

# The Role of Context in Information Retrieval

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## Overview

- Definitions of Context for Information Retrieval
- Information Retrieval in Context (IRiX)
- Context in Current IR Systems
- Context in Mobile and Ubiquitous Information Access
  - Context-of-Interest
- Context in IR Algorithms
- Concluding Thoughts

## Definitions of Context for Information Retrieval

Information Retrieval (IR): location and delivery of documents which satisfy a user information need.

IR takes place in “context”, but this context is generally ignored in IR models and system design.

The definition of *context* in IR is widely interpreted (“abused” (Finkelstein et al. 2002)).

## Definitions of Context for Information Retrieval

Does/Should context in IR relate to:

- user tasks?
- interactive searching?
- domain specific searching?
- personalization in search?
- physical context as measured by environmental sensors?

# Definitions of Context for Information Retrieval

IR has conventionally been concerned with users in an “information world” using a desk-based IR system.

- concerned with *cognitive* context

Wireless networks are providing IR possibilities users embedded in the “real/physical world”

- concerned with cognitive and *physical* context

## Information Retrieval in Context (IRiX)

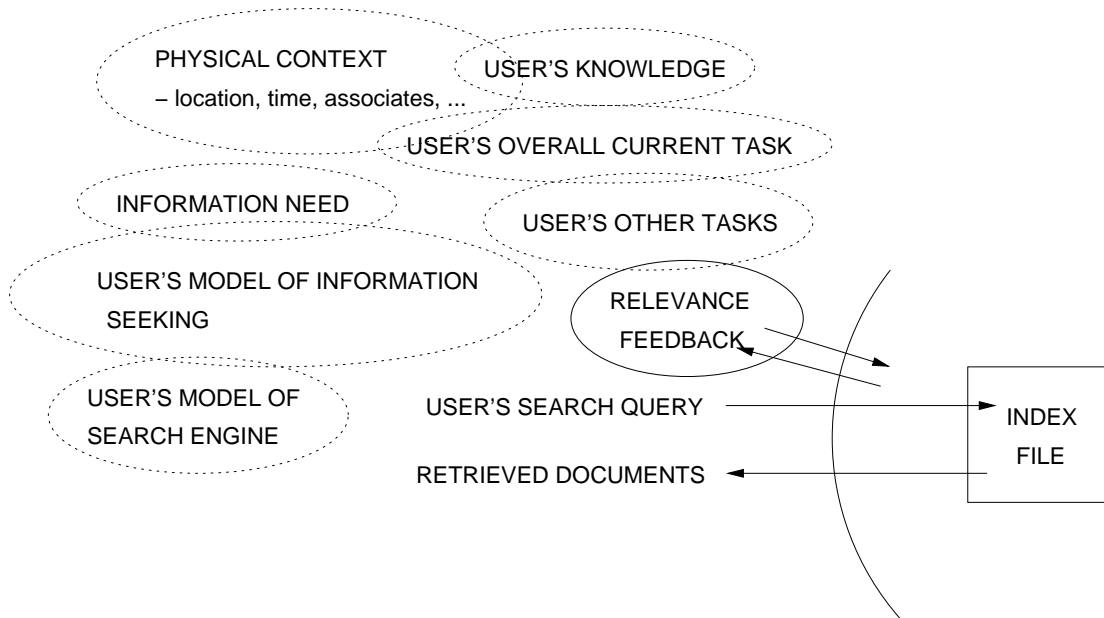
Does IRiX imply interactive IR?

Is all IR interactive IR?

Does context have to come from the user?

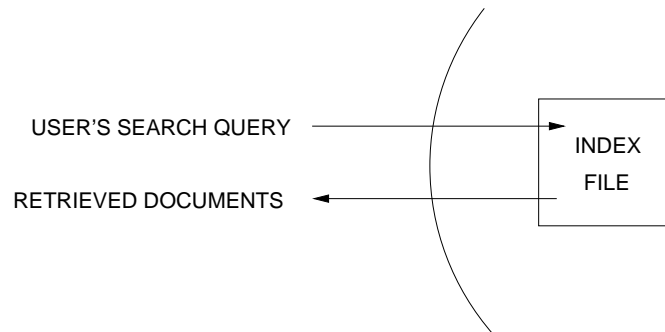
Does/Should IRiX encompass all forms of context information wherever it can be found in the IR process?

# Information Retrieval in Context (IRiX)



Typical interactive IR scenario.

# Information Retrieval in Context (IRiX)



Typical IR scenario without considering context.

Is this an interactive IR scenario as well?

## Context in Current IR Systems

Any information from the user can be regarded as some form of search context data.

- including the query?

A typical IR system assumes:

- indexing units (words, attributes) are independent.
- independent indexing units appear in the context of other ones within documents.
- relevance feedback (RF) implicitly makes use of indexing unit context.
  - indexing units are in the context of relevant documents.

## Context in Current IR Systems

- the IR system models the importance of indexing units in the context of relevance information.
  - can be used to expand the query.
- pseudo or blind RF has no user feedback.
  - relevance context is inferred from ranking of initial retrieval run.
- location context of indexing units within documents can be taken into account as part of the expansion process.

# Context in Mobile and Ubiquitous Information Access

Portable networked devices means that users have access to IR applications while engaging in their everyday lives.

Studies conclude that:

- user is likely often to be engaged primarily in other activities.
- user will desire information relevant to their current cognitive and physical context.
- there are limited possibilities for interaction and browsing.
- there is potential to use physical context to improve IR in this environment.

# Context in Mobile and Ubiquitous Information Access

Physical context data can be made available via personal and environmental sensors.

Some context information can be used directly, e.g. current location.

Other may need to be aggregated, e.g. to decide on audio information delivery while the user is driving.

# Context in Mobile and Ubiquitous Information Access

## Context-of-Interest

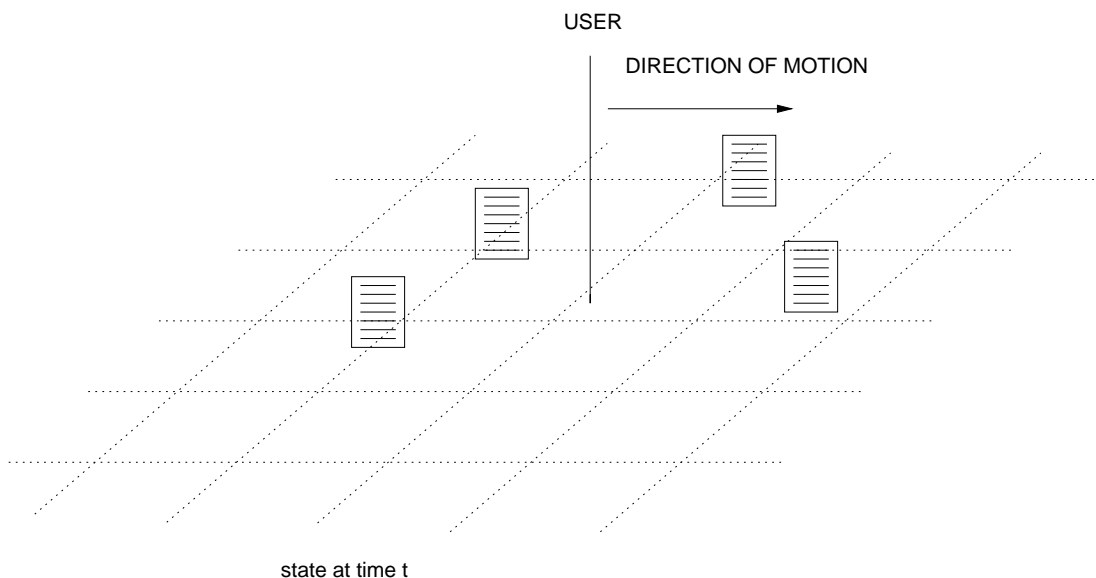
Hypothesis: mobile users will often be interested in information relating to context just ahead of their current context.

Solution: predict their future context and retrieve based on this rather than the current context.

- context-diary - the past (what happened), present (what is happened), and expected future (planned, observed)
- personal profiles

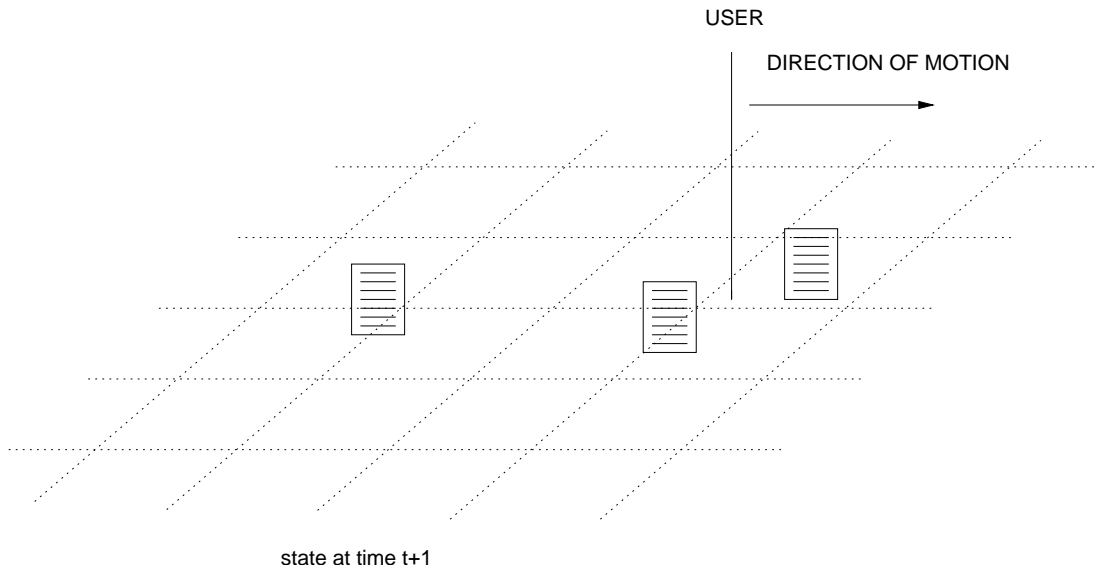
Rank scoring of potentially relevant document set may change with context.

## Context-of-Interest



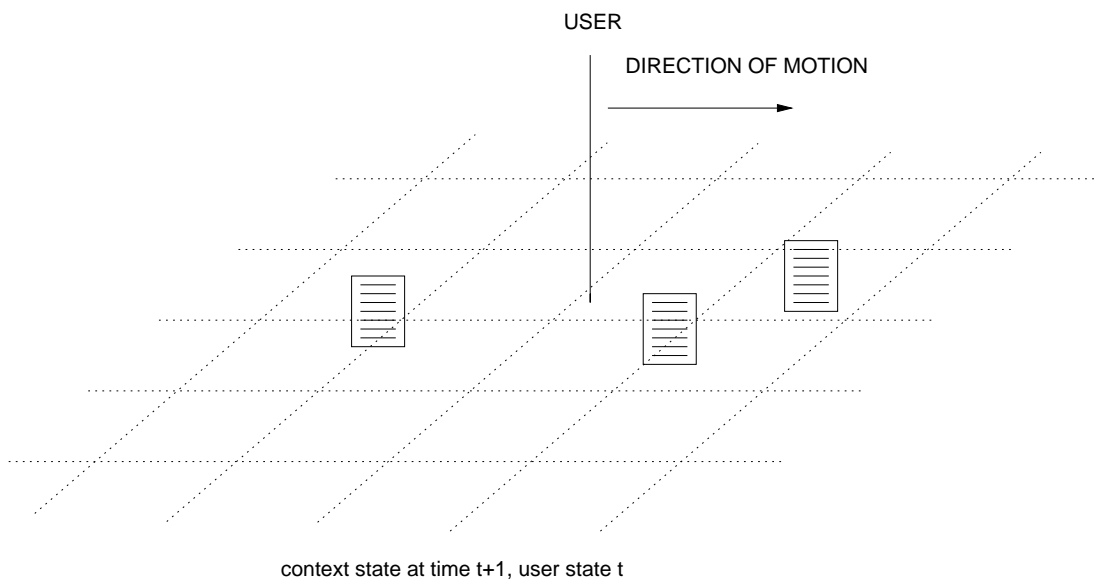
Current state of user and potentially relevant documents at time  $t$ .

# Context-of-Interest



State of user and potentially relevant documents at time  $t + 1$ .

# Context-of-Interest



Current state of user at time  $t$ , state of potentially relevant documents at time  $t + 1$ . Predict user context at time  $t = 1$  - may not be correct!

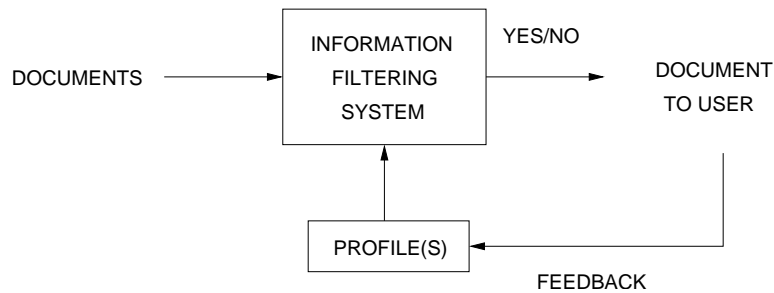
# Context in Mobile and Ubiquitous Information Access

## Pro-activeness and Autonomy

- user is busy, engaged in other activities.
- user may be unaware of available information potentially relevant to their context.
- user context with personal profiles to perform pro-active searching.

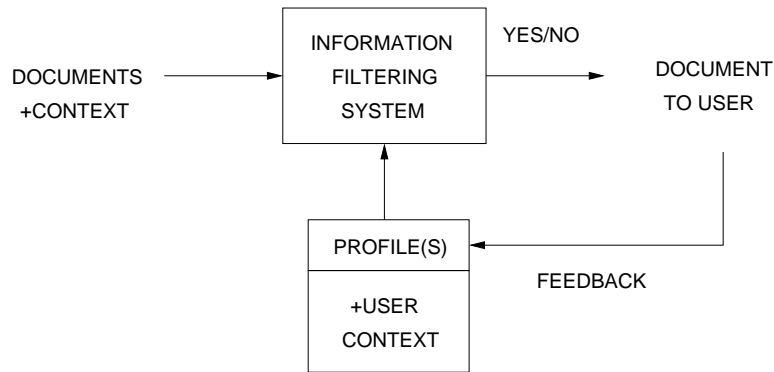
Elements of information filtering and IR.

## Context-Aware Retrieval



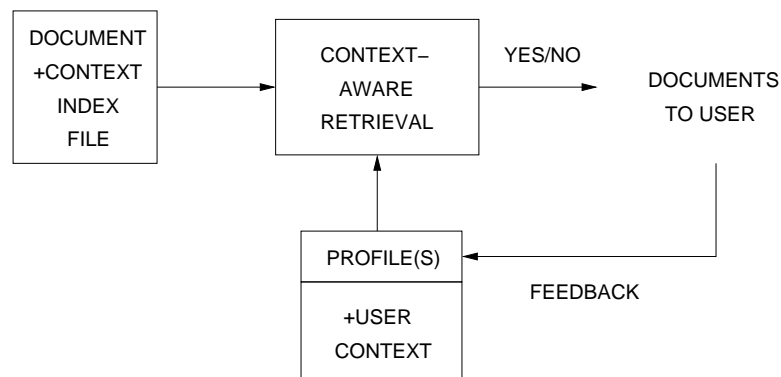
Information filtering with profile adaptation via feedback.

# Context-Aware Retrieval



Information filtering with profile adaptation via feedback with document and profile context fields.

# Context-Aware Retrieval



Context-aware retrieval, change in user context or documents requires pro-active IR/IF with profile adaptation via feedback.

## Concluding Thoughts

- What should be the scope of IR in Context?
- Context in some form appears at many levels stages within an IR system?
- Physical context is an important aspect of mobile computing systems.
  - How can we make use of this for mobile iR?
- Can we usefully extract context information from documents and queries to enhance the effectiveness of retrieval algorithms?
- Related field merging issues in multimedia IR, genomic IR, geographic IR.