Systems for Disaster Management

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Motivation

- Terrorist attacks

- Natural disasters

- Music festivals, conventions, the Olympics, etc.

Overview

- Disaster Managements
  - Disasters characteristics and management challenges
  - The Disaster Cycle
    - Planning
    - Response
- Disaster Management Systems
  - Requirements
  - 2D User Interfaces
  - 3D User Interfaces
- Conclusion

Characteristics of Disasters

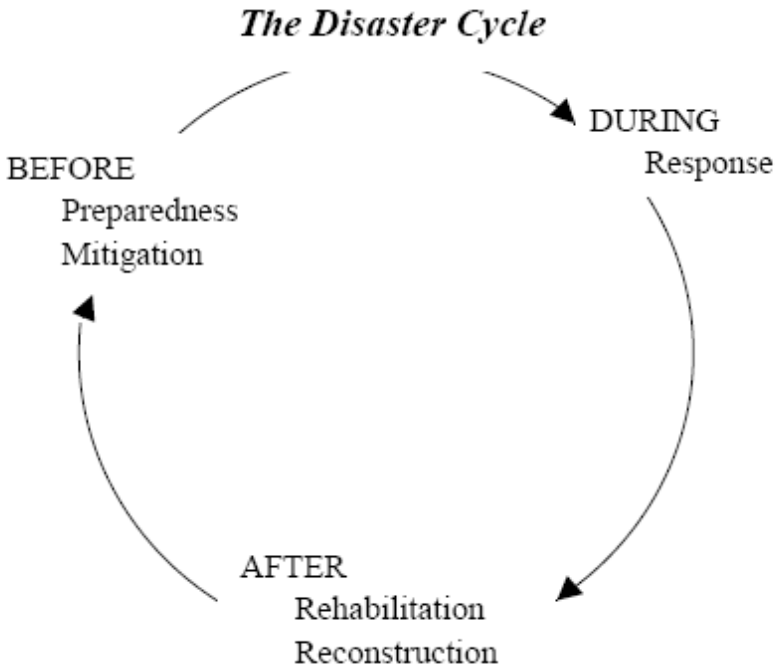
- Large number of Victims
- Large number of Relief Personnel
- Respondents from separate Public Service Organizations e.g. Police, Firefighters, Paramedics
- Quickly changing situation

Disaster Management Challenges

- Realistic planning
- Time critical decision making
- Vast amount of information
- Efficient resources management
- Counting, sorting and attending to the victims

The Disaster Cycle

- Mitigation
- Preparedness
- Response
- Recovery



Preparedness For Large Scale Emergencies

- Partial inadequacy of current disaster preparedness
- Rehearsal and evaluation of resources allocation and management
- Emergency Operation Command Centers
- Training of relief units
- Acquisition of situational awareness
- Stockpiling

Disaster Response

- 'Golden Hour'
- Information Gathering
- Resources allocation
- Communication
- Accident Development Monitoring
- Triage

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Disaster Management Functional Requirements

- Dependability
  - Confidentiality - patient data
  - Data Integrity
  - Availability
    - 99.5% Service Level
    - 5 minutes maximum down time
- Controllability
  - Accountability - Logs, Data Owners and Creators, etc.
  - Legal Liability - no third party data manipulations

Disaster Management Non -Functional Systems Requirements

- Various Time Limits
  - medical checks time limit
  - transportation time limit
  - many more depending on the system objectives
- Non Distractive
- Intuitive

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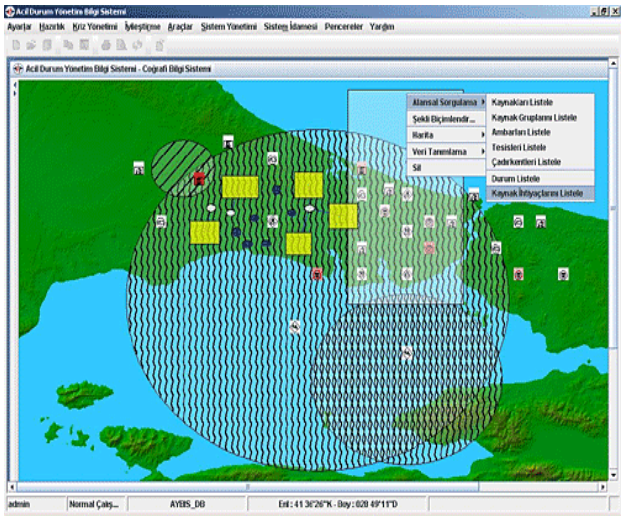
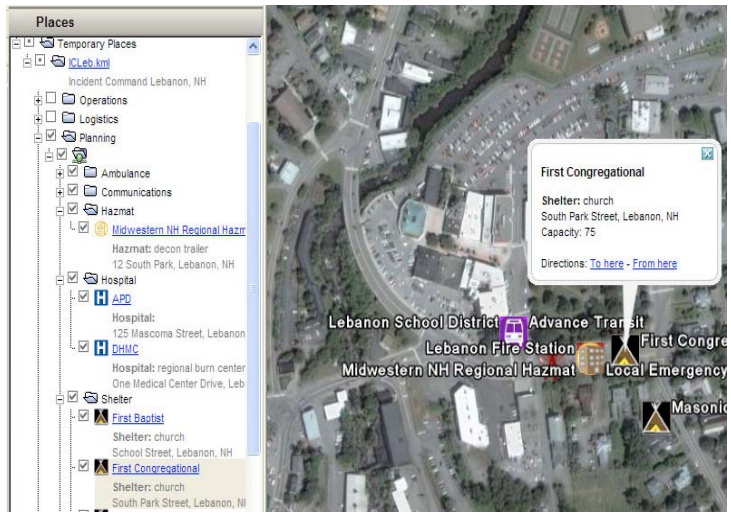
2D User Interfaces in Disaster Management Information Systems

- Desktop based distributed systems by Siemens, MilSOFT, MultiTeam and others
- Emphasis on communication, information gathering and coordination
- Standard 2D User Interfaces
- Development towards 3D



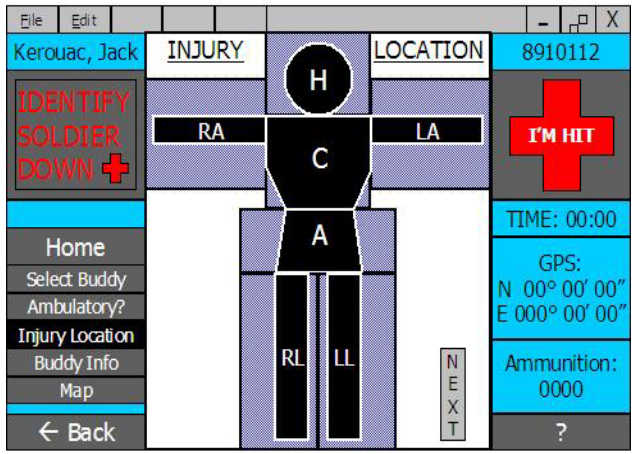


Real-time Mobile Triage

- Definition: Prioritizing the victims according to the severity of their medical condition
- Different Application Areas – battlefield, urban disasters, etc.
- Triage by first respondents vs. Real-time patients monitoring
- A number of prototypes under evaluation – mostly on PDAs
- Data gathering for situation assessment

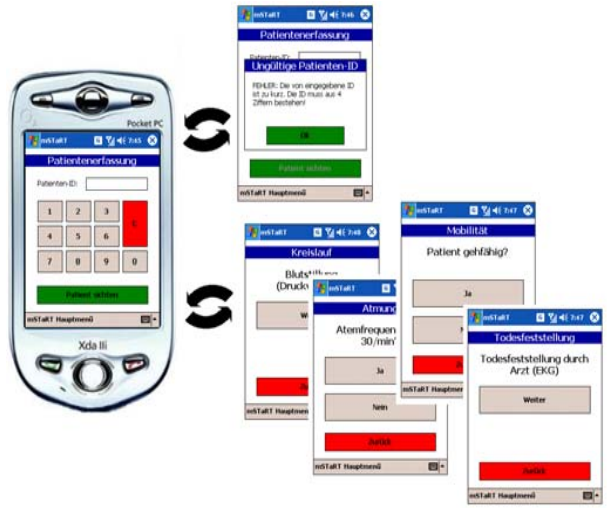
2D User Interfaces for Triage

- US Army ARTEMIS
  - Combat Casualty Care
  - Vital signs real-time remote monitoring
  - Triage strategies analysis
  - One mobile device per soldier
- University of Ottawa
  - Pediatric Emergency Department
  - Rule-based decision model for triage recommendation
  - One mobile device per medic



2D User Interfaces for Triage

- Simon Nestler, TUM
  - Mass casualties emergency
  - mSTaRT Triage algorithm
  - One mobile device per first respondent
  - Extension by GPS planned
- M-AID
  - First aid algorithm performed by a lay person before medics have arrived
  - Mobile phone application



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Advantages of 3D User Interfaces

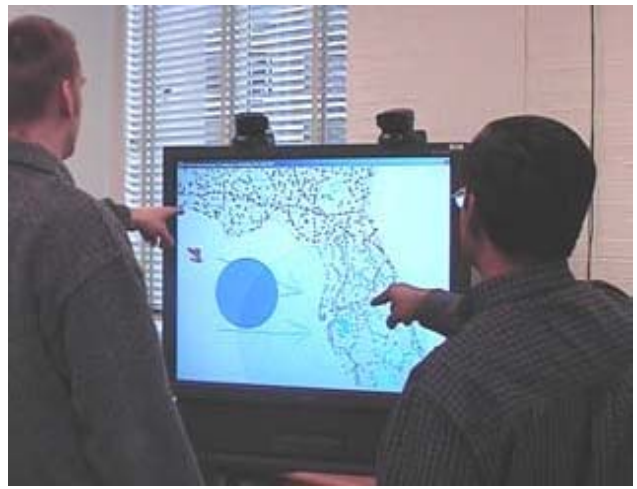
- Lower Abstraction Level – intuitive interaction
- Interaction as in real world environment – spatially integrated ubiquitous widgets
- Allow to concentrate on the given task only
- Multi modal 3D UIs allow more efficient interaction than unimodal

3D UI Concepts - Suitability for Disaster Management

- Travel and Way finding
- Manipulation
- Selection
- Multimodality

3D UIs of Emergency Planning

- VR/AR Training in simulated emergencies
  - Transfer spatial knowledge to the real world
  - Controlled environment (here fire fighting)
  - Various Scenarios
- Multi-user 3D GIS interface
  - Hand gestures from multiple users
  - Response planning
  - Evacuation planning



3D UIs for relief teams command – a Multi modal 3D HCI system

- Natural interaction with a large screen display – tracking of the users hands
- Simultaneous use of speech and gesture
- Selection and issuing of orders

Spatial Orientation/Wayfinding and Disaster Management

- Definition: Knowledge of user location and viewing direction
- Maps
  - You-Are-Here
  - Multiscale
  - Rotation Mapping
- Position Relative to Landmarks or Artificial Landmarks
- Compasses
- Signs
- Trails

Situational Awareness in Disaster Management

- Definition: Spatial Orientation + Spatial Knowledge
- Locating and prioritizing victims
- Awareness of other rescue teams
- Information about current and developing hazards

Auditory Displays In Disaster Management

- Direction Finding
  - Binaural Cues
  - Spectral and Dynamic Cues
- Situational Awareness
  - Navigation
  - Warnings
  - Devices Reading (Geiger Counter, etc.)

Conclusion

- Disaster management is just starting to utilize IT
- Significant potential of 3D User Interfaces for Disaster Management
- Outlook
  - Intuitiveness of interaction but not interfering with main rescue task
  - Enabling Technologies – advanced Head Mounted Displays, Ubiquitous Computing and Sensors, CPU Power etc.