Designing Tabletop Interfaces for Asymmetric Distributed Collaboration

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Abstract

In domains like **emergency response**, distributed teams of people must communicate with each other. We propose giving a **tabletop display** to the co-ordinator in the command centre, and **handheld devices** to personnel in the field. This creates a very **asymmetric** form of **collaboration**. We are investigating how the devices can support the team's tasks, and how the interfaces should be designed.

1. Introduction: USAR Teams

- Urban Search and Rescue (USAR), and other emergency response and command and control work, often requires **geographically distributed teamwork.**
- USAR teams typically comprise:
  - **tactical** actors in a base, and
  - **operational** actors in the field.
- Teams currently communicate mainly via voice channels (such as walkie talkies.)
- Advanced mobile and wireless networking capabilities will enable real-time **sharing of data** such as maps and schedules.
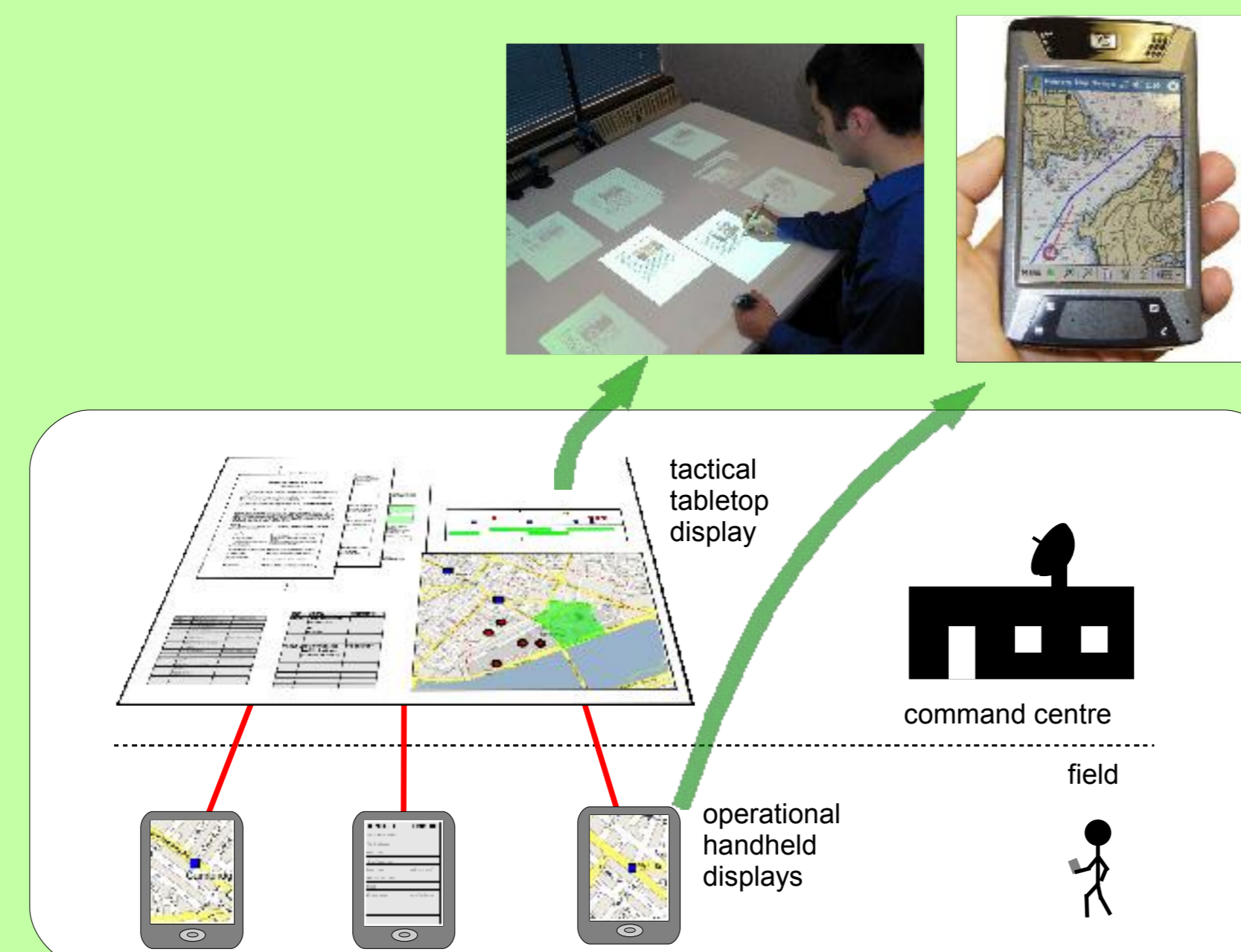
2. Asymmetric Collaboration

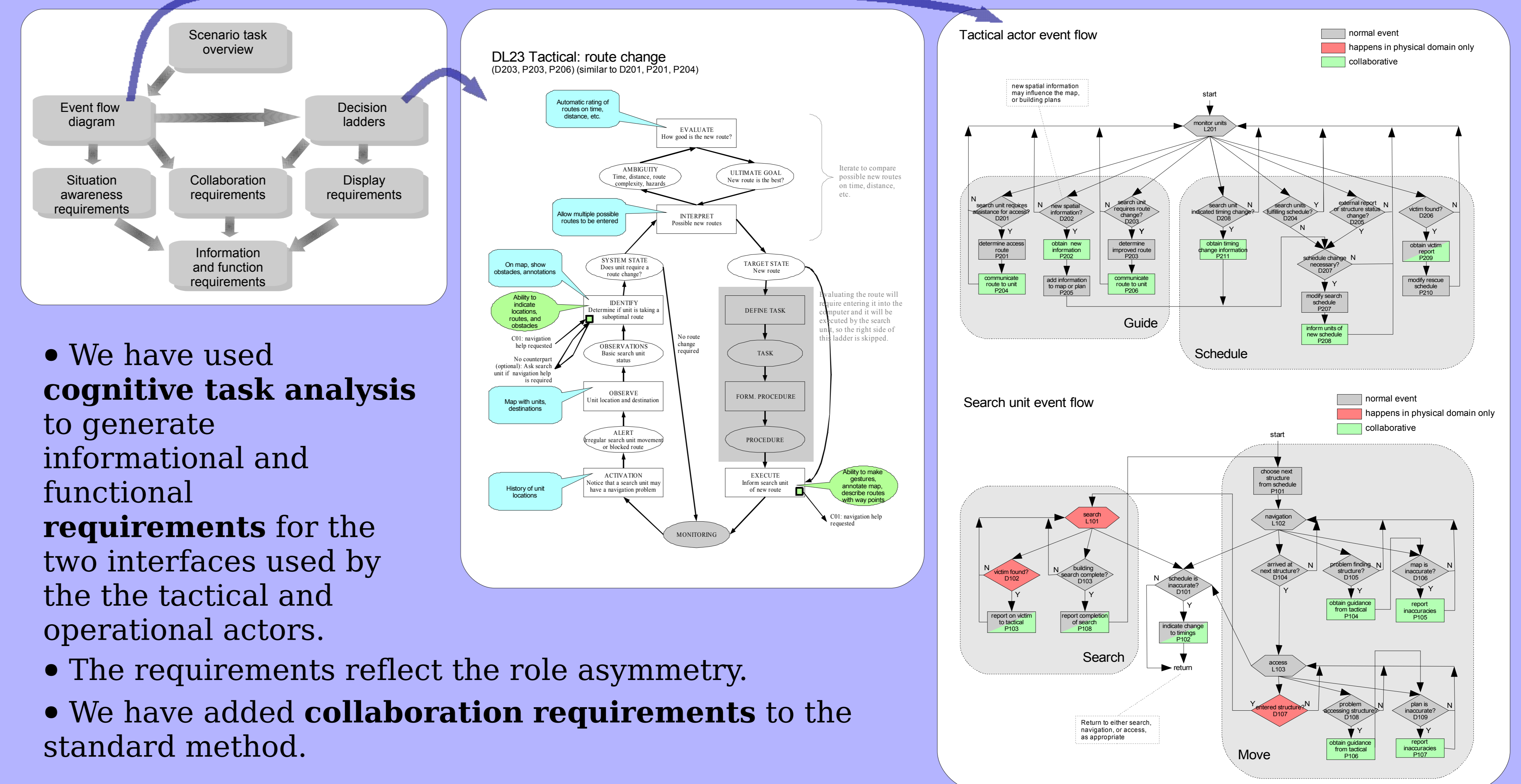Asymmetric aspects of tactical and operational actor roles in USAR teams

role	operational	tactical
function	execute task	plan, supervise operations
style of work	mainly physical	informational
environment	difficult, hazardous	controlled, safe
latency	negligible	significant
knowledge of world	local, detailed	global, coarse
knowledge of plans	narrow	comprehensive
computing	portable, limited	fixed, powerful
attention	intermittent	continuous

To address the asymmetric task requirements for tactical and operational USAR actors, we propose using different computing devices:

- a **tabletop display** in the base would allow tactical actors to interact with large amounts of information from different sources, and
- **handheld devices** in the field would provide operational actors mobility.
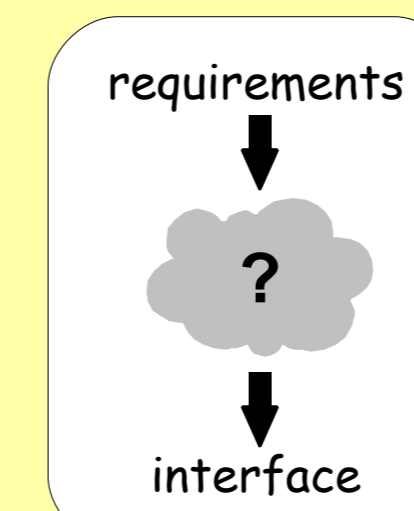

3. Task Analysis

- We have used **cognitive task analysis** to generate informational and functional **requirements** for the two interfaces used by the the tactical and operational actors.
- The requirements reflect the role asymmetry.
- We have added **collaboration requirements** to the standard method.

4. Challenges: What Next?

- Collaborators should be able to share spatial information (**maps**) and temporal information (**schedules**).
- We assume that all data is available to all devices, but cognitive and physical constraints limit the use of information at the operational level.
- Task requirements must be translated into **interface design** for a this novel system.

- **Free-form** information should be allowed because no two crisis situations are the same.
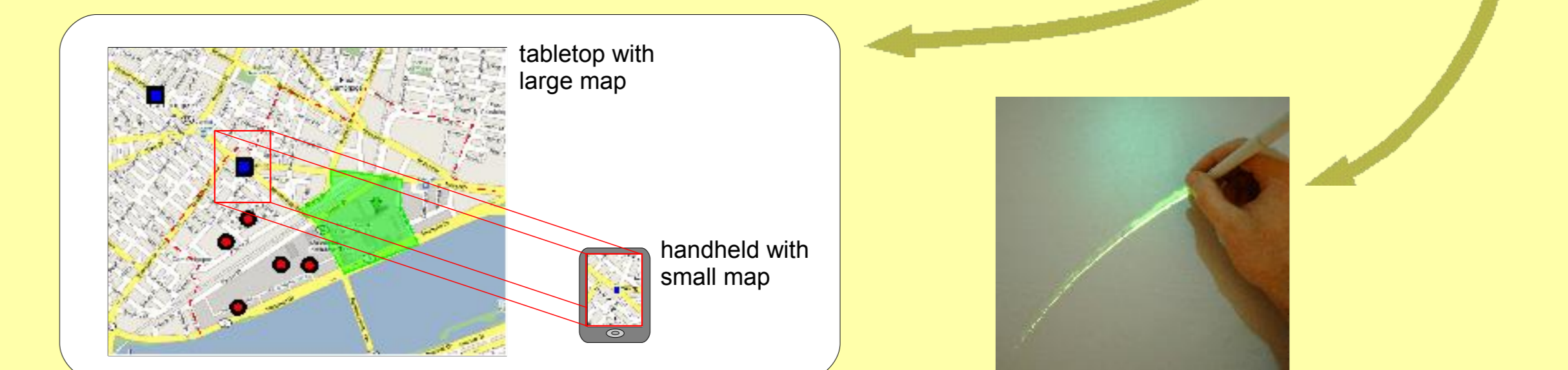

- **WYSIWIS is not feasible** because of the vast difference in display sizes.

Design Questions

- **Activity awareness**: how much activity information should be displayed given that the collaborators' roles are different?
- How much **control** should one person have of the other person's display?
- How should **consequential communication** be conveyed?
- **Workspace awareness**: which visibility techniques should be used. Radar view, over-the-shoulder-view?

Experimental Questions

- How do the collaborators deal with the **asymmetry** in hardware and roles?
- What **communication strategies** do they use to deal with the mismatch of information?
- How do they **balance** the tasks between them?
- Which **awareness techniques** are most effective?