

Visualization Techniques for Personal Tasks on Mobile Computers

Gerald Bieber
Fraunhofer Institute for Computer Graphics
Rostock (Germany)
&
Christian Tominski
University of Rostock
Rostock (Germany)



Institut
Graphische
Datenverarbeitung



10th International Conference on Human - Computer Interaction
Crete, Greece, 2003

Outline

- ⇒ Introduction
- ⇒ Visualization of personal tasks
 - Temporal aspects
 - Spatial aspects
 - Reduction of information
 - Information linking
- ⇒ Application convention guide: *eGuide*
- ⇒ Conclusion

Introduction

Personal Task Management

- ➔ Today mobile computers are used in many fields of application
- ➔ One main application is personal information management (PIM)
- ➔ This means mobile computers support users to manage and optimize their personal tasks
- ➔ However, there is a large amount of personal information a user somehow must be informed of
- ➔ This has to be done in an intuitive, expressive and effective way
- ➔ Visualization is a possible solution for this problem
- ➔ New field of research: the graphical representation of personal activities on mobile devices

Introduction

Visualization

- ➔ Visualization means mapping (abstract) data to visual representations
- ➔ Three main criteria of visualization
 - Expressiveness
 - Effectiveness
 - Appropriateness
- ➔ The visualization has to consider the limitations of mobile devices as well
 - Limited display space, limited display resolution
 - Limited processing power, limited memory
 - Only pen-based interaction

Visualization of Personal Tasks

Requirements

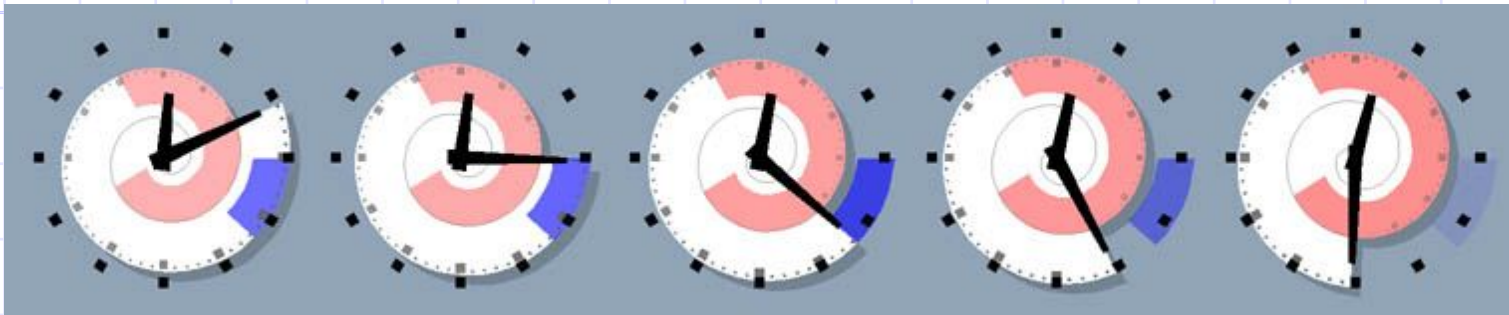
- ➔ 3 aspects of personal task data
 - Temporal aspects: when tasks have to be performed
 - Spatial aspects: where tasks have to be performed
 - Task aspects: what has to be performed including required resources, task partners, special information, etc.

- ➔ All of these aspects must be considered in order to achieve expressiveness for the visualization
- ➔ Additionally, information linking is an important goal to achieve
- ➔ Therefore we integrated techniques addressing all of these needs

Visualization of Personal Tasks

Temporal Aspects I

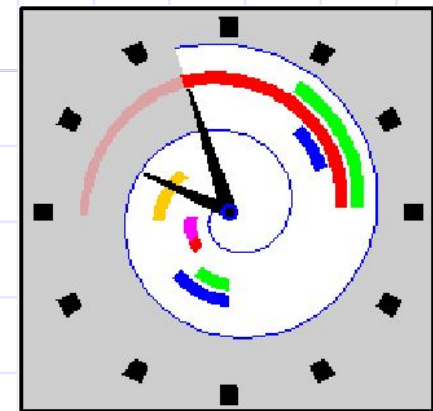
- We found SpiraClock (Dragicevic & Huot, 2002) eligible for representing temporal aspects of personal tasks
 - Based on a clock design, and therefore very easy to comprehend
 - Supports temporal focus and context
 - High degree of interactivity
 - Additionally, there is support for spatial aspects (limited)



Visualization of Personal Tasks

Temporal Aspects II

- ⇒ However, SpiraClock was not developed for mobile computers
- ⇒ Therefore, an adaptation of the known technique was necessary
 - Implementation with Personal Java
 - Simplification of SpiraClock regarding number of graphical primitives
 - Graphical effects have been omitted (transparency replaced by change of color intensity)
 - Adaptation to pen-based input



Visualization of Personal Tasks

Spatial Aspects

- ⇒ Maps are commonly used for representing spatial data
- ⇒ There are two different approaches
 - Raster maps
 - Vector maps
- ⇒ Raster maps are easy to handle and fast to display
- ⇒ However,
 - Scaling leads to decrease in map quality
 - Huge amount of map data
 - Not as flexible to meet the requirements for a dynamic task management

- ⇒ Therefore, vector maps are more eligible for the representation of the spatial aspects of personal tasks

Visualization of Personal Tasks

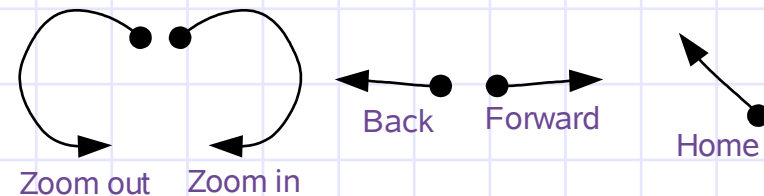
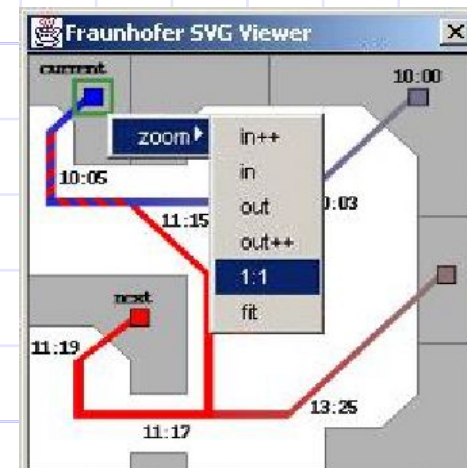
Scalable Vector Graphics (SVG) I

- ➔ A suitable base for the development of interactive vector based maps on mobile devices is SVG (Scalable Vector Graphics)
 - It is standardized (W3 Consortium, 2002)
 - Special profiles of SVG address the requirements of mobile computers (W3 Consortium, 2003)
 - Based on XML grammar (easy acquirement and/or transformation of map content)
 - Information linking is essential part of the SVG specification
 - Map content can be altered dynamically (e.g. by using DOM functionality)

Visualization of Personal Tasks

Scalable Vector Graphics (SVG) II

- ➔ Since for our purposes we do not need all capabilities of SVG and in order to be system independent Personal Java was used to implement the map engine
- ➔ There is support for
 - Simple zooming and panning accessed via menu and via drag
 - Symbol-based map navigation
 - Dynamic altering of map content, e.g. for a dynamically calculated route
 - Linking of information



Visualization of Personal Tasks

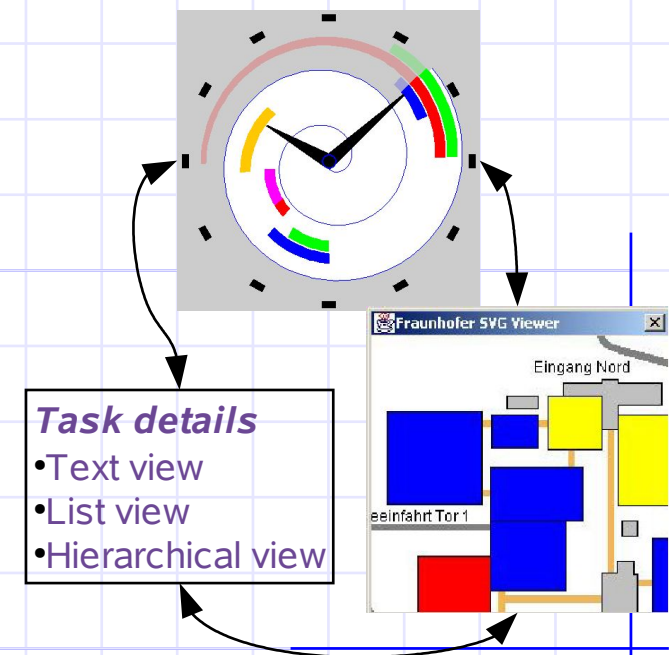
Reduction of Information

- ⇒ Often there is a large amount of personal task data
- ⇒ Due to the limitations of mobile computers it is necessary to reduce the amount of data to be displayed
- ⇒ Time and location awareness can be used for this purpose
 - Time awareness via system time
 - Location awareness via IrDA beacons (discrete tracking) or WLAN (continuous tracking)
- ⇒ Aware of current time and location only those data being relevant for the present context have to be displayed (reduction of task specific information, reduction of map content)

Visualization of Personal Tasks

Information Linking

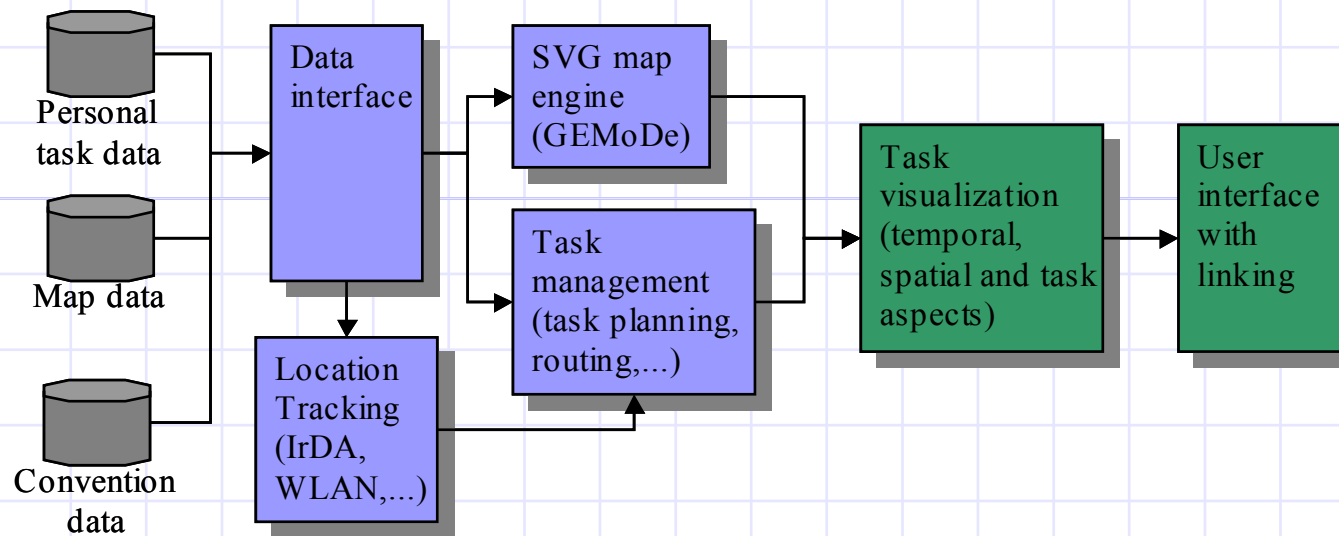
- ➔ A method is needed, which allows users easy access to the different aspects of personal task data
- ➔ Linking of information is a commonly used approach
- ➔ Therefore, all of the presented visualizations are based on a common interface, which provides linking functionality
- ➔ In combination with a special relational data structure temporal, spatial and task specific information can be easily accessed via links (e.g. by clicking on input sensitive graphical primitives)



Application convention guide: eGuide

System Architecture

- Data Interface provides access to the data basis
- SVG map engine GEMoDe
- Task management
- Location tracking
- Visualization component
- User interface



Application convention guide: eGuide

Information provided

- ➔ Companies attended to the convention
- ➔ Product groups
- ➔ Locations (halls, booths, lecture rooms, etc.)
- ➔ Lectures connected with location and time
- ➔ Lecture speakers
- ➔ IrDA beacons and/or WLAN access points for location tracking

- ➔ Integration of the presented techniques for visualization of temporal aspects
- ➔ Interactive map for spatial aspects
- ➔ Text views, list views and hierarchical views for detailed task information (integration of focus and context lists)

Conclusion

- ➔ For the presentation of personal tasks temporal, spatial, and task specific aspects have to be considered
- ➔ Interactive visualization of these aspects in combination with information linking help users to manage and perform their personal tasks successfully
- ➔ The presented techniques were integrated in a system independent electronic convention guide for mobile devices: *eGuide*

- ➔ Future work will concentrate on
 - Improvement of the map engine
 - Integration of additional sensory components
 - Evaluation and user studies