Sonifying Cyber-Security Cues

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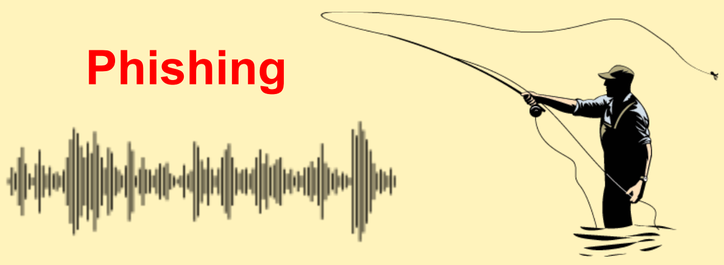
http://www.myweb.ttu.edu/asiamina/research_files/Sonification.html

Research Objectives

- Identify the security concerns of users who are visually impaired
- Design appropriate sonification to present security warnings and cues
- Study the emotional effects of sounds on users who are visually impaired

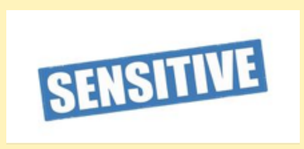
Phishing



Casting a Fishing Rod

Malvertising

Dropping a Bomb



Form-Filling

Typing on a Keyboard

Sonification Challenges

- Design must convey the warning at different levels of danger to users
- The use of screen readers with Web browsers presents contents via speech sounds and difficult to comprehend
- Visual cues can be lost when screen readers translate them to speech sounds

Earcon-based (Natural Sounds) Sonification Approach

Advantages of Using Natural Sounds
- Representational
- Easy to remember
- Easy to comprehend

User-Centric Information to Convey
- The "concept" or "meaning" of threats
- The "consequences" of threats
- The "actions" that should be taken in response to threats

Usability Testing

Sonified Three Security Threats / Cues

- Phishing
  - Casting a Fishing Rod
- Malvertising
  - Dropping a Bomb
- Form filling (typing sensitive information)
  - Typing on a Keynoard

Sonification Procedure

- **The Creation of Sonification:**
  - **Choosing a sonification approach**
    - ✓ **Representational (i.e., natural Sounds)**
  - **Choosing sounds to represent the intention and meaning**
    - ✓ **User Centric**

Results

Participants:
5 individuals who were visually impaired

Threat	Sonification	Correctly Identified	Average Pleasantness	Average Urgency	Average Conspicuity	Rated Best	Correctly Remembered
Phishing	- Casting a Fishing Reel	80%	2.4	3.6	4.4	60%	40%
	- Breaking Glass	0%	2.8	4	4.2	40%	60%
	- Opening a Rusty Door	0%	2.4	2.8	3	0%	60%
Malware Download	- Dropping a Bomb	40%	3	4.2	5	20%	80%
	- Pouring water	20%	3.2	2.8	4.4	0%	40%
	- Sounding a Siren	60%	2.6	4.6	4.8	80%	60%
Form-Filling	- Typing on a Keyboard	40%	3.4	3	2.8	100%	80%
	- Bubbling Water	20%	3.4	3	4	0%	80%
	- Playing a Slot Machine	20%	3.2	4.4	5	0%	80%

Interested in meeting the PIs? Attach post-it note below!

National Science Foundation
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The 3rd NSF Secure and Trustworthy Cyberspace Principal Investigator Meeting
January 9-11, 2017
Arlington, Virginia