

**Title:** Usability-Efficiency Tradeoff in Multiscale Navigation

**Domain:** Human-Computer Interaction

**Keywords:** Multiscale navigation, Information theory, Bayesian experimental design, Human-Computer partnerships, Usability

**Location:** LRI & INRIA Saclay, Orsay, France

**Group:** HCC / ExSitu

**Supervisor:** Michel Beaudouin-Lafon, PR Univ. Paris-Sud (mbl@lri.fr)

**Co-Advisor:** Wanyu Liu, Ph.D. student (wanyu.liu@telecom-paristech.fr)

**Lab director:** Yannis Manoussakis, LRI (yannis.manoussakis@lri.fr)

**Context:**

Multiscale interfaces are a powerful way to represent large datasets such as maps and deep hierarchies. Existing navigation techniques leave users in complete control, leading to frustrating situations such as getting “lost in desert fog” [1]. We have proposed a new technique *BIGnav* [2] that is based on Bayesian experimental design with the criterion of maximizing information-theoretic concept of mutual information. Rather than simply executing user navigation commands, *BIGnav* interprets user input and challenges users to gain information. We have shown that this Human-Computer partnership technique is significantly faster than standard navigation, but sacrifices user experience. How to support usability while ensuring navigation efficiency, moreover, how to determine “who does what” in human-computer collaboration [3] become interesting questions.

**Objectives:**

The goal of this internship is to explore usability-efficiency tradeoff in multiscale navigation. We will build upon *BIGnav*, which maximally challenges users to gain information for guiding navigation, resulting in increased efficiency but higher cognitive load. The student will explore strategies to support usability, e.g. navigation comfort and user control, while still ensuring navigation efficiency. Furthermore, what is navigation comfort and to what extent users need control worth investigation, e.g. defining user comfort zone to regularize researching and providing smooth transition between *BIGnav* and standard navigation.

**Specific Activities:**

During this internship, the student will be expected to:

- Explore the tradeoffs between usability and efficiency in multiscale navigation;
- Investigate strategies for improving user experience while ensuring efficiency;
- Design and implement an experiment to evaluate proposed strategies;
- Implement and demonstrate, if possible, realistic map applications with proposed strategies.
- Alternatively work on other multiscale navigation tasks such as searching [4] and wayfinding [5], or combination of *BIGnav* with other navigation techniques, i.e. focus+context [6] and fisheye lens [7].

The internship will last from four to six months.

### **Expected Results:**

We anticipate that this work will lead to a publication in a top-tier research conference, such as ACM/CHI. It could also serve as the foundation for a Ph.D. thesis.

### **Required Skills:**

We are looking for motivated students who are enthusiastic about Human-Computer Interaction research and particularly about Human-Computer Partnerships studies. Solid programming skills are required, especially Java programming. Basic knowledge in mathematics is also required. A background in Information Theory is a plus. Experience in multiscale interaction is appreciated.

### **References:**

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