

Non-Speech Audio

Area overview

Four Areas

Evaluation

Challenges/issues

Area overview

1. Will it be heard?
2. Will it be identified?
3. Will it be understood?

Four Areas

Uses of Non-Speech Audio

- Beeps 'n' Bops
- Peripheral Awareness
- Sonification
- Navigation

Four Areas

Beeps 'n' Bops

- Warnings, alerts, status messages
 - Status indicators
 - Error messages
 - Alarms
- Will they be heard, identified, and understood?

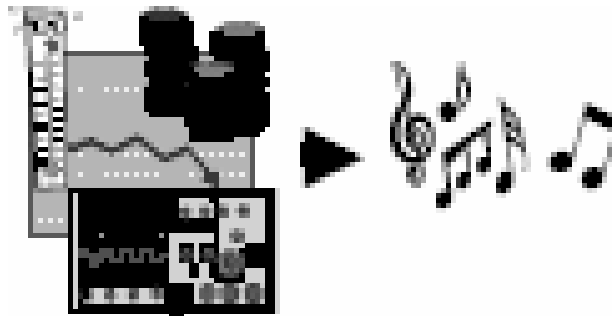
Peripheral Awareness

- Using sound to communicate information about the environment
- Compare to information visualization
 - Web server traffic
 - Weather outside
 - Traffic
 - Activity level of colleagues
 - Status of resources (printers, etc.)

Four Areas

Sonification

- “Auditory display of quantitative information”
- Compare to visualization
 - Weather data Demo: Nebraska
 - Stock market data Demo: DJIA
 - Election results Demo: Florida 2000
 - Factory process monitoring and control
 - Surgical assistance Demo: Tactical Surgery
 - Brainwave sonification Demo: Paul’s brainwaves



Sonification

Sonification in Education

- Math & science are largely visual
- Blind students are shut out
- Develop a system to turn data into sound
- Virtual Physics Lab
- “Auditory Graphs”
 - ❖ Demo: Sonification Sandbox

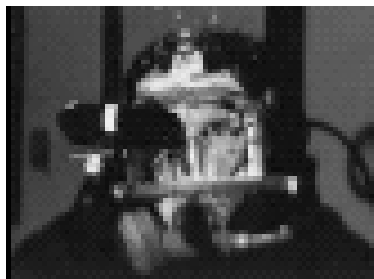
Sonification Design Issues

- Mapping
 - ❖ Data dimension --> Display
 - Dollars --> pitch (or distance from x-axis)
- Polarity
 - ❖ Increasing pitch = increasing or decreasing \$?
- Scaling
 - ❖ Double the pitch = double the \$?
- Context
 - ❖ Equivalent to tick marks, axes, trend lines
- Interaction techniques

Four Areas

Navigation

- Getting around, for those who cannot look or cannot see
 - ❖ Persons with visual impairments
 - ❖ Military applications



Evaluation

- **How do we evaluate these technologies?**
 - ❖ **Navigation effectiveness**
 - ❖ **Situational awareness**
 - ❖ **Movement speed, efficiency**
 - ❖ **Comfort, satisfaction**
 - ❖ **Safety**
- **Key: Do they help the user to safely accomplish specific tasks?**



Other Issues

- **Interaction with the system?**
 - ❖ **Input (speech, text, other)?**
 - ❖ **Output (auditory display design)?**
- **Output devices**
 - ❖ **Headphones block ambient sound**
 - ❖ **Other systems are either bulky (speakers, audio spotlight), or poor quality (bone phones)**
- **Standards, programming tools, awareness**
- **Training and practice**
 - ❖ **Smith & Walker, 2002**



More Practical Issues

- **Human auditory perception**
 - ❖ **Abilities, limitations**
- **Audio-visual integration**
 - ❖ **e.g., McGurk effect**
- **Technical issues**
 - ❖ **File formats (wav, aiff, mp3, acc/mp4)**
 - ❖ **Sampling rates, frequency responses**
 - ❖ **Output variability (speakers, phones, etc.)**
 - ❖ **Programming hooks**

Interested in More...

- **Sonification Lab**
 - ❖ **<http://sonify.psych.gatech.edu>**
- **Bruce Walker**
- **Projects in all these areas, plus other “non-traditional interfaces”**