# Caractérisation géographique de l'environnement d'exécution pour la conception d'un système d'information mobile et distribué

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# Overview

# Adaptive GIS definition [PRC06]

GIS should integrate additional constraints such as:

- Mobility and distribution, wireless communications
- Multiple users and simultaneous usages, different data sources

These constraints:

- dynamically evolve over time
- are first defined at running time.

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→ *Example of a distributed GIS design*

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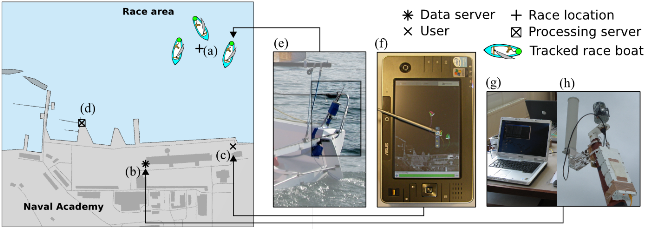


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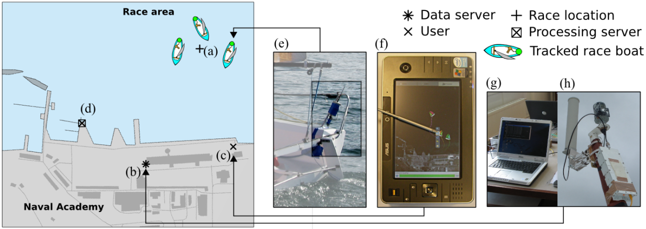


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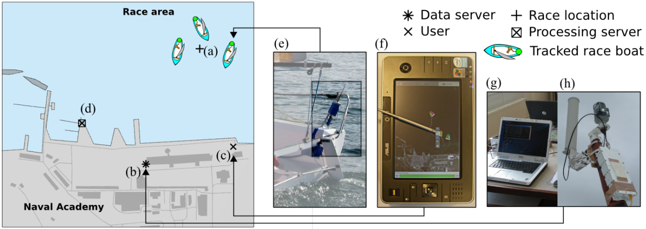


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# Regions of significance

Several types of regions are derived from system components:

- $U_x$: User region, where the user interacts with the system
- $D_x$: Data region, where the data are available
- $P_x$: Processing region, where the data are processed
- $S_x$: Source region, where the data are coming from

**These regions have specific properties:**

- They are mobile, may intersect or not
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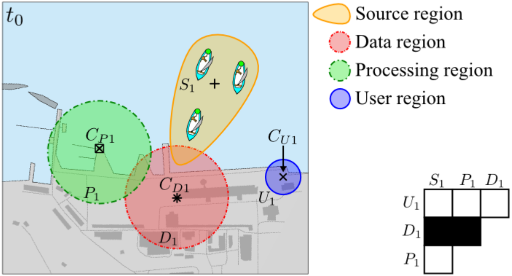
# Regions of significance : case study

3 component regions: $U_1$, $D_1$ & $P_1$

1 origin region, around the tracked ships: $S_1$




(a) Regions of interests of the regata system

(b) Execution context notation

Execution context at $t_0$ : $\{P_1 \cap D_1 \neq \emptyset, S_1 \cap D_1 \neq \emptyset\}$

# Execution Context

An execution context summarizes ...

$$\ldots \left\{ \begin{array}{l} \text{the system architecture} \\ \text{the components communications} \end{array} \right\} \ldots$$

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**In an adaptive system, at the functional level:**

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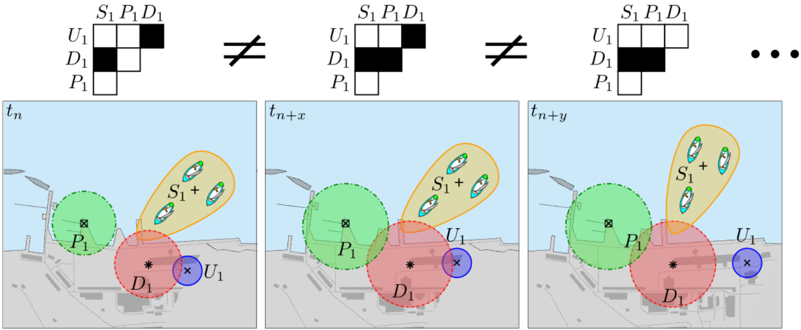
# Execution context : case study

Considering several contexts ...




... every context means a specific system behaviour :

- User + Data *vs.* User + Data & procedures *vs.* User alone, etc.

# Regions of interest : summary

A well defined design of a system implies:

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**However ...**

- The Description of each per-context behaviour is **complex**
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# Mobility areas & constraints [PRC09]

Assumption: *"It is usually possible to restrain a region of interest to a given area of mobility"*

**Given a region of interest $R_x$**

$\zeta_{R_x}$ : set of possible $R_x$ locations during the system runtime.

- When $R_x$ is a part of $\zeta_{R_x}$, $R_x$ is *mobile*
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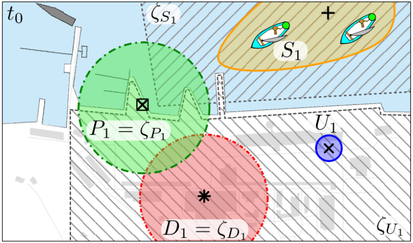


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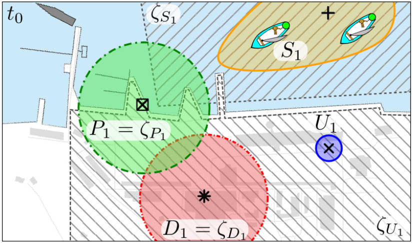


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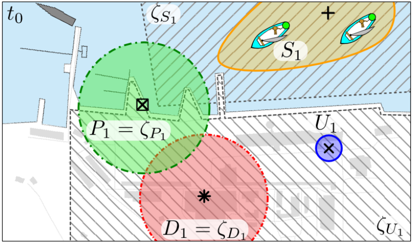


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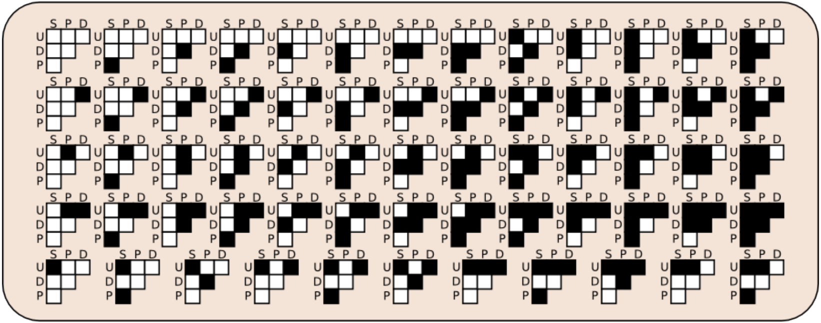

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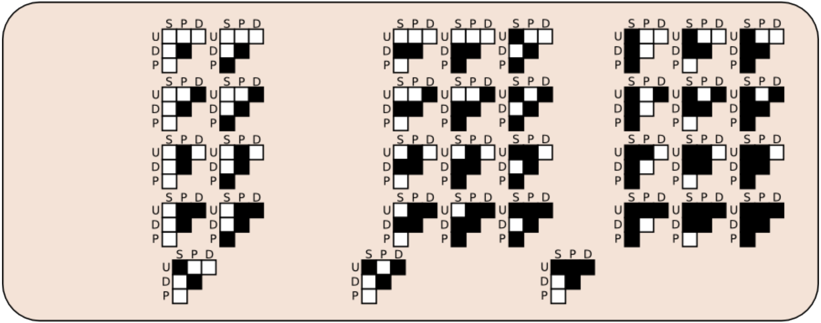

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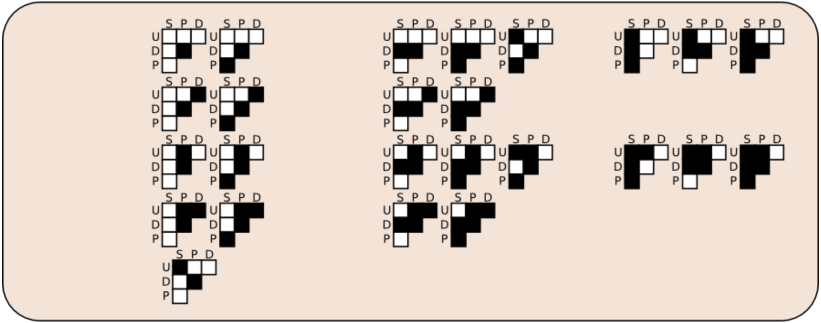

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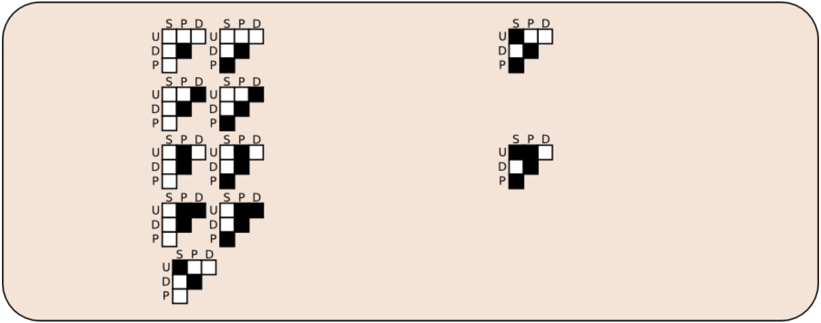

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Assumption: *"same behaviour at the functional level = same context on a design point of view"*

**In an interactive system:**

The adaptivity is oriented towards the user.
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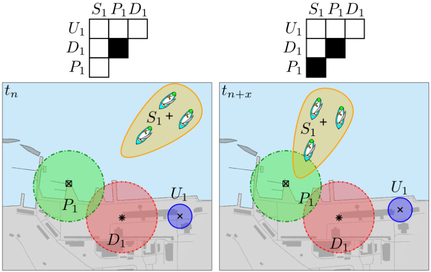


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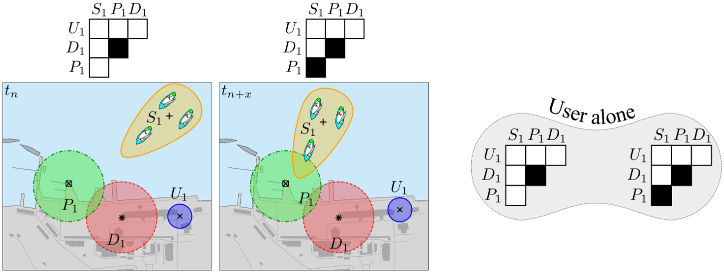


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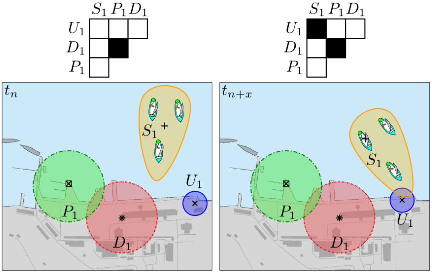


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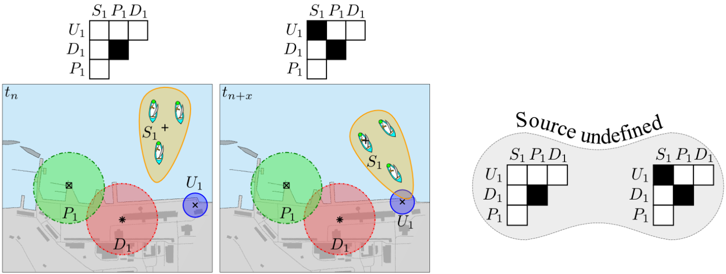


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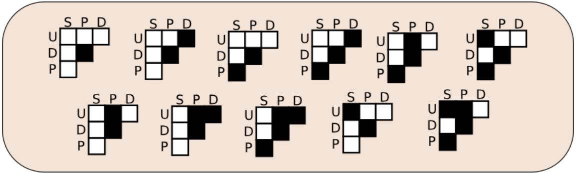


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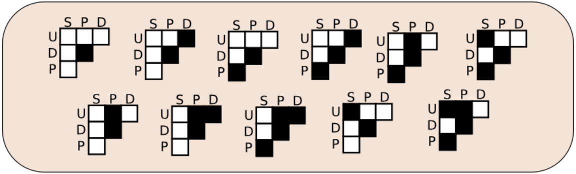

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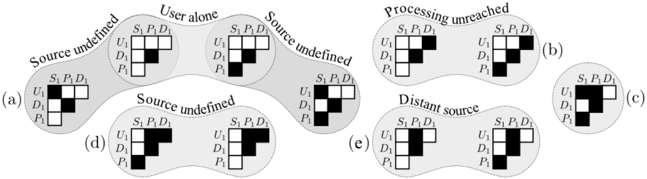
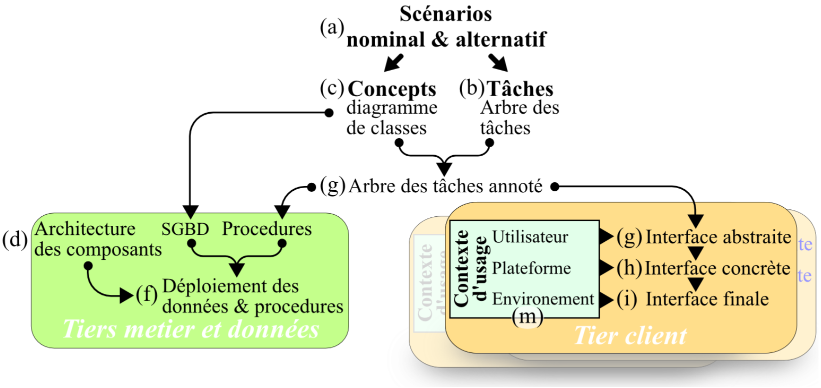


# Overview

1. Adaptive GIS & case study
   - Adaptive GIS design
   - Case study
2. Geographic description of the execution context
   - Regions of interest
   - Mobility constraints
   - Context equivalence
3. **Design process integration**
   - Interactive system design
   - Integration of contexts groups
   - Prototyping the user interface
4. Conclusion, discussion

# User-centred design : from scenario to prototype



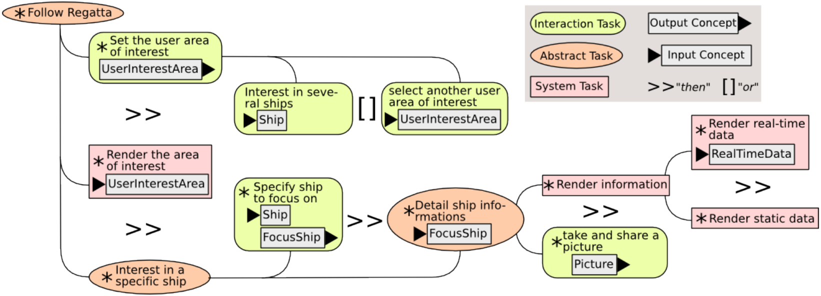
# User-centred design : example scenario

**Table:** Nominal scenario

| |
|---|
| *"The race documentation system runs on a user's PDA and allows her/him to* **follow the regatta** *in real-time. The PDA provides manipulation tools, and a map of the race area where the racing ships are regularly re-located. The user may* **be interested in several ships**, *or alternaltively* **by other user interests**, *to* **set her/his own area of interest**. *If she/he* **is interested in a specific ship**, *information (year, name, crew and pictures) and real-time data (location, speed and heading) on this ship are provided. When being close enough to the race area, the user* **takes and shares ships pictures** *with other users."* |

These scenarios reflect **user tasks** and the *data manipulated*.

# User-centred design : example task-tree



# User-centred design : bridging the gap

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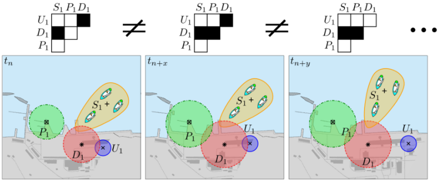


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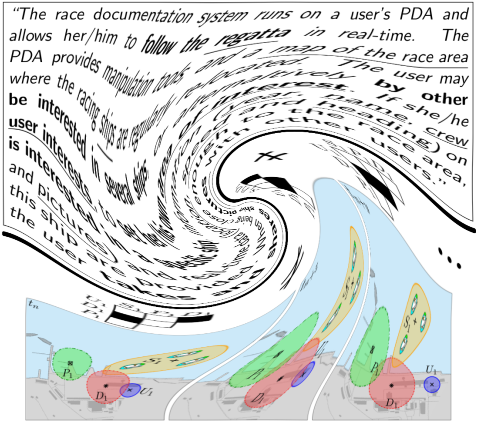


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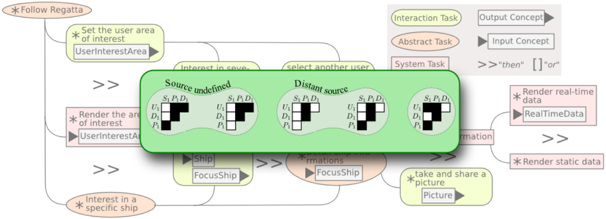

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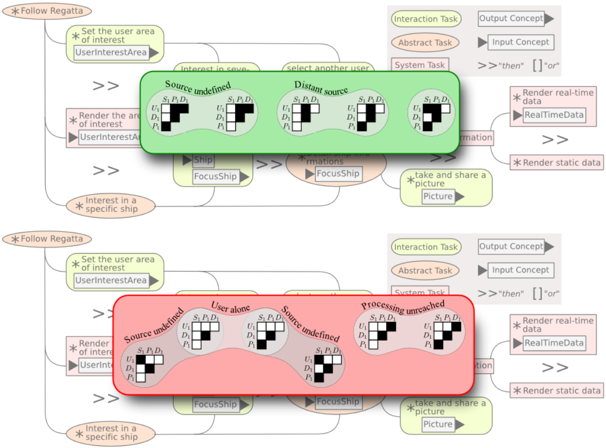

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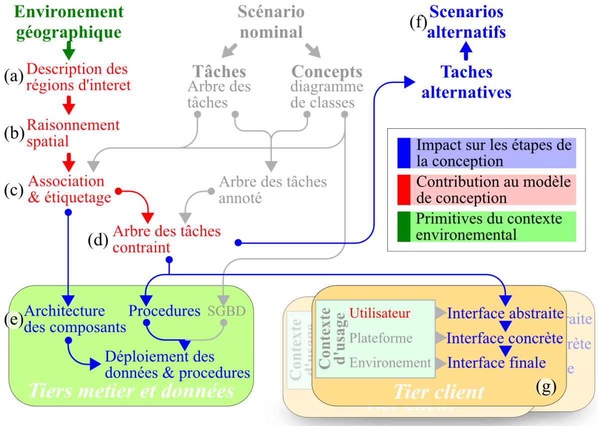


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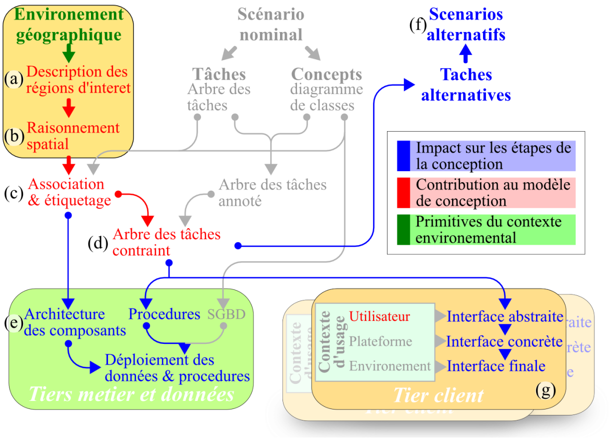


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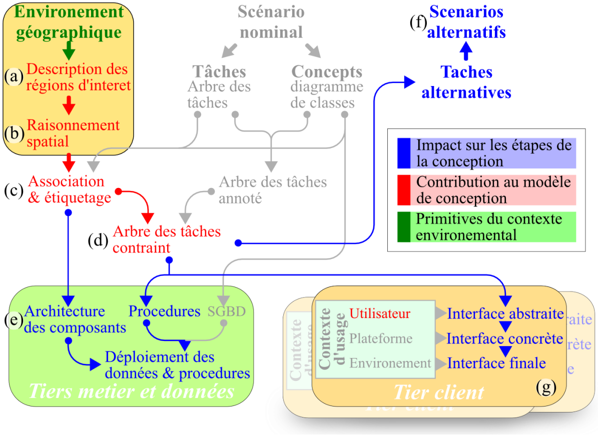


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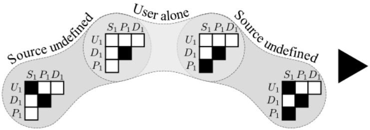


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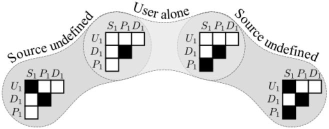


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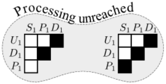
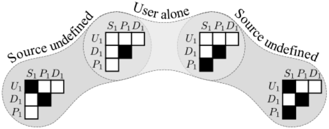



*"When accessing the data of the system, the user may be **interested in a specific ship**. Informations (<u>year</u>, <u>name</u>, <u>crew</u> and <u>pictures</u>) are presented"*

# One behaviour per group of context

Designers, along with users and staff, give each group of equivalency a proper behaviour.

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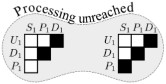


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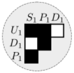
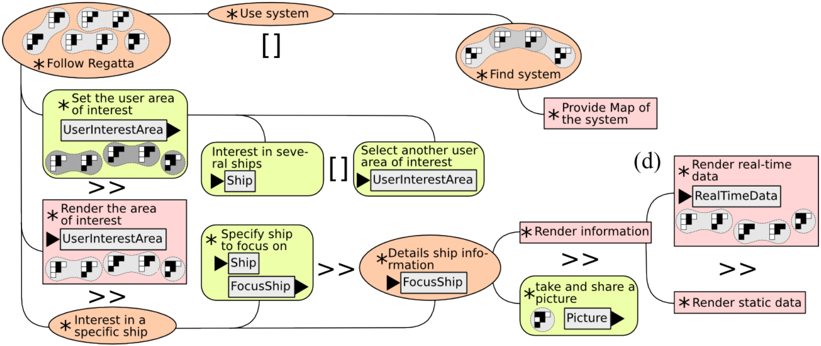



*"When being close enough to the race area, the user **takes and shares ships pictures** with other users."*

# Design primitive : the task tree

Scenarios derives the task and data tree. The execution contexts annotate the possible actions



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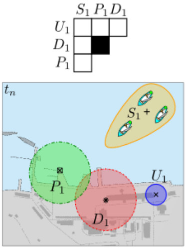

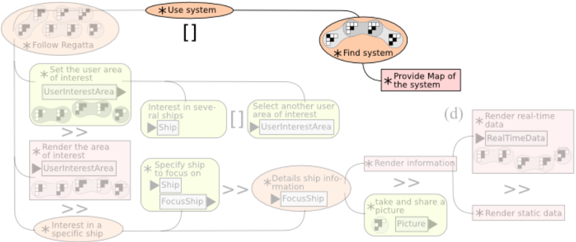

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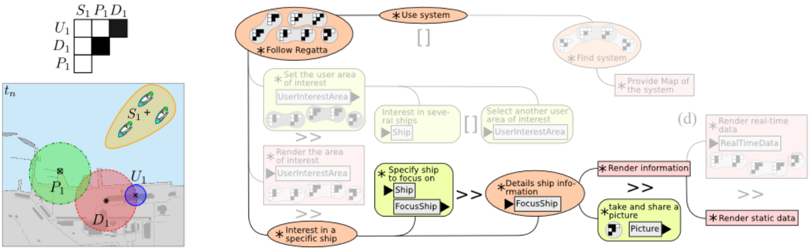
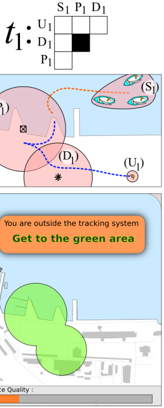



From the task tree : **processing methods**, **data handling** code, and **user interaction** layer are implemented.

# Sketching the interface: case study

*“A user is walking along the shoreline and is accessing information via the regatta tracking system and his PDA. Tracked boats return from high sea to the harbour”*

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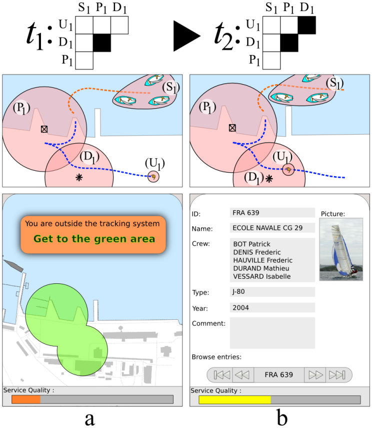

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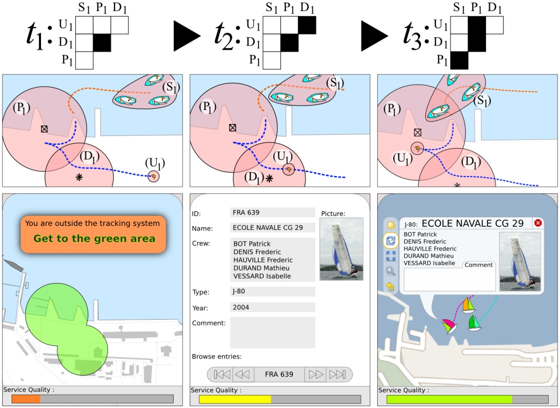


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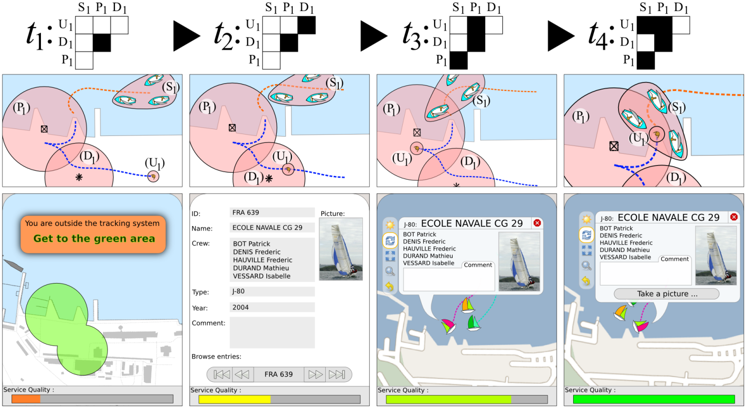


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# Overview

# Conclusion

From a description of a system environment:

- the execution context are derived and grouped;
- these groups are integrated within a design framework;
- the annotated task tree favors prototyping.

The designed interactive system is:

- **robust** : it runs in every "situation"
- **consistent** : the user level is derived from a single task tree
- **efficient** : it fits the data and the processes available

At the case study level : the system is available everywhere, and provides functional flexibility.

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# Discussion

**Perspectives:**

- Context equivalence : properties generalization
- Levels of adaptivity : user context, appliance context.
- HCI & ergonomics : transition between different behaviours

**Thank you for your attention**

Time for questions...

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# References


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