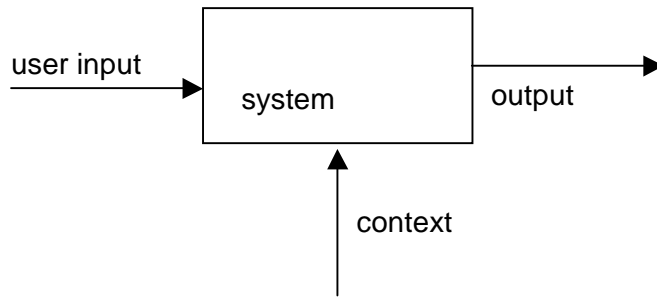


Figure 2. Context modifying (interpreting) user (or other) input.

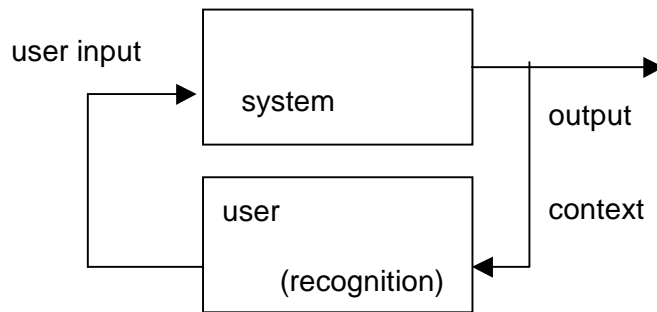


Figure 3. Context in user-system feedback loop.

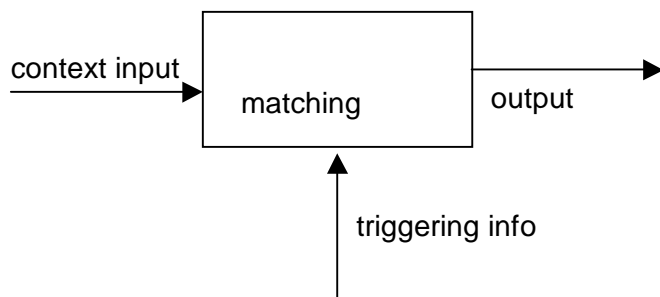


Figure 4. Context as trigger.

Presented brief overview of types of context information and of different classes of its uses demonstrates large variety of possibilities and provides starting point to further discussions.

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