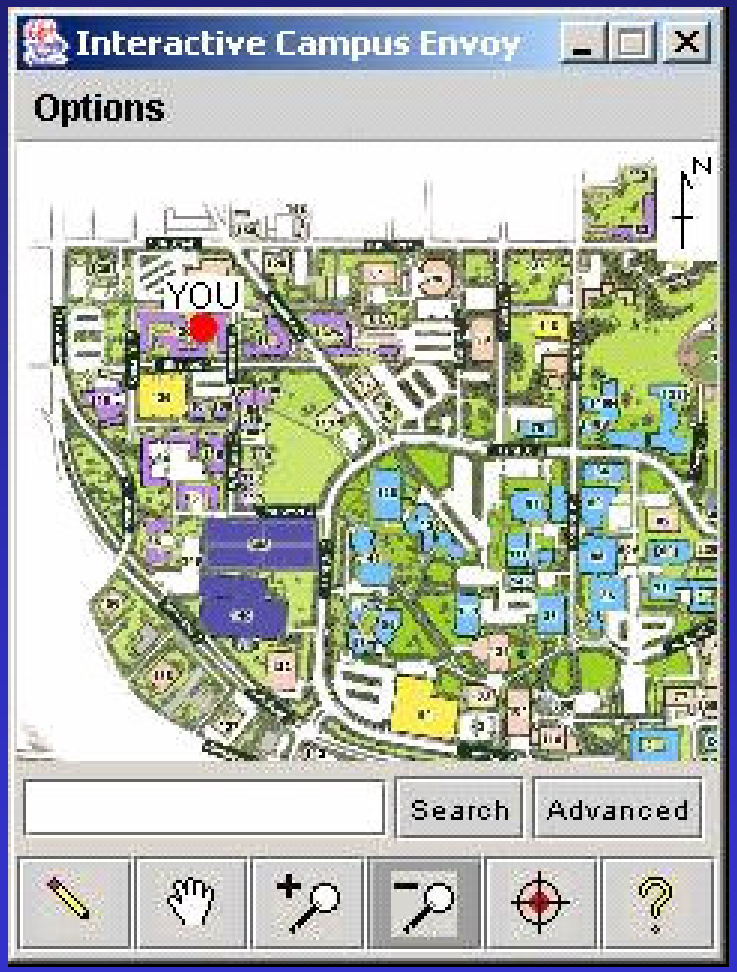
ICE: Interactive Campus Envoy



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Issues for a New System

- How to get from here to there efficiently
- How to locate buildings, people, departments, and events
- How to get provide information for those with differing needs

Interactive Campus Envoy

The User

- Primarily new students & employees, first-time visitors
- Knowledge of the campus varies
- Mobile
- Intelligent
- Self-reliant

Interactive Campus Envoy

The Task

- Locate user's current position
- Determine destination
- Convey information to ICE
- ICE conveys a route back to the user

Interactive Campus Envoy

The Environment

- Named and unnamed roads and paths
- Lack of prominently displayed building names
- Few landmarks and signs
- Outdoor environment
- Presence of other students
- Primarily pedestrians

Interactive Campus Envoy

Implications

- Students learn their way around campus well enough for their basic needs relatively quickly
- Students prefer a PDA based interface, followed by cell phones
- Physical constraints of the users must be taken into account

Design Alternatives
Cell Phone

- Tiles paths
- The symbols and their names
- Interaction through cell phones

Design Alternatives
Cell Phone

Advantages:

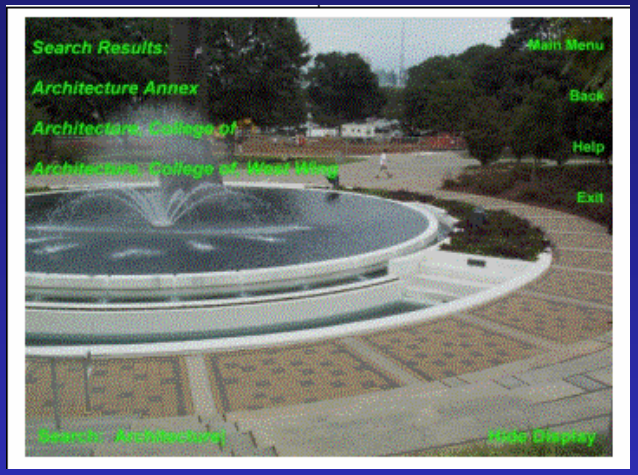
- 66% own cell phones
- A newcomer can easily use the system
- It is fun for users

Disadvantages:

- Initial cost and maintenance
- No persistent connection
- Disneyfication

Design Alternatives
Augmented Reality

- Requires a wearable computer, AR glasses, and GPS and voice recognition capabilities
- Overlays paths on users' view of surrounding environment
- Follow the yellow brick road



Design Alternatives
Augmented Reality

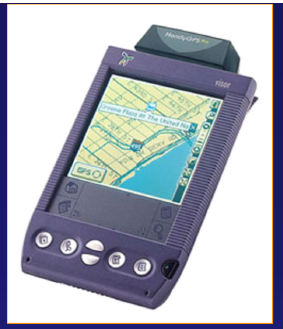
Advantages:

- User can focus on her environment while traveling
- No need to keep referring to a device and then translate its display to the real world

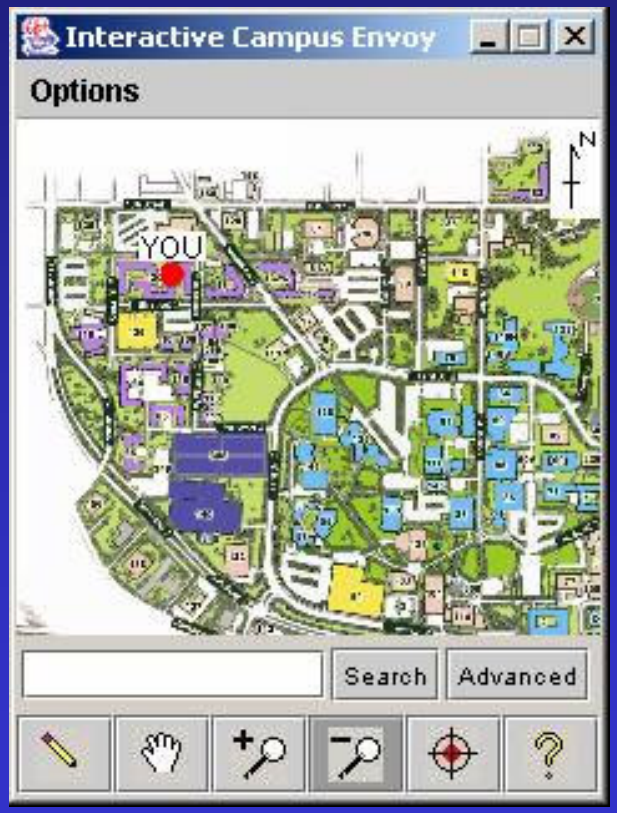
Disadvantages:

- The equipment is very uncommon and expensive
- Requiring a persistent and fast wireless connection
- The device might be distracting

Design Alternatives
PDA



- GPS-equipped, map-based system with functionality similar to MapBlast, MapQuest, and the like
- PDAs will be more common and GPS will be wide spread



Design Alternatives
PDA

Advantages:

- Always available
- Constant positional feedback
- Familiar point-click interface

Disadvantages:

- Assumes a constant, reliable GPS and network connection
- Small screen size

System Prototype

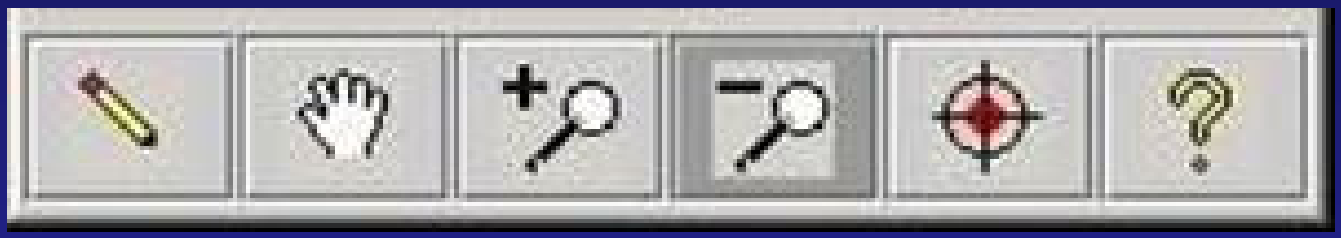
Final Choice: PDA based ICE system

- PDA's visual capabilities offer more information and flexibility than the cell phone
- PDA has more mature technology support and is less expensive than augmented reality
- Prospective users prefer PDA

Functions of System Prototype

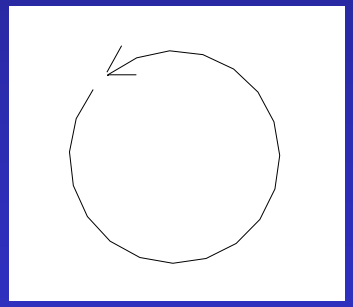
- Automatic route generation based on current position
- Updates your position on map in real time
- Single interface for information on buildings, people, and events
- Advanced route options
- Familiar mapping model

Buttons

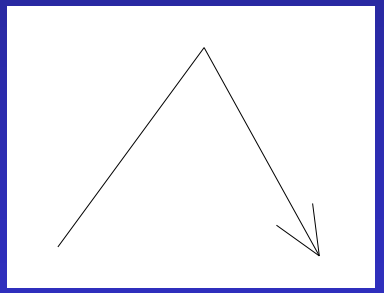


Gestures

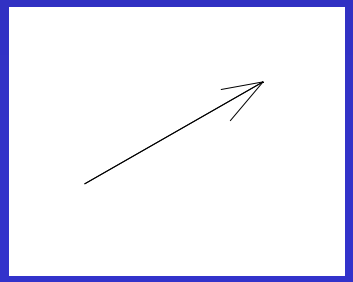
- Zoom in:



- Zoom out:



- Pan:



Evaluation

Hypothesis

- We believe that using the Interactive Campus Envoy (ICE) handheld application will allow users to locate buildings on campus, navigate to locations on campus, and find information about the campus faster than the existing system and that they will prefer it to the existing system.

Criteria

- Learnability
- Usability
- Improvement over GT website map
- The Speed of Buttons vs Gestures

Evaluation
Usability Specifications

- Be able to determine a route from point A to point B using the ICE system in equal or less time than the GT website map.
- Indicate they prefer the ICE system to the website map.
- Report they were able to learn how to use the ICE system within a reasonable amount of time.
- Indicate that gestures would improve speed.
- Indicate that gestures map appropriately to their actions.

Evaluation
Methods

- Participants: Eight Georgia Tech graduate students with varying degrees of familiarity of the campus

- Apparatus: A laptop for Georgia Tech website map and a tablet computer for the ICE prototype

Evaluation
Mixed Experiment

- **Within: ICE vs. GT website map**
  - Perform tasks on each system
  - Order of systems counterbalanced
- **Between: Buttons vs. Gestures**
  - Four participants timed using Buttons
  - Four participants timed using Gestures
  - Groups had similar mapping software and PDA experience

Evaluation
Timed Tasks

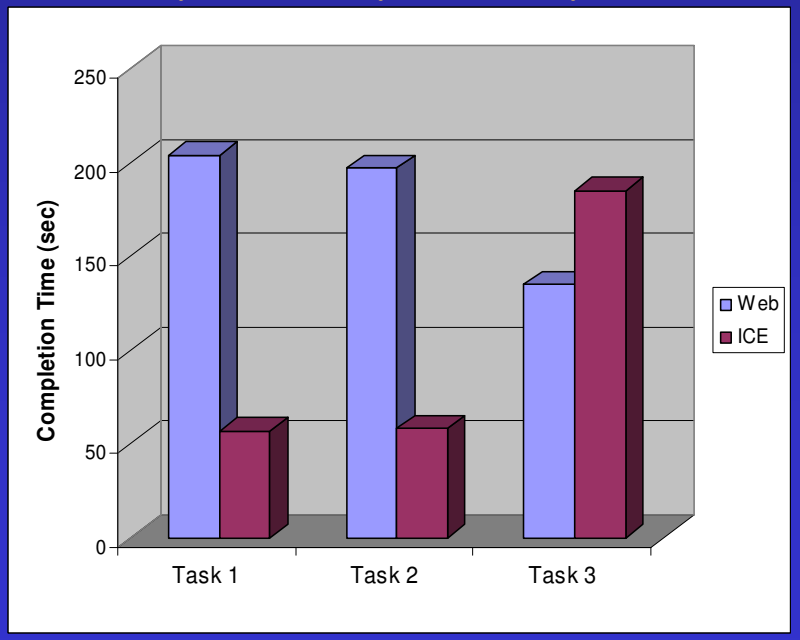
- Tutorial: Explains how to do all actions on the system necessary to complete the tasks
- Task1: Create a well-lit route to a building
- Task2: Retrieve information about a professor and plot a route to his office
- Task3: Pan, zoom, and probe buildings

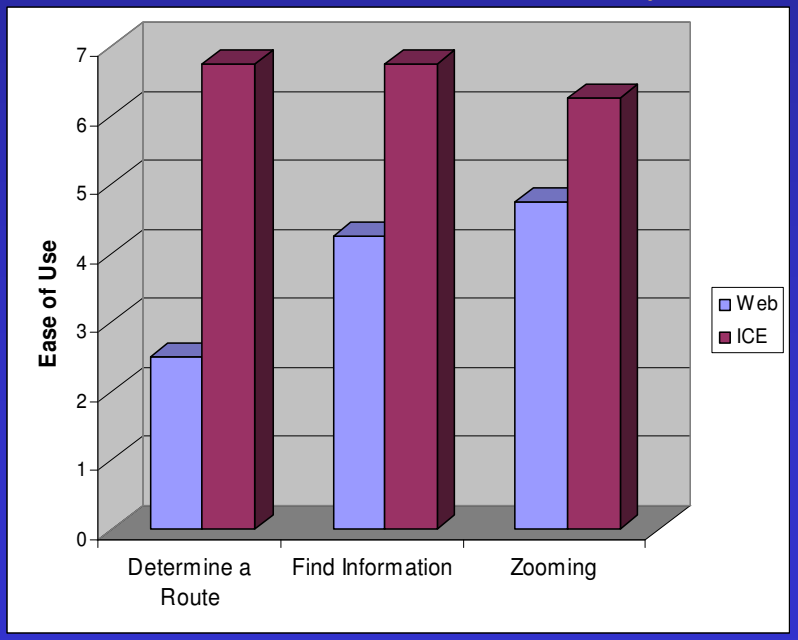
Evaluation
Procedure

- Background Questionnaire
- Tutorial and three tasks on the two systems
- Mini-tutorial and one task using secondary ICE interaction method
- Post-test questionnaire and interview

Evaluation Results

- Participants found routes faster with ICE
  - Tasks 1 & 2 were completed 4 times as fast
- Participants thought ICE was easier to use
- All participants preferred ICE to the web map





Evaluation
Results

- Participants reported learning ICE took an appropriate amount of time
- Participants found ICE's gestures appropriate for their actions
- Tasks using gestures were completed faster than tasks using buttons
  - 7 of 8 Participants preferred the interaction method they learned second

Evaluation
User Comments

- The good…
  - Automatic creation of routes
  - Displays user's current location
  - Single database includes buildings, departments, people, and events
  - Allows users control over the display
  - Routing options

Evaluation
User Comments

- The bad…
  - Display is small
  - Search result screen does not select first result
  - Pop-up menu disappears when easing up on stylus
  - Lack of error message when no results returned
  - Zoom-in gesture did not recognize all circles

Conclusion
Future Improvement

- Language of the system help screens
- Automatic selection of the first result of the "results" page
- Notification for "no results found"
- Better gesture recognition
- Links from information pages to web pages
- Better "Center-user" icon
- Lower the zoom in limit

Conclusion
Future Research

- Evaluate users following the routes
  - How does a user determine in which direction to start walking?
  - How should the interface respond if a user walks off course?