SIGN – Adapting Navigation Instructions to Individual Users

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September 2006

Outline

introduction
- personalized mobile services

SIGN
- motivation
- basic idea

terminology
- from navigation systems
- from situation-based systems
- interconnection

back to SIGN
- architecture
- general procedure

conclusions

Personalization of Mobile Services

technological aspects

- small displays
- limited interaction capabilities
- bandwidth
- communication cost

usage aspects

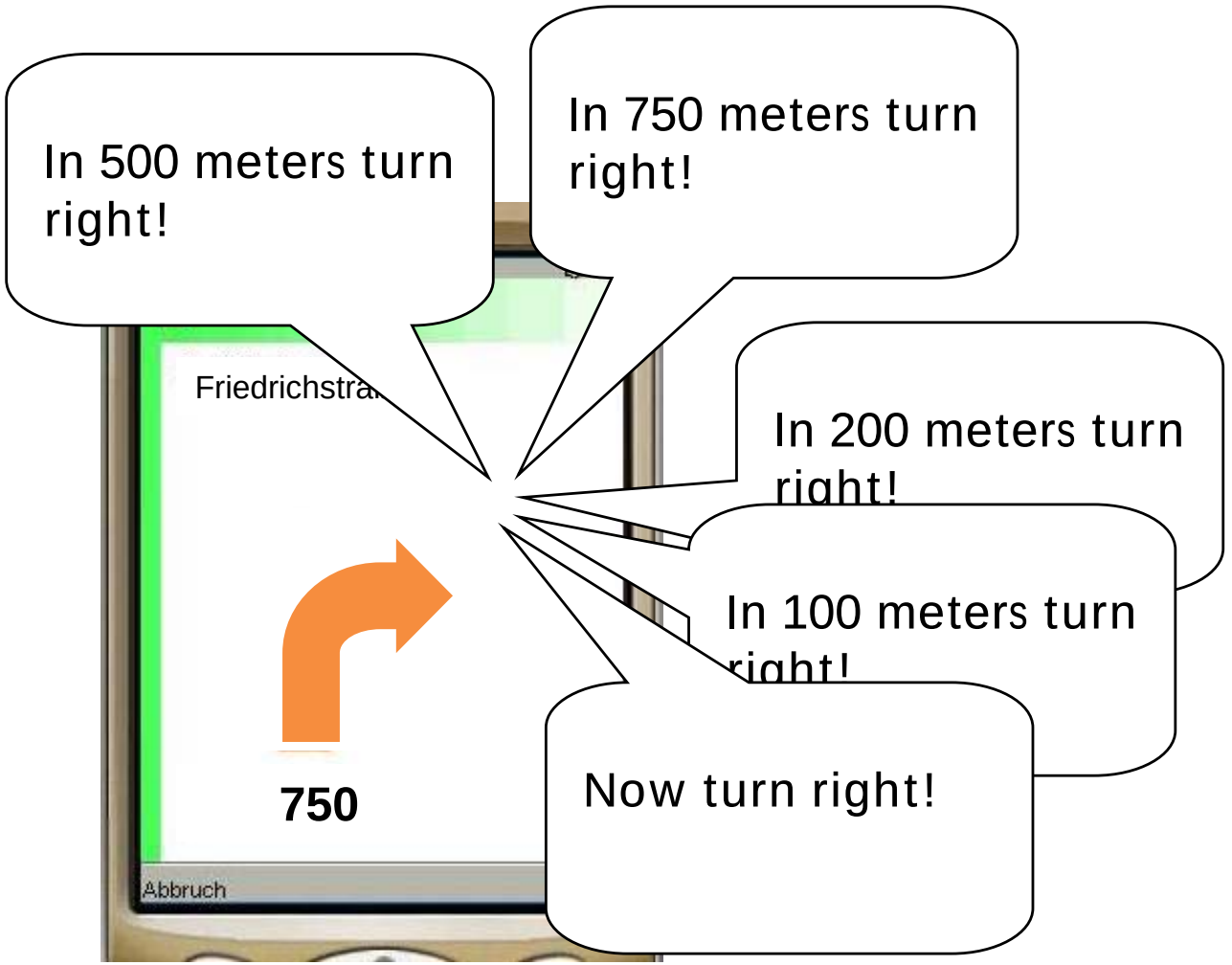
- mobile usage (ad hoc, short, as support)

⇨ „intelligent“ services

Example: Navigation Systems

navigation systems support two modes

on



Example: Navigation Systems

navigation systems support two modes

off

SIGN – Basic Idea

SIGN module

situation-dependent guidance and navigation

suiting navigation to local knowledge

backlight on,
notification sound,
„left into Schillerstraße“

SIGN – Notions

familiarity	describes routes a user knows (local knowledge) as an *absolute* concept
habits	describes routes a user usually takes as a *relative* concept
expectations	describes route features a user expects (due to familiarity and habits)
side conditions	limits *familiarity*, influence *habits*, e.g., • weather, • daylight, • season,

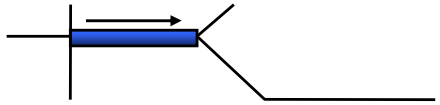
⇨ modeling of a user‘s history and comparison required

Terminology

Terminology from Navigation Systems

link a basic road element

e.g., “Wilhelmstraße” from “Behrenstraße” to “Unter den Linden”



e.g., NAVTEQ: (53500573,0)

segment an ordered set of successive links

route triple (startpoint, endpoint, ordered set of succ. links)

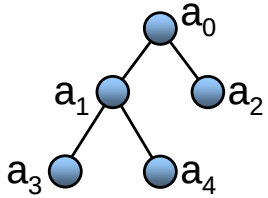
Terminology from Situation-based Systems

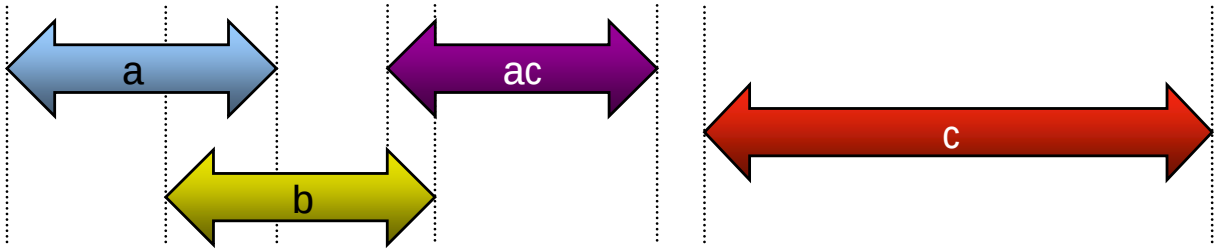
situation

A situation is a set of characteristic features – or characteristics – valid during a time interval.

symbolically $(t_\mathrm{b}, t_\mathrm{e}, C)$

characteristic features:



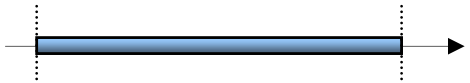


a = A(a_1) b = B(b_1) c = C(c_1)

Situation terminology

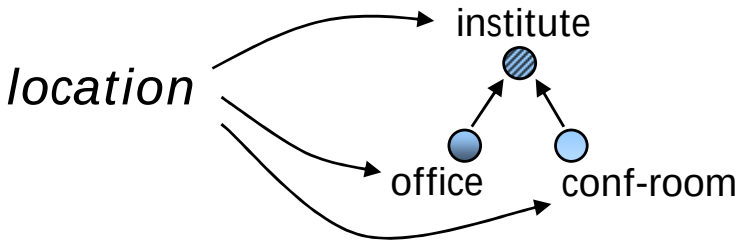
based on predicate logics

situation invariant feature holding during a time interval



feature logical proposition defined over a dimension:
e.g., *location(office)*

dimension predicate defined over a concept hierarchy (DAG)



pattern conjunction of features

Situation terminology (cont‘d)

situation sequence ordered set of non-overlapping situations

transition difference in the patterns of two neighboring situations

event change in the situation of a user (time,transition)

sequences

pattern sequence 

transition sequence 

event sequence 

Routes and Situations

e.g., intermodal routes including different transportation

- *public* as well as *individual* transportation

pattern sequence

situation sequence

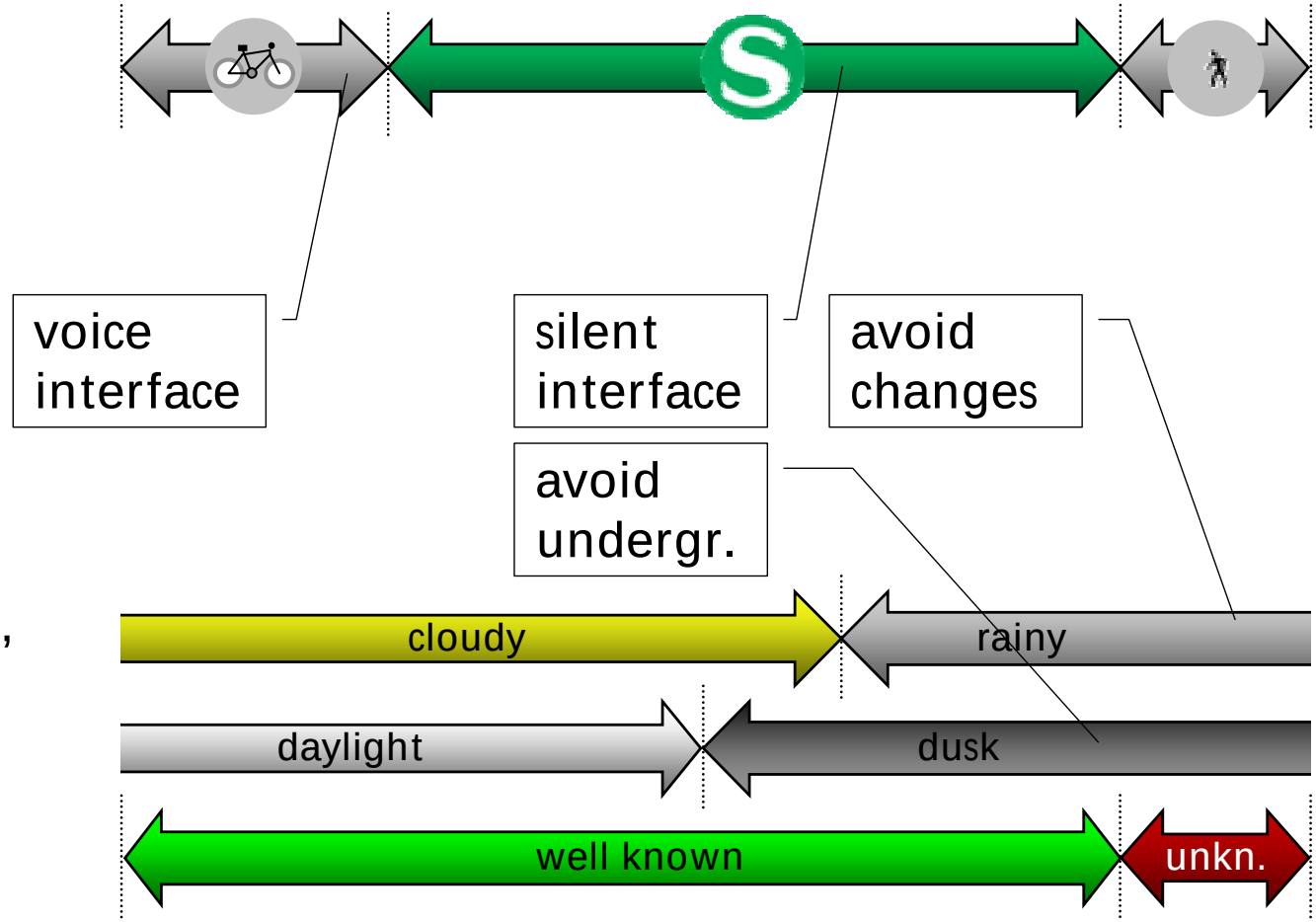
Routes and Situations (cont‘d)

routes as
situation sequences

situation-dependent
preferences

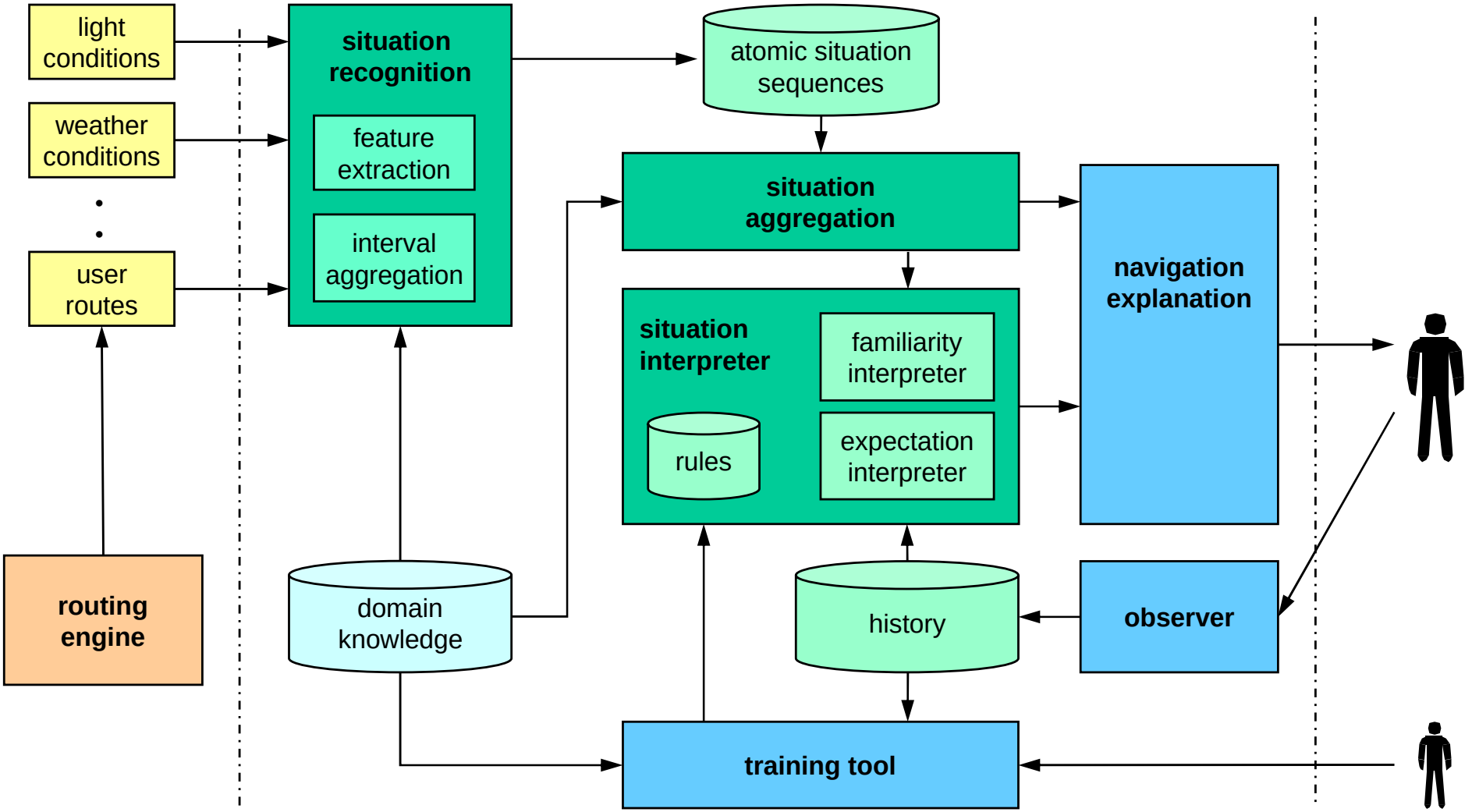
integration with weather,
daylight conditions

**inferring
familiarity and habits**



System Architecture

SIGN – Architecture

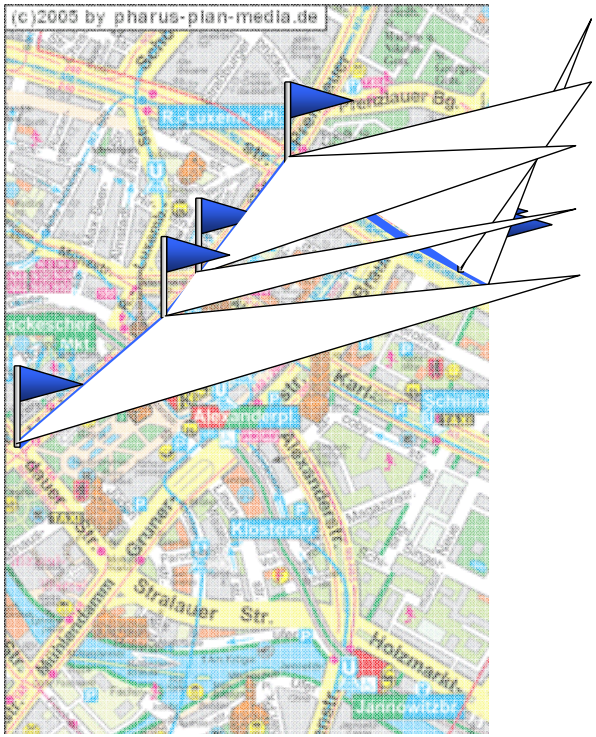


Back to the Example

Back to the Navigator Example

knowledge-dependent navigation instructions depend on *familiarity* and *habits*

route representation as pattern sequences



- Platz der Vereinten Nationen
- Mollstraße
- Karl-Liebknecht-Straße
- Alexanderplatz
- Karl-Liebknecht-Straße
- ...

integrating additional features, e.g.,

- daylight conditions,
- guided (yes/no),
- season

advantage “string” manipulation functions applicable

SIGN – Basic Algorithm

new route

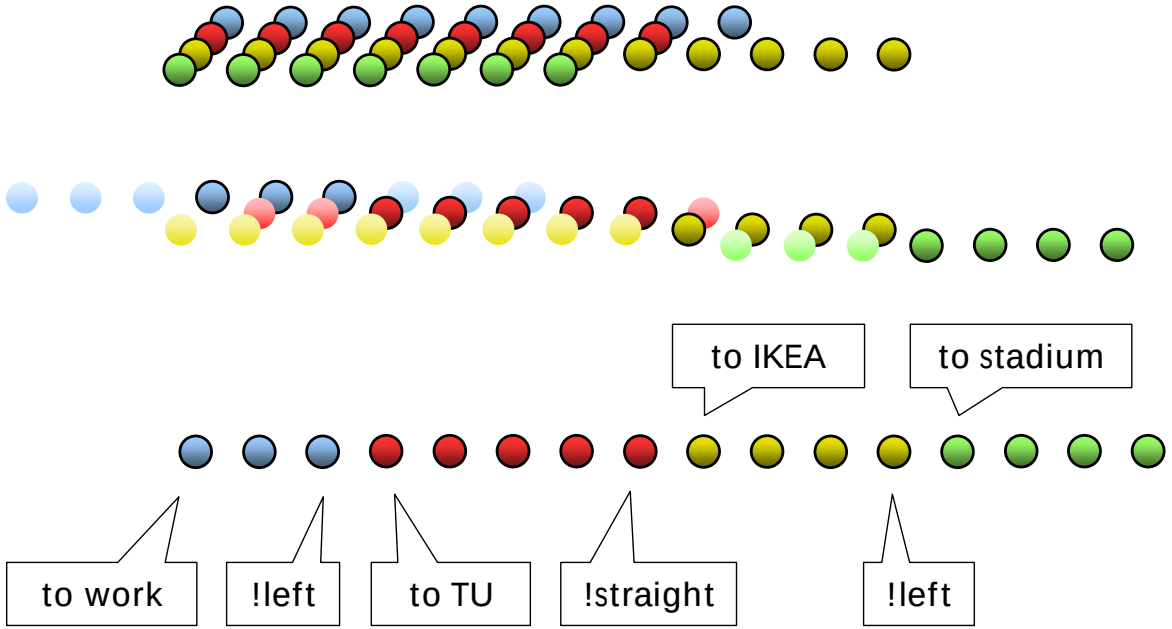
basic procedure

(1) Identify familiar routes.

(2) Compute familiar segments of the new route.

(3) Compute the optimal segment combination.

(4) Derive Instructions.



Conclusion

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personalization

- uses the notions of
  – familiarity,
  – habits, and
  – expectations

SIGN approach

- based on describing and comparing situation sequences

application of SIGN

- in individual motorized transportation
- also applicable in public transportation (?)

some further research issues

- familiarity extraction
- familiarity dependent routing

Thank you very much!