



# Enhancement of GUIs: Audio Extensions for Blind Users for a Better Human-Computer Interaction

Wersényi György

SZÉCHENYI ISTVÁN UNIVERSITY, Department of Telecommunications, wersenyi@sze.hu

## Abstract

Human-Computer interaction is usually based on a graphical user interface (GUI) and some auditory warnings. Blind users do not benefit from GUIs, therefore, a sound-based extension is being developed to enhance accessibility. In a framework called GUIB (Graphical User Interface of Blind Persons) a collection of special sound samples - such as auditory icons, earcons, spearcons, auditory emoticons - were developed and based on the target group's opinion they were categorized, selected and evaluated. The most frequently used programs, icons, functions and events of a computer screen were extended or replaced by auditory events. Sounds of everyday life, specially compressed and speeded up speech samples are there to link visual representations to auditory events. Instead of speech, these signals are language independent, easy to learn, fast to use and sometimes even funny and amusing. On the other hand, spearcons (speech-based earcons) can be created easily for different languages using MATLAB codes (current database includes Hungarian, English and various German versions). Results show that blind users welcome this idea and sighted users may also benefit from having auditory feedbacks and warnings. Future works includes implementation of the sound.

GUIB project: Graphical User Interface for Blind Persons  
50 blind and 100 sighted users

The most important functions and applications were selected and results were compared. (ICAD 2007, 2008, 2009 papers)

Second part of the investigation included collecting of auditory representations (auditory icons, spearcons etc.), mapping with visual information and evaluation with the target groups.

## Introduction

## Auditory signals

### Auditory icons

- Easy to interpret, to learn, to use
- Not every event has a good auditory representation

### Earcons

- Harder to use

### Spearcons

- Compressed speech samples, often better than earcons and auditory icons

### Auditory emoticons

- Emoticons are widely used in e-mails, chat and messenger programs, forum posts etc.
- Non-verbal human voice samples to represent additional emotional content.
- Sometimes extended and combined with other sounds in the background. They are related to the auditory icons the most.
- Auditory emoticons – just like the visual emoticons - are language independent and they can be interpreted easily.

Auditory Emoticon	Visual Representation	Description	Filename (Female)	Filename (Male)
Smile	😊	chuckle	Smile_f	Smile_m
Laughter	😄	laughing	Laugh_f	Laugh_m
Wink	😉	Short "poking" sound and chuckle	Wink_f	Wink_m
Mock (tongue out)	😜	Typical sound of tongue out	Tongue_f	Tongue_m
Surprise	😲	"oh"	Surprise_f	Surprise_m
Anger	😡	"grrrrrr, mumble"	Anger_f	Anger_m
Perplexed, distracted	😞	"hm, mumble"	Puzzled_f	Puzzled_m
Shame, "red face"	😳	"yum, eh-eh"	Redface_f	Redface_m
Shyness, sorry	😇	A sad "oh"	Sad_f	Sad_m
Crying, whinger	😭	Crying	Cry_f	Cry_m
Kiss	😘	Sound of kiss on the cheek	Kiss_f	Kiss_m
Disappointment	😞	"oh-hm"	Dis_f	Dis_m

## Signals and evaluation

A length of about 1,5 sec.

Normal sounds that have to be played back once; and sounds to be played back repeated (in loop).

Sound files were recorded or downloaded from the Internet and were edited by Adobe Audition software in 16 bit, 44100 Hz mono wave format.

A collection of wave data of about 300 files was categorized, selected and evaluated.

If there was no definite winner or no idea at all, a spearcon version was used (e.g. for „Acrobat“).

<http://vip.tilb.sze.hu/~wersenyi/Sounds.zip>.

## Summary

Fifty blind and hundred users with normal vision participated in a survey in order to find the most important and frequently used applications, and furthermore, to create and evaluate different auditory representations for them.

These auditory events included auditory icons, earcons, spearcons of German and Hungarian language.

Furthermore, a new class of auditory events was introduced: the auditory emoticons. These represent icons or events with emotional content, using non-speech human voices and other sounds (laughter, crying etc).

The previously selected applications, programs, function, icons etc. were mapped and sound samples are being evaluated based on subjective parameters.

Both target groups liked and welcomed the idea and representation method to extended and/or replace the visual content of a computer screen.

Other sounds	Description	Filename
Moving the mouse (cursor)	Some kind of "ding" (loop)	Mouse_(loop)
Waiting for... (sound-glass turning)	Ticking (loop)	Ticking_(loop)
User - intervention, pop-up window	Notification sound	Notify
Border of the screen	Some kind of "ding"	Ding (Border)
Scrolling	Increasing and decreasing freq.	
Menu navigation	Spearcons with modifications	
System clock	Speech	S_SystemClock
Start menu	Speech, speech	S_StartMenu

Application	Description	Filename
Internet browser (1)	Door opening with keys	Brower1
Internet browser (2)	Knocking and opening a door	Brower2
E-mail client	Bicycle and P.O. box	Mail
Windows Explorer	Speech	S_Explorer
My Computer	Computer start-up loop and fan noise	My Computer
Acrobat	Speech	S_Acrobat
Recycle Bin	Point of a thin can with the recycle bin	Recycle
MS Word	Speech	S_Word
CD/DVD burning	Burning flame	Burn
Movie/music player (MP3 MediaPlayer)	Classic movie projector	Projector
Compressors (ZIP, RAR)	Extruding machine	Press
Virus/spam killer	Coughing and "sahhh"	Cough
MSN Messenger	Speech	S_Messenger
Control Panel	Speech	S_ControlP
My Documents folder on the desktop	Speech	S_MyDocs
Search for files etc.	Seeking and searching with human voice (loop)	Search_(loop)
JAWS/TTS/Screen Reader appl.	Speech, speech	

Events, Functions	Where?	Visual Representations	Description	Filename
Home button	Internet Browser		Doorbell and dog barking	Homebutton
Arrow back	Internet Browser, My Computer		Reverse a car with signalling	Backarrow
Arrow forward	Internet Browser, My Computer		Starting a car	Forwardarrow
Arrow up	My Computer, Explorer		Car engine RPM increasing	Uparrow
Reveal - Re-hide actual page	Internet Browser		Breaking a car not start-up	Reveal
Typing, entering URL	Internet Browser		The sound of typing on a keyboard	Keyboard
Open new / close Browser	Internet Browser		Opening and closing sound of a window window	Window_open Window_close
Search/find text on this screen/document	Internet Browser, E-mail, Documents		Seeking and searching with human voice (loop)	Search_(loop)
Save link or image	Internet Browser		Speech	S_SaveImageAs S_SaveLinkAs
Bookmarks, Favorites	Internet Browser		Turning the pages of a book with human sound	Book
Printing (action in progress)	Everywhere		Sound of a dot-matrix printer	Print
Cut	Documents, My Computer, Browser		Cutting with scissors	Cut
Paste	Documents, My Computer, Browser		Pasting with a brick, whistle and can chatter	Paste
Copy	Documents, My Computer, Browser		Sound of a copy machine	Copy_(loop)
Move	Documents, My Computer, Browser		Wooden box pushed with human whispering sound and cutting with a scissor and putting with a brush	Move1 Move2
Delete	Documents, My Computer, Browser		Pushing the roller	Delete
New Folder	My Computer		Speech	S_New
New mail, create/compose new message	E-mail		Burbling and clumping	Composemail
Reply to a mail	E-mail		Breath and stamp (noise)	Replymail
Forward mail	E-mail		Movement of paper on a desk	Forwardmail
Save mail	E-mail		Sound of save and bicycle bells	SaveMail
Send mail	E-mail		Bicycle bell and by-bye sounds	Sendmail
Addressbook	E-mail		Turning the pages with human sound	Book
Attachment to a mail	E-mail		Stapler	Attach
Open	Documents, Files		Zip fly up or opening beer can	Zip_up Beer_up
Save	Documents, Files		Locking a door with keys	Save
Save as...	Documents, Files		Locking a door with keys with human "beep"	Save_as
Close	Documents, Files		Zip fly down or squaring beer can	Zip_down Beer_down
Resume	Documents, Files		Speech	S_Resume
Reverse from the recycle bin	Recycle bin		Original "paper sound" of MS Windows and human cane	Recycleback
Empty recycle bin	Recycle bin		Original sound of MS Windows (paper sound)	Recycle
New Document (create)	Documents		Speech	S_New
Text Formatting tools	Documents		Speech	S_Fountain S_Fountain S_Bold S_Italic S_Underline S_Spelling
Mark/select (text)	Documents, Browser, E-mail		Sound of magic marker pen	Mark

