In-hospital navigation system for people with special needs

Eva Lorencová, Miroslav Macík
{loreneva, macikmir}@fel.cvut.cz
INTRODUCTION

- Study in a 300-bed hospital in USA: Staff spends 4500 hours per year by giving navigation instruction to patients and visiting relatives [Colfelt12]

- Seniors and visually impaired are challenged with substantial navigation and orientation difficulties [Fixova14]

- Navigation systems in hospitals are mostly suited to able-bodied users only [Fixova14]
FIELD STUDY

- Biggest hospital in the Czech Republic (3000 beds)
- Problematic indoor and outdoor navigation
- Misleading signposts
- Different names of floors below ground
FIELD STUDY

- Very challenging for visually impaired
- Symmetrical building parts
- Wide open areas without guiding lines
- Lifts without (or damaged) braille labels
USER STUDY

SENIORS (N=7, ~AGE 72)

- Go out independently
- Prefer to visit known places
- Ask hospital staff for assistance
- Combination of health challenges
- Most use simple mobile phones for calling

VISUALLY IMP. (N=5, ~AGE 36)

- Want to lead active live
- Prefer to use regular, learned routes
- Most need assistant for a hospital visit
- Most use mobile phones with physical keyboard
INDOOR NAVIGATION SYSTEMS

- Use special one-purpose devices

[Panasonic10]
INDOOR NAVIGATION SYSTEMS

- Based on smartphones

[Nakajima13]  [Spirit12]  [Ganz11]
INDOOR NAVIGATION SYSTEMS

- Special white cane with RGB sensor

[Fukasawa12]
INDOOR NAVIGATION SYSTEMS

SUMMARY

- User must carry some special device (smartphone at least)
- Systems provide information about position of user
- Systems are not suited to all users
DESIGN PRINCIPLES

- Do not require users to carry any physical objects to be navigated
- Rely on the ability of users to follow simple instructions
- Identify users via biometric technique
- Adapt UIs according to users needs and preferences
NAVIGATION SYSTEM DESIGN

(1) Trip to hospital
(2) Registration/Destination selection
(3) Route overview
(4) Step-by-step navigation
NAVIGATION SYSTEM DESIGN

(0) Visit Preparation
(1) Trip to hospital
(2) Registration/Destination selection
(3) Route overview
(4) Step-by-step navigation
NAVIGATION SYSTEM DESIGN

(0) Visit Preparation
(1) Trip to hospital
(2) Registration/Destination selection
(3) Route overview
(4) Step-by-step navigation
(5) Waiting room management
PROTOTYPES

Smart kiosk

Interactive haptic map

Simple nav. terminal

Identification device

Concept

Lo-Fi

Hi-Fi

Working

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SMART KIOSK

- Hallway next to entrance
- User registration
- Definition of navigation task
- Additional information (reception, lift)
INTERACTIVE HAPTIC MAP

› Helps users to orientate and build mental model of the environment
› Suited for both visually impaired and sighted users
› Information about obstacles, terrain changes
SIMPLE NAVIGATION TERMINAL

- Gives step-by-step navigation instructions
- Additional functionality (WiFi access point, emergency button)
- Haptic map (actual position at the highest point)
SIMPLE NAVIGATION TERMINAL

(0) Idle
(1) Motion Detected
(2) Face Detected
(3) Face Recognized
(4) Advise Given
CONCLUSION

- In-hospital navigation system which
  - Is adaptive
  - Provides step-by-step navigation
  - Does not require patients to carry any device
  - Is not only navigation system (WiFi access points, security system, emergency system)

- Future work
  - System extension (visit preparation, waiting room management)
  - System deployment
Thank you for your attention

TEAM:

- **Staff**
  - Miroslav Macík
  - Zdeněk Míkovec
  - Jan Balata

- **Industrial design students**
  - Ondřej Rakušan
  - Jana Svobodová

- **Students (thesis)**
  - Eva Lorencová
  - Tomáš Flek
  - Albert Riera
  - Kateřina Fixová (past)
REFERENCES


