The background image shows a hand interacting with a multi-touch interface. The interface displays a grid of colorful tiles with numbers and symbols, such as '3', '5', '8', '9', '2', and '0'. The tiles are arranged in a way that suggests a collaborative problem-solving activity.

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Collaborative problem solving on mobile hand-held devices and stationary multi-touch interfaces

Introduction

Motivation: mass casualty incidents

Collaboration between..

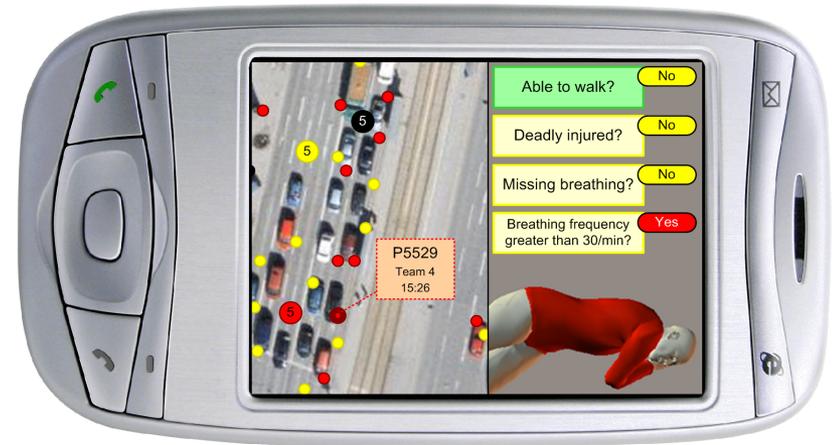
- Paramedics and doctors (mobile hand-helds)
- Operation control center (table top-device)

Requirements

- Paramedics: High Mobility
- Operation control: Overview

Information presentation on

- Small private devices
- Large public displays



S. Nestler and G. Klinker. **Towards adaptive user-interfaces: Developing mobile user-interfaces for the health care domain.** In Mobiles Computing in der Medizin (MoCoMed), Augsburg, Germany, September 2007.

Introduction

Sudoku

Sudoku used for evaluation of collaboration modalities

Implementation of the Sudoku puzzle on:

Mobile hand-helds (Windows mobile, C#)

Table-top device (Linux, C++)

9*9 grid with nine 3*3 sub-grids

Filling the puzzle with numbers from 1 to 9

All numbers may only appear once in...

each column

each row

each sub-grid

7	9	4	5	8	2	1	3	6
2	6	8	9	3	1	7	4	5
3	1	5	4	7	6	9	8	2
6	8	9	7	1	5	3	2	4
4	3	2	8	6	9	5	7	1
1	5	7	2	4	3	8	6	9
8	2	1	6	5	7	4	9	3
9	4	3	1	2	8	6	5	7
5	7	6	3	9	4	2	1	8

G. Klinker and F. Echter. **3D visualization and exploration of relationships and constraints at the example of sudoku games**. Technical Report TUM-I0722, Technische Universität München, Department of Computer Science, Nov. 2007.

User Interface

Table top device

Multi-touch tabletop display based on FTIR

Screen layout

- Sudoku grid in the center
- Number tiles are placed around

Interaction

- Concurrent drag-and-drop of the tiles
- Snapping of the tiles into the free fields

Communication

- Wireless transmission of all actions to the hand-helds
- Actions on the hand-helds result in a short animation on the table-top



User Interface

Mobile hand-helds

Due to highly limited screen space, we built a different visualization.

Screen layout

Unset tiles are not displayed separately

Showing the complete sudoku grid at once.

9 tile stacks with numerically indicated height

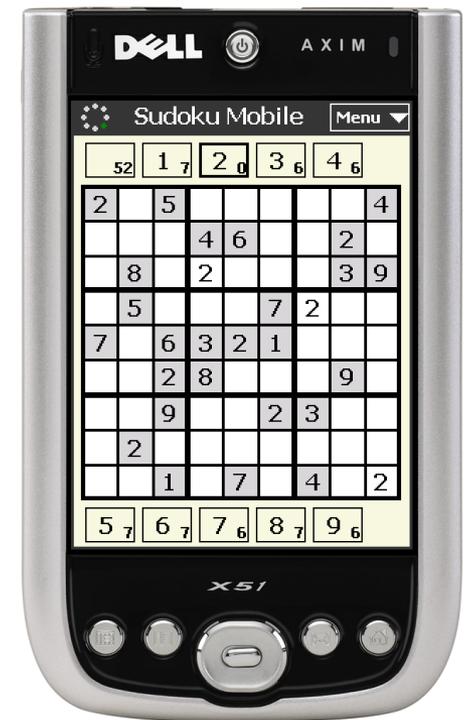
Interaction

Separating the tile movement into two steps

Tile selection and tile placement

Fast placement of several tiles from the same stack

Adding an “Empty” stack for removing tiles



Pre-Evaluation Overview

In total 16 people participated

- Five different sudoku puzzles
- Teams of four

Different alternatives of collaboration

Table top. All four people are collaborating at the table top

Face-to-face. Two people are collaborating at the table top, two people are equipped with hand-helds.

Remote. Similar to face-to-face, but all participants are in different rooms (except the two at the table top).



Pre-Evaluation Results

Different alternatives of collaboration – time to completion:

Table top: 473 s mean (± 195 s)

Face-to-face: 585 s mean (± 507 s)

Remote: 566 s mean (± 280 s)

⇒ no conclusions possible yet (besides insufficient sample size)

Subjective impressions:

Which interface was more enjoyable/efficient? (both inconclusive)

Did you feel the other players' presence? (inconclusive)

Did you feel disturbed by other players' actions? (slightly more on tabletop)

Conclusion & Future Work

- **improve evaluation – larger sample size**
- **avoid visual clutter**
- **move towards MCI application**
- **e.g. role playing game: players as paramedics, coordinators etc.**

Thank you for your attention!



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Questions?

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