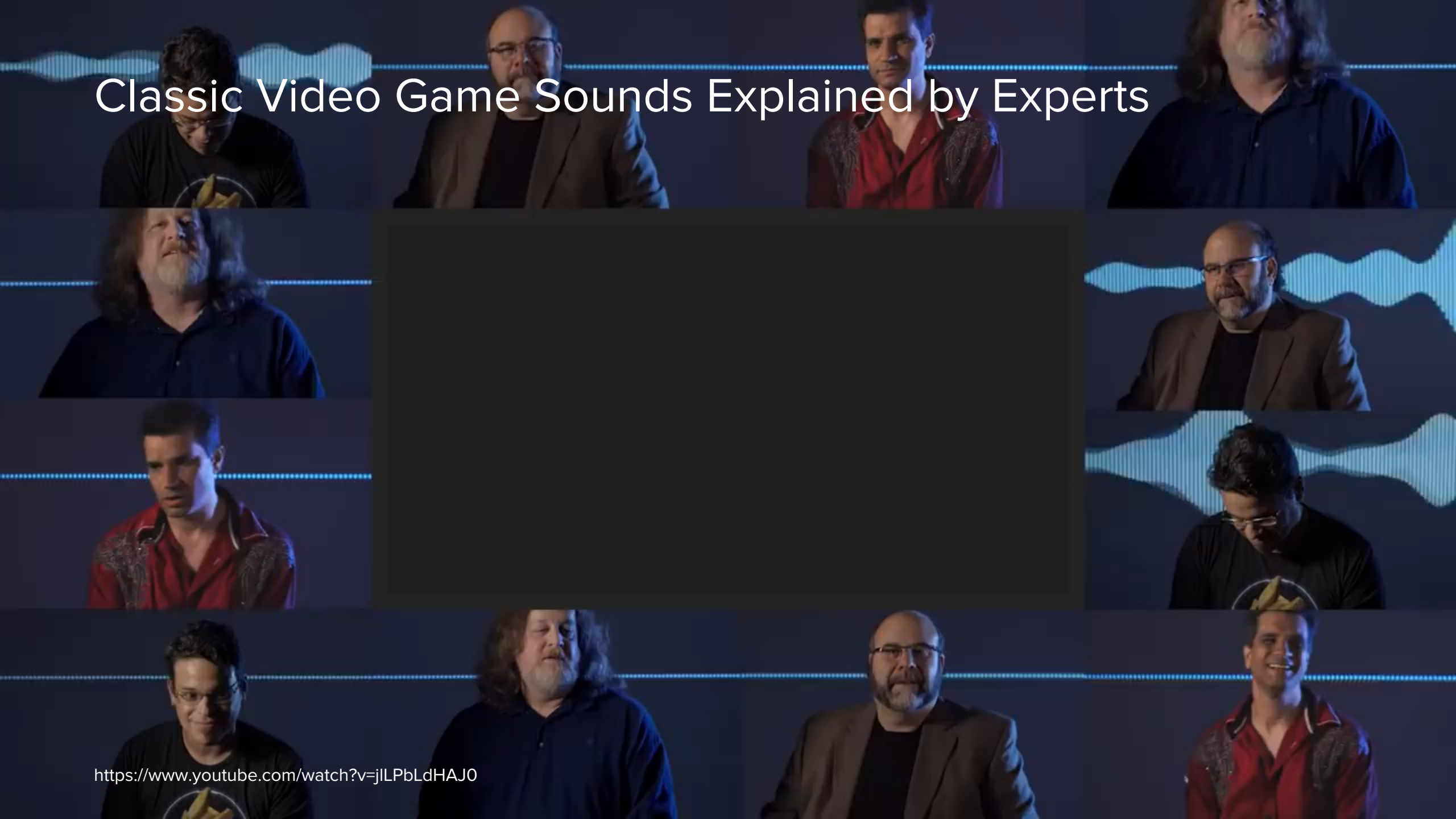
Auditory Displays

Classic Video Game Sounds Explained by Experts



https://www.youtube.com/watch?v=jILPbLdHAJ0

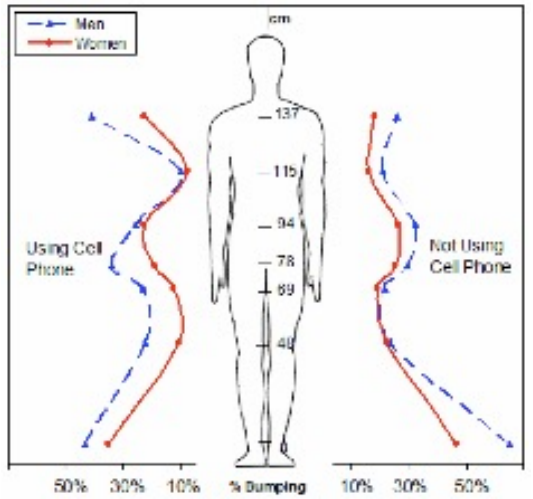
Ben Burtt Sound Design Star Wars | Lightsaber Sound

https://www.youtube.com/watch?v=tZj1mYLC7h0

What is an Auditory Display?

"The use of non-linguistic sound to represent information of all kinds" ("Sonification Report")

Special strengths:
- Providing information when visual attention is elsewhere
- Focusing the user attention
- Navigation, orientation (eg in menus)
- Relieving cognition through multimodality,
- Increasing efficiency through redundancy
- Non-verbal sounds can work universally like icons (eg sound symbols in movies!)



Alerts, Notifications, Alarms

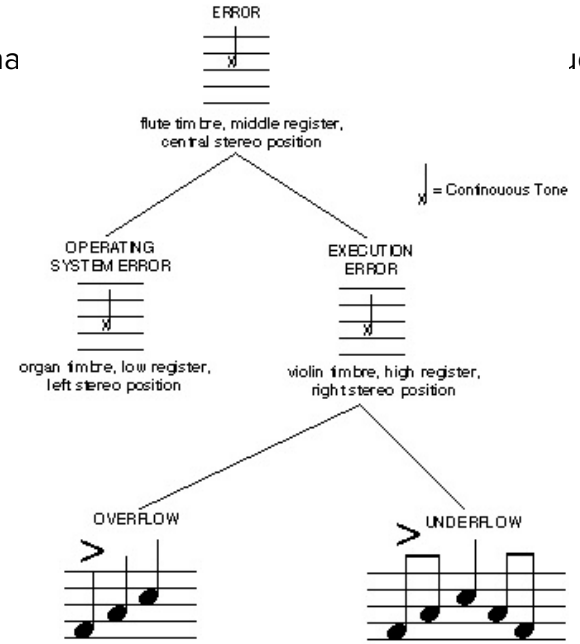
- Examples?
- Sound shows that something happened or will happen
- Little information included: "It burns", but not "850 degrees, 3rd floor" etc.
- Notification, Alarm,
- Statusinformation
- Processinformation
- Often not enough to cope with the increasing complexity of applications. Follow-up concepts are "Auditory Icons" and "Earcons"

Auditory Icons

- Icon = Abstract representation of a "real" object, refers to this by "similarity"
- Use of "everyday sounds"
- Based on auditory experiences
- Metaphorical, reference
- Examples
  - Camera
  - Trashbin
- Advantage: recognizability, association
- Physical Models (see paper jam)

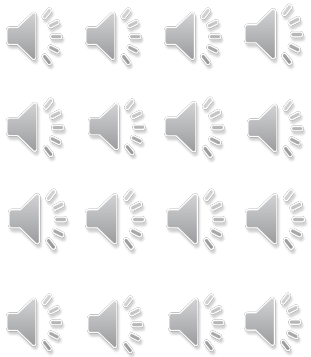
Earcons

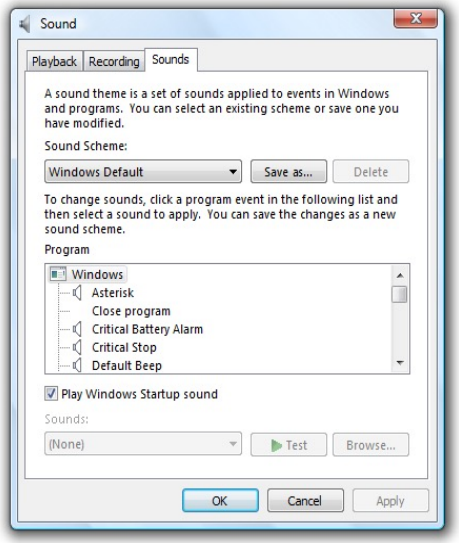
- Earcons: abstract, tonal, often synthetic sound events, "musical" (1, 2, 3)
- Guidelines the creation: (siehe auch http://www.dcs.gla.ac.uk/~stephen/earcon_guidelines.shtml)
  - Tone: multiple harmonies, different instruments
  - Pitch: unsuitable for absolute determination as the only parameter. Helps in identifying when complex and even combined with rhythm.
  - Rhythms are most effective when the number of notes differs.
  - If rhythms are too similar, even different tones can not be optimally distinguished.
  - Duration must be matched to interaction sequence
  - Volume usually unsuitable for differentiation, except for foreground / background. Limit dyna udibility



Ex1: Systematics

- Comprehensive and flexible infrastructure for employing sounds
- Ensuring minimal consistency with styleguide
- Skins and sound schemes ensure minimal consistency and quality while providing customizability
- Examples
  - Logon
  - Battery critical
  - General notification
  - Print complete





Ex2: Systematics, Branding

- All functional sounds are complex and detailed and share common design quality.
- Every sound is a “brand” sound
  - “Whilst composing these sounds the most important thing was to create a strong character and personality for the evolving brand and medium.” (http://www.soundtree.co.uk)

- Examples:
  - Sign in
  - Incoming message
  - Ringtone
  - File send error

Version 5

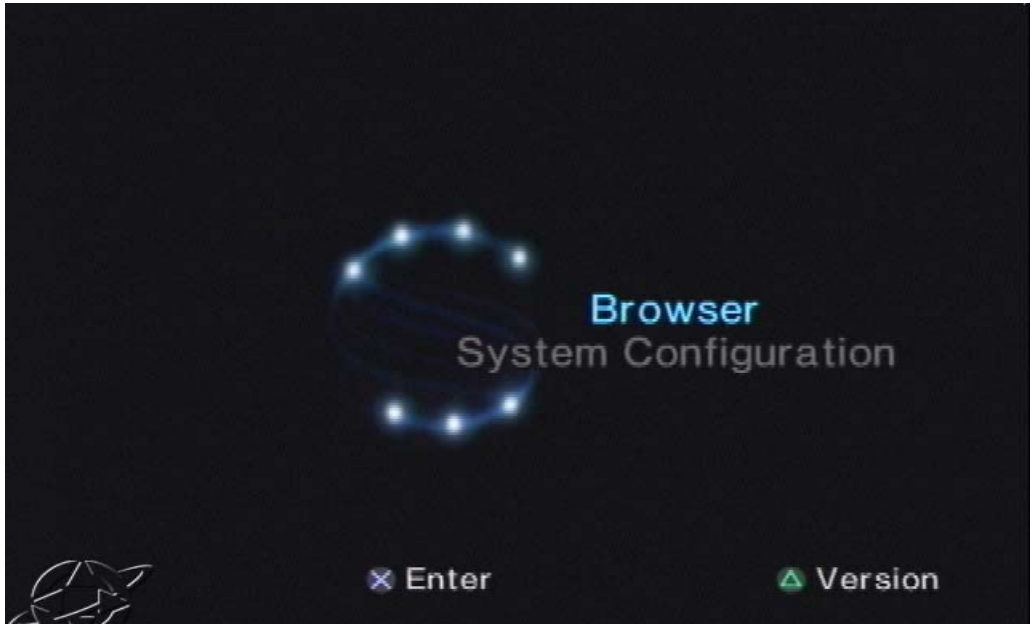
Ex3: Emotionalisation, Welcome

- Sounds and animations associated with the device or service activation
- May be used to “bridge” loading / update processes
- General user expectation from game consoles, adopted by Google TV, Apple TV and others
  - Apple Boot Sound legacy
  - Apple TV Welcome Movie

Ex4: Atmosphere

- Long and subtle background atmosphere

- Functional sounds (menu navigation) embedded in a sonic environment



Ex5: Diversity, Design Refresh

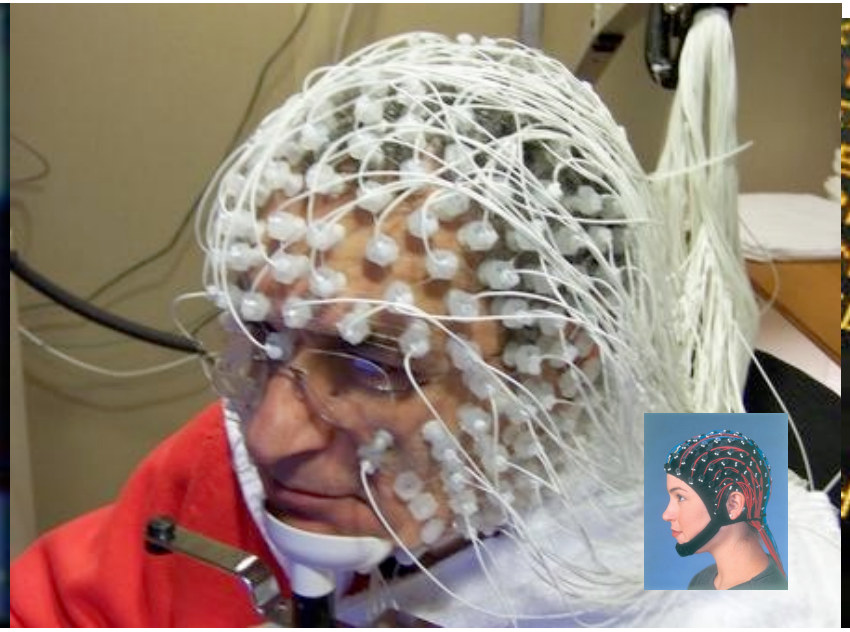
- Comprehensive sound use
- Startup and functional sounds with variations
- Sound redesign for significant updates

Before update

After update

Sonification: Data-based sonification

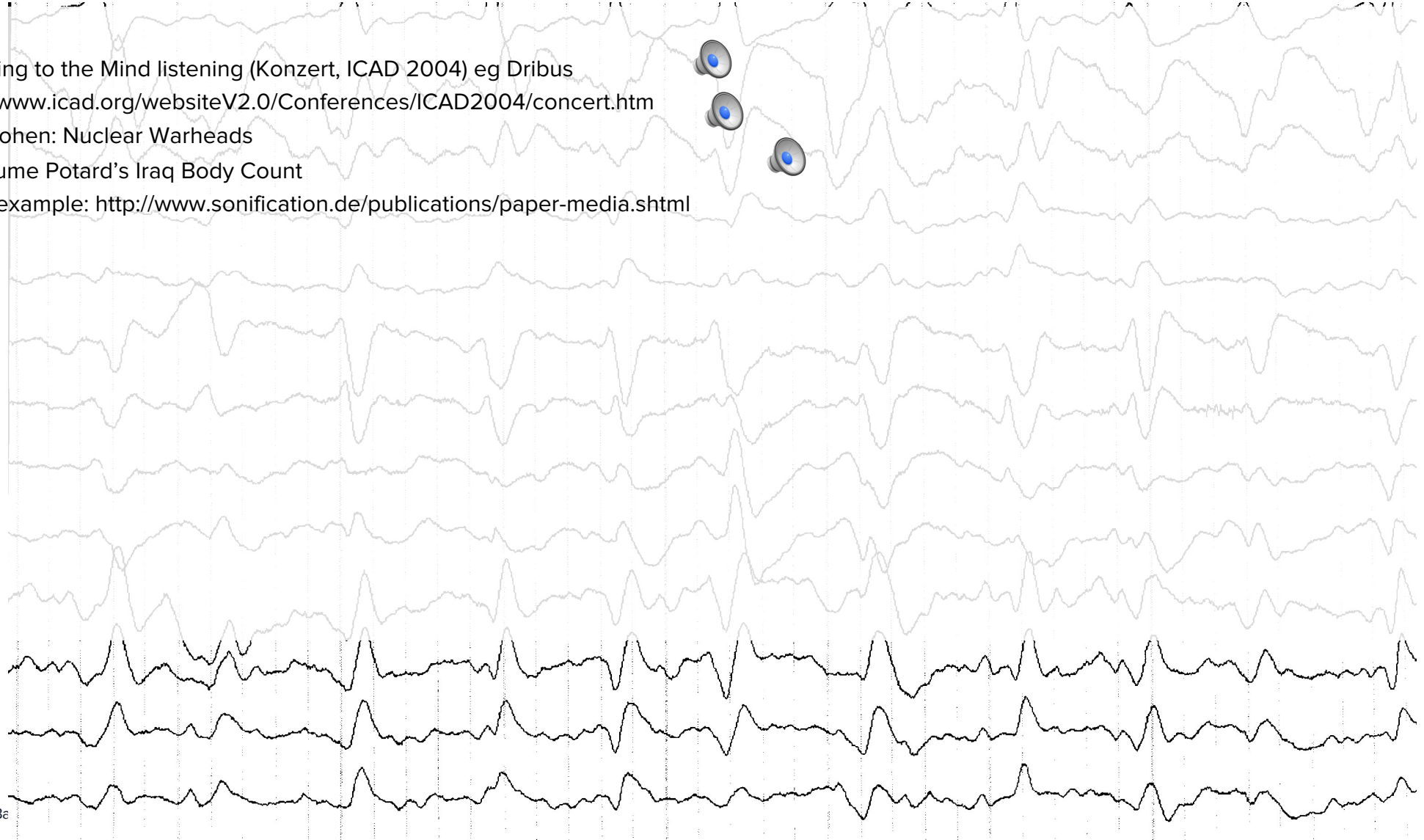
- Data-based sonification: data relationships are mapped to tonal parameters. "Auditory Graphs"
- Up to 8 parallel streams can be displayed!
- applications in medicine, biometrics, geology, economic analysis, scientific presentation in general ...



Sonification: Data-based sonification

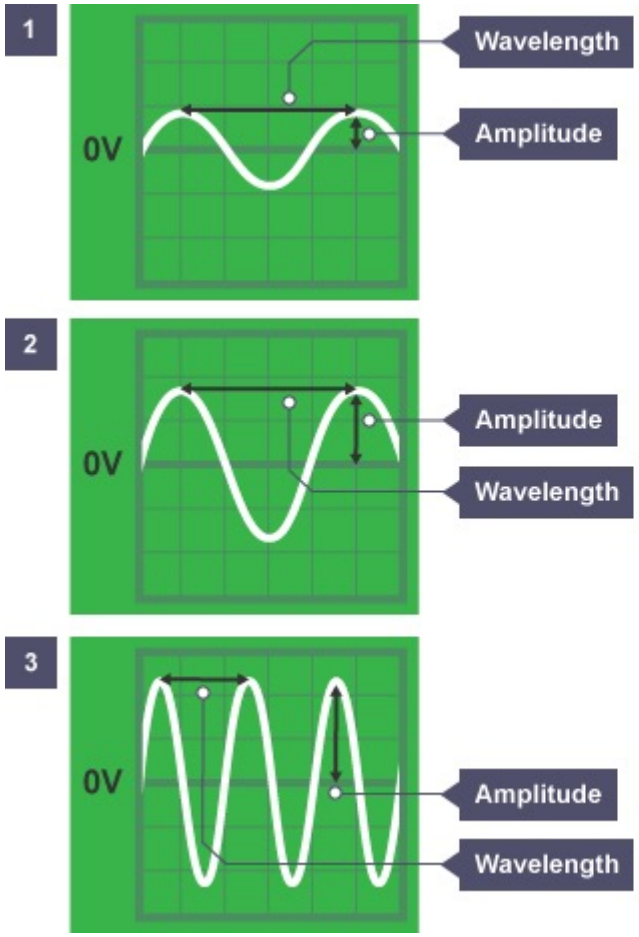
Examples

- Listening to the Mind listening (Konzert, ICAD 2004) eg Dribus
  http://www.icad.org/websiteV2.0/Conferences/ICAD2004/concert.htm
- Ben Cohen: Nuclear Warheads
- Guillaume Potard's Iraq Body Count
- More example: http://www.sonification.de/publications/paper-media.shtml



Basic physical properties

- To create sound, vibration is needed
- To generate vibration, a physical force on an elastic object is needed
- A resonator transmits and "shapes" the vibrations into the air
- The type of material and the mass affect the vibration behavior
- Basic elements of the sound: Amplitude, period, frequency (f)
- Propagation speed "c" in the air? = About 343m / s



https://www.bbc.co.uk/bitesize/guides/zdc6fg8/revision/2

Description of acoustic events

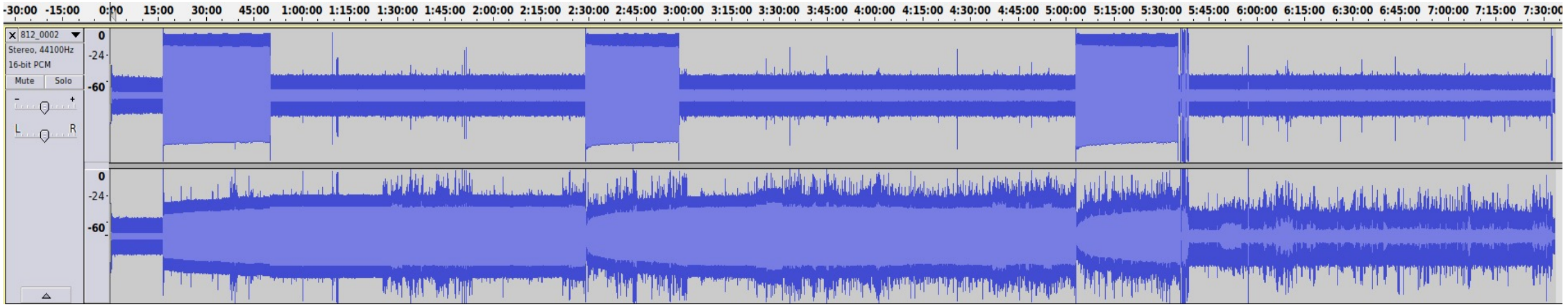
- pitch -> frequency:

  80hz, 160hz, 320hz, 640hz, 1280hz,
  2540hr, 5080hz, 10160hz

- volume -> amplitude

  z.B: 0dB, -6dB, -12dB

- Timbre -> frequency spectrum

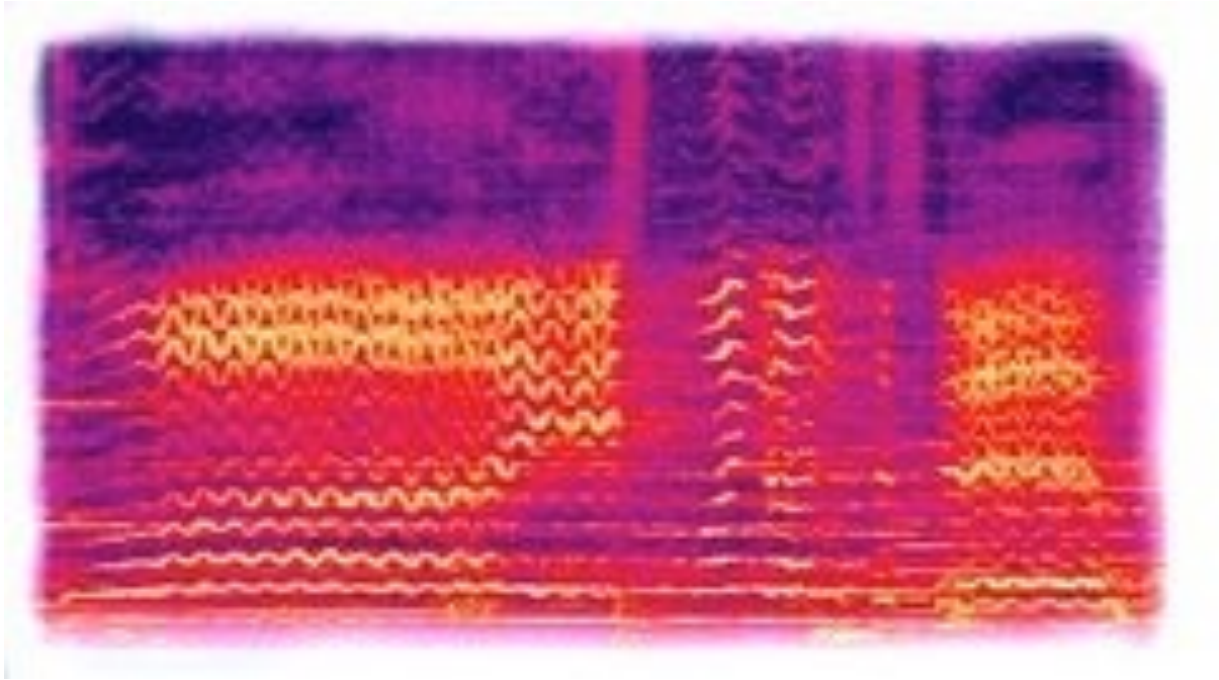


More about timbre

- Makes two sounds of the same pitch and volume distinguishable
- Is determined by the frequency spectrum
- Can change over time
- Changes time-dependent! (eg backwards played piano or "white noise" with "wavy" volume curve)

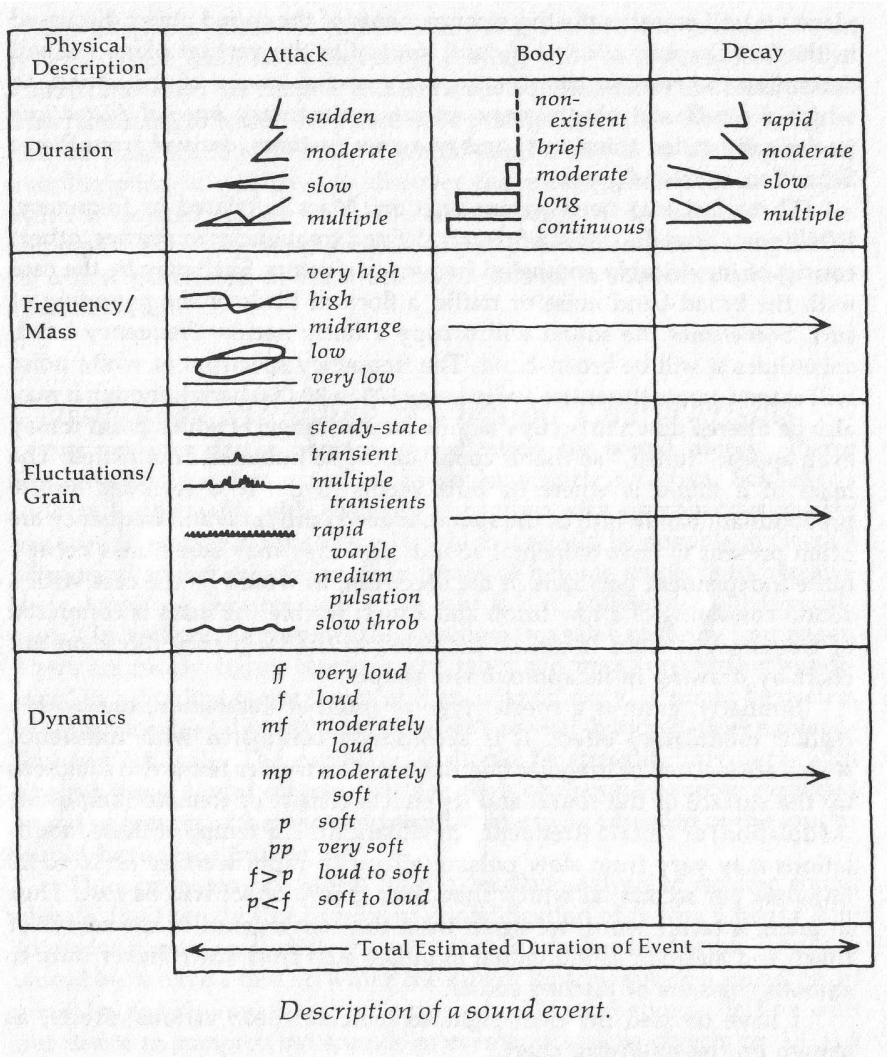
white noise...

waves

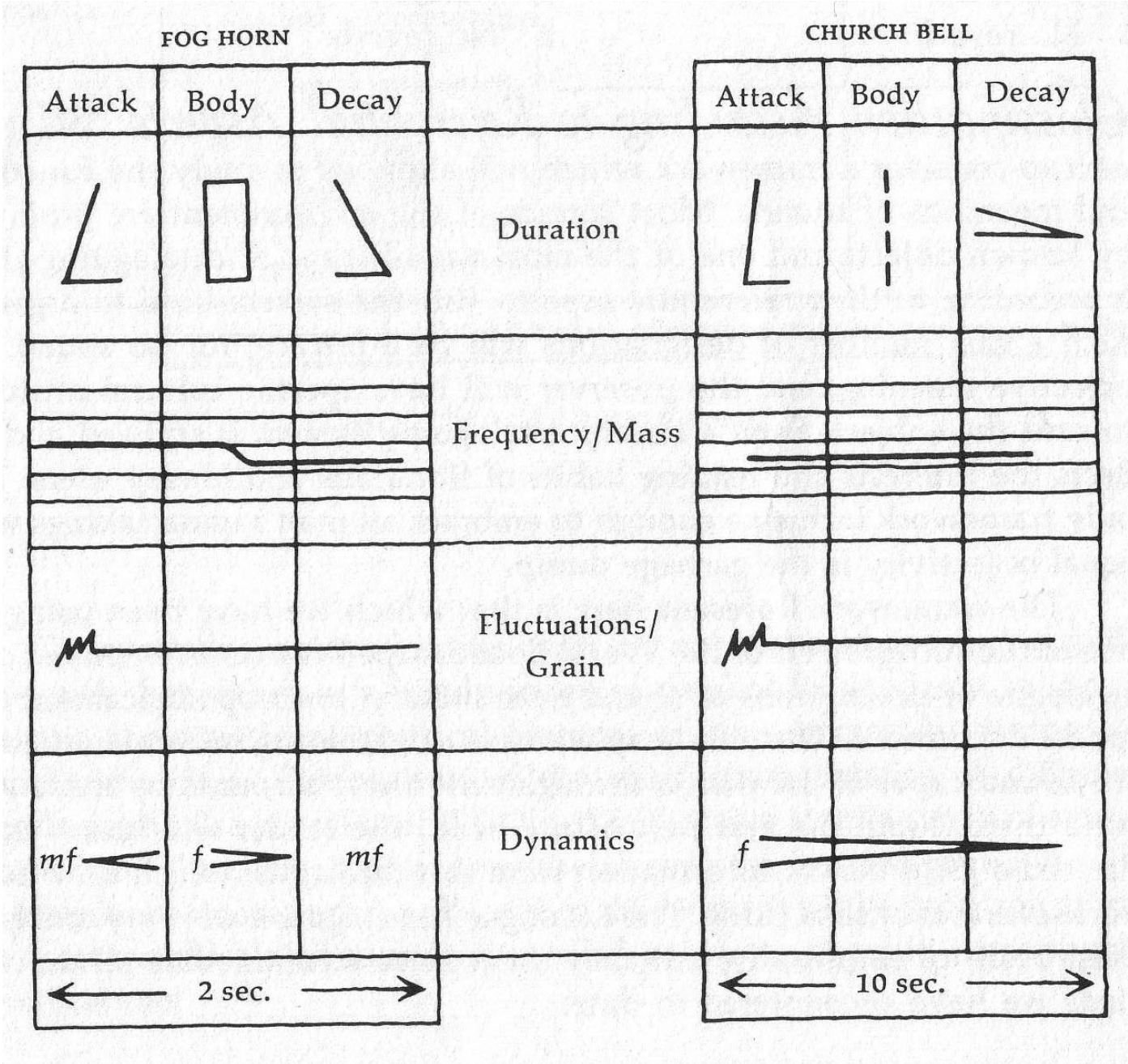


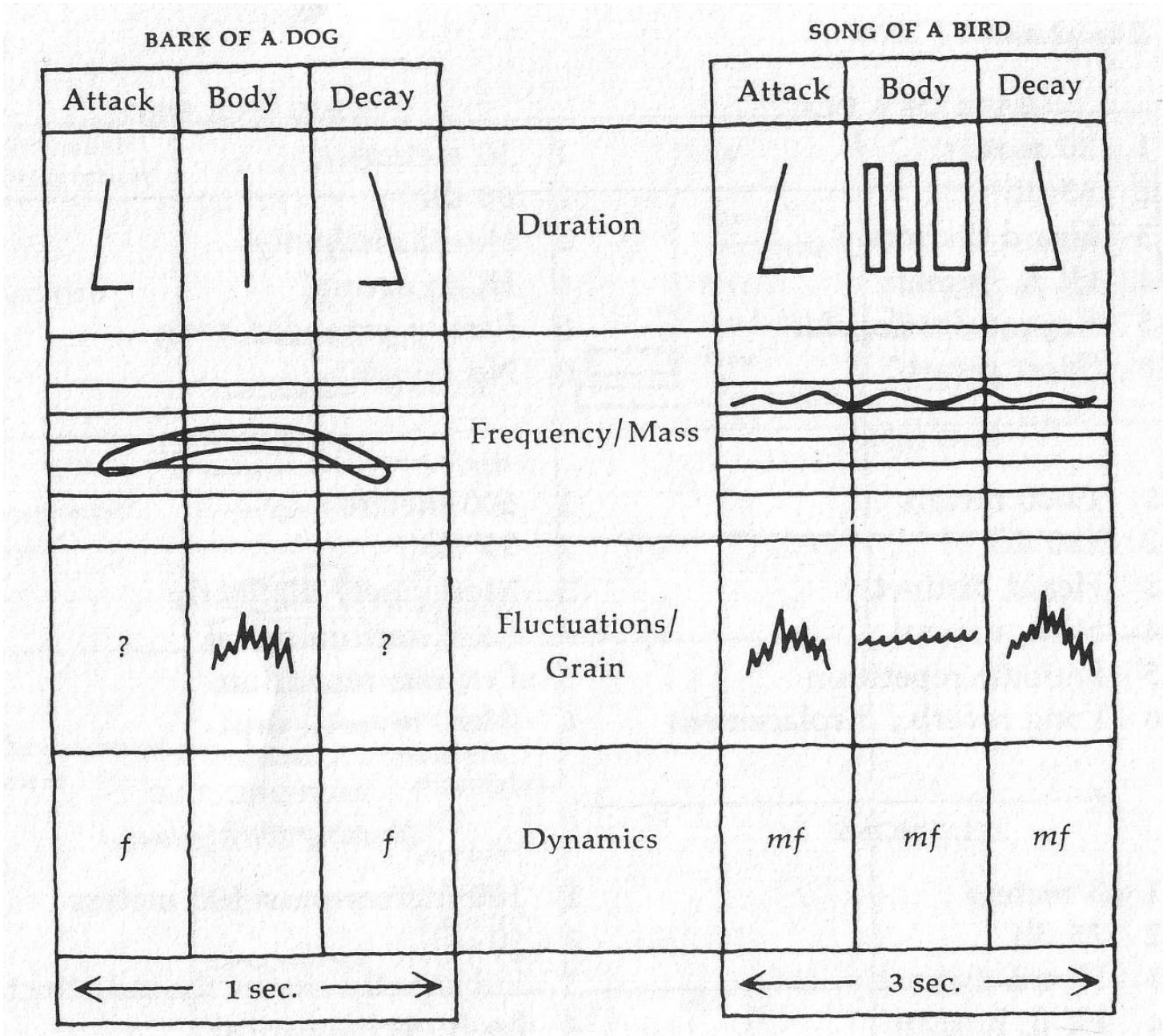
Visual representation of sounds

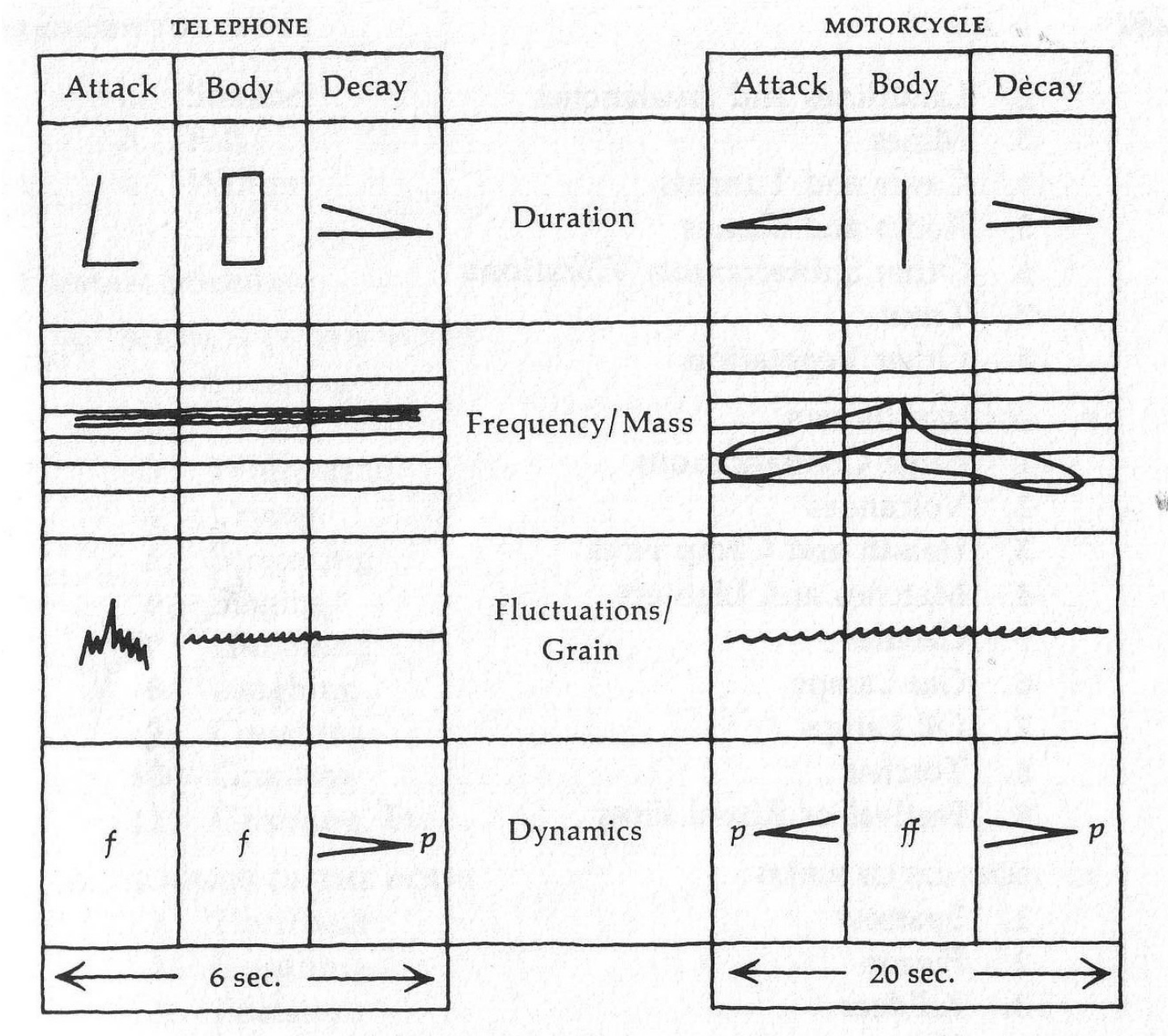
- Murray Schafer's method (simplification of Schaeffer):



Description of a sound event.


FOG HORN
CHURCH BELL
Attack
Body
Decay
Attack
Body
Decay
Duration
Frequency/Mass
Fluctuations/
Grain
Dynamics
mf
f
mf
f
2 sec.
10 sec.


BARK OF A DOG
SONG OF A BIRD
Attack
Body
Decay
Attack
Body
Decay
Duration
Frequency/Mass
?
?
Fluctuations/
Grain
f
f
Dynamics
mf
mf
mf
1 sec.
3 sec.


TELEPHONE
MOTORCYCLE
Attack
Body
Decay
Attack
Body
Decay
Duration
Frequency/Mass
Fluctuations/
Grain
Dynamics
f
f
p
p
ff
p
6 sec.
20 sec.

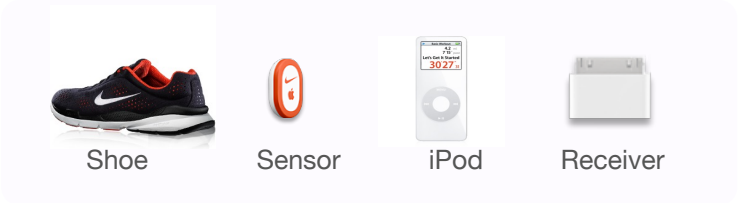
Higher levels of meaning

- "Archetypes" (wind, rain, crying baby ...)
- Symbolic (religious, cultural ...)
- "Sacred" sounds, sound and power
- Signals (bells, horns ...) 
- Symbols (culturally "charged", eg animals, keys ...)
- KeySounds (strategically used in a narrative context) 
- Stereotypes (generated by repetitive, contextualized use)
- «Theme» (eg in Starwars) 

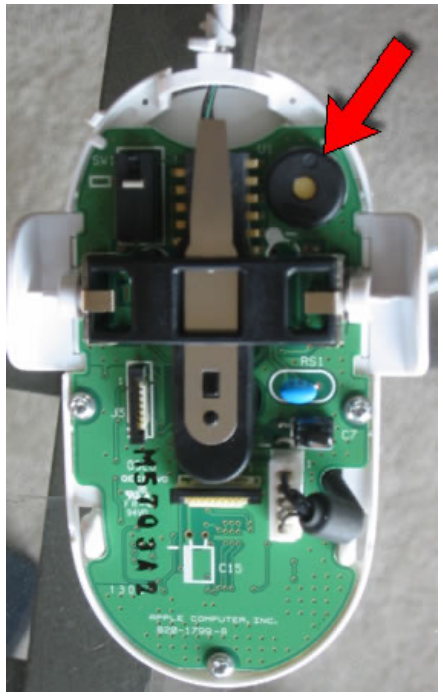
A New Generation of Commodities

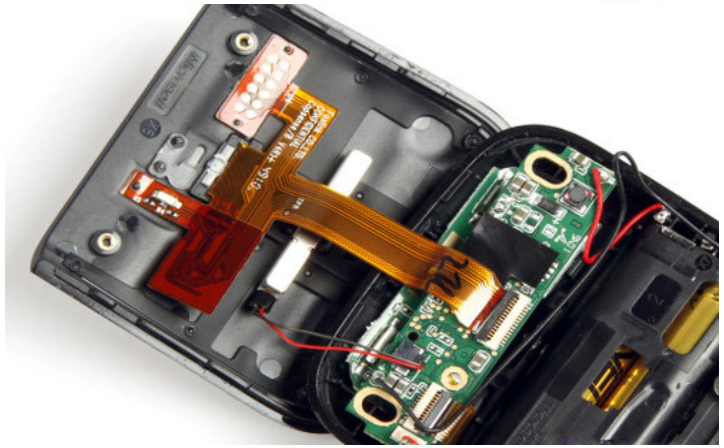
- Everyday objects meet Information & Communication Technologies -> INTERACTIVE COMMODITIES
  - Devices get smaller, screens lose importance, overload of the visual channel
  - Sound conveys information, meaning, supports performance and affects the experience of interactive artifacts or systems

- Exploring narrative and performative sound design strategies
- Fast and inspiring iterative prototyping



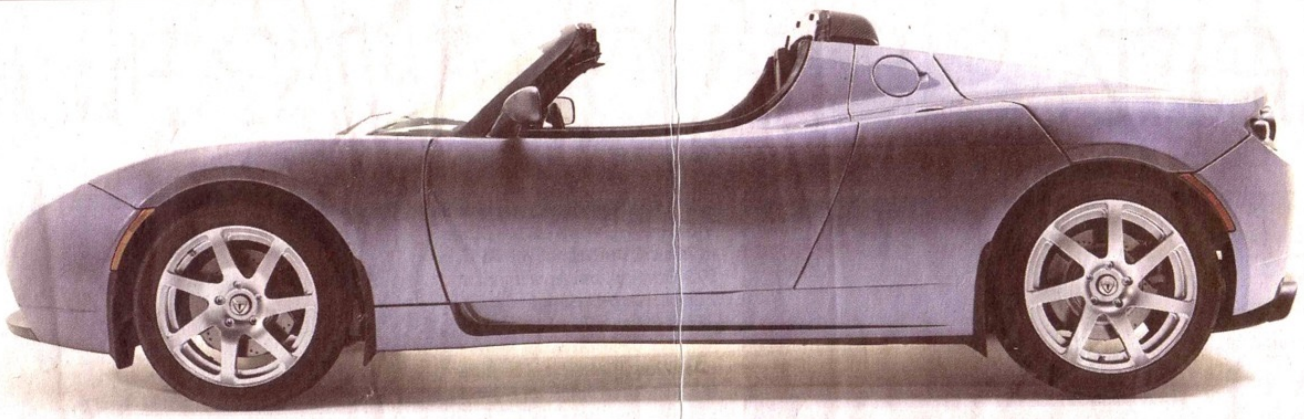
An „authentic“ mouse?





EV, HEV, PHEV – How Does this Car Sound?

NZZ am Sonntag • 23. November 2008



Summ-summ macht der Sportwagen

Der Tesla-Zweisitzer fährt schnell und mit Strom. Eine Testfahrt mit dem «Auto der Zukunft»

Der Anlasser hält die erste Überraschung bereit. Eine kurze Melodie lässt erkennen, dass man den Zündschlüssel in die richtige Richtung gedreht hat und der Wagen startbereit ist. Die

solche Ladung im Niedertarif in der Stadt Zürich 4 Franken 30 – ein Schnäppchen, verglichen mit den derzeitigen Preisen an den Tankstellen. Das Batteriepaket soll laut den Tesla-Herstellern erst nach 150 000 Kilometern ausgewechselt werden müssen.

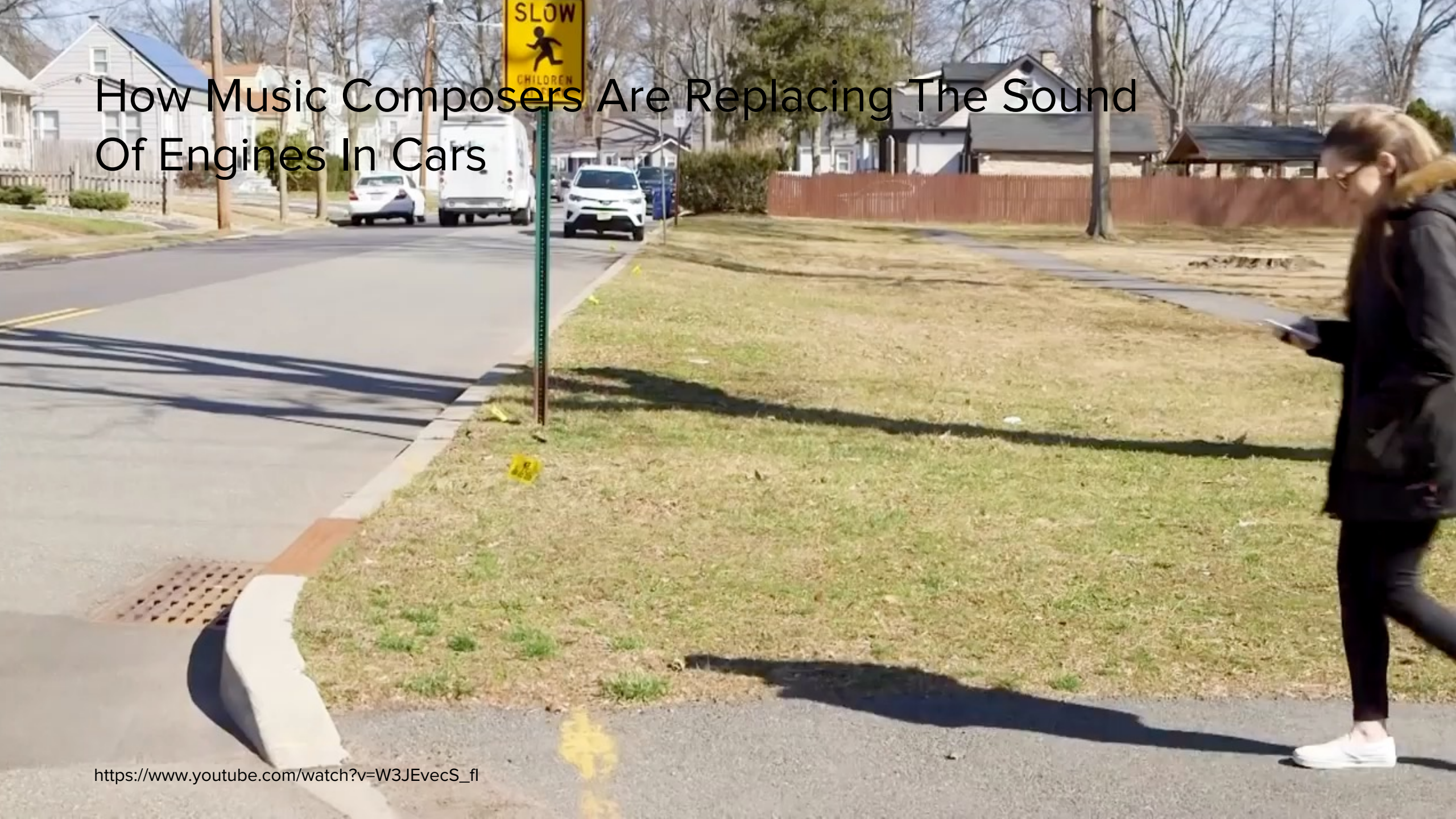
Der Strom für ihr derzeit einziges Modell soll wenn immer möglich aus erneuerbaren Quellen wie Sonne, Wind und Wasser kommen, heisst es bei Tesla. Die Firma hat denn auch vorgerechnet, dass man mit 25 Quadratmetern Solarzellen eine Strommenge produzieren kann, die für jährlich 20 000 Kilometer Fahrt mit dem Tesla genügen soll. Das Unternehmen plant, seinen

Electric car owners to 'choose' engine sounds

- Artificial engine sounds available on existing models, such as the Mitsubishi Outlander, generally make the hum of the battery-driven engine louder.
- Mercedes AMG has worked with rock band Linkin Park to make distinctive sounds for its electric vehicles.
- Porsche offers a $500 (£400) upgrade to its Taycan sports car that boosts the volume of its electric motor to make it sound more like a petrol engine.
- Nissan has trialled a warning system called Canto that adds a choral element to the engine's whirr.

https://www.bbc.com/news/technology-49726841

How Music Composers Are Replacing The Sound Of Engines In Cars



https://www.youtube.com/watch?v=W3JEvecS_fI

Roles of Sound in SID (Franinovic, Hug, Visell 2007)

- Supports new functions or display possibilities for products
  - Displaying new informational possibilities
  - Displaying invisible affordances of an ICT-enhanced artifact
  - Providing the possibility of displaying more information using multimodal channels

- Shape the sonic “appearance” of an artifact
  - Improving the aesthetic experience and sonic quality
  - Extending the emotional aspects of the design
  - Enhancing the interplay between material, form and action

- Improve the performance in interaction processes
  - Feedback supports the use/control of interfaces, device, tool or a physical activity
  - Sonification of processes and states
  - Improvement of focus and flow during task execution

Relationship of Sound and Objects

- Sound and physical properties
  - Direct relation to, and evocative of, material properties and processes of an object (and the related meaning potential)
  - Sonic and haptic experience similar
  - -> 1st order sound semantics: Information about artifact & use: Feedback, notification, (mecanical) processes
  - Several sounds can be combined to basic „narratives“
- Beyond sonic causalism and naturalism
  - Sound can give presence to a inexistent object or process - mental models
  - Upon recording, sound develops a quality independent from it’s original source

Expressive Performance, Sound – Action Relationships

- Specific relationships between actions, movements, object qualities and sonic structures can be observed / designed
- Not necessarily isomorphous! 3 relationships (Chion 1998)
  - Isomorphous / direct link: Turning the throttle on a motorcycle
  - Link indirect, delayed or established through knowledge about it: Long, sustained tone of a violin
  - Not isomorphous, gesture triggers sound, which develops autonomously: e.g. hitting a gong.
- Manipulations vs. Trigger/hold relationships
- Ergo-Audition (Chion 1998):
  - Positive sign of own influence on world
  - More than just feedback: Meaningful, nuanced sounds evoke the „joy of hearing oneself“
    - „Differential of power“
  - Goal: design sustainable and meaningful sounds that are enjoyed during interaction.

Gestural Metaphors and Affordances: Audioshaker (Jenkins 2005)

Design as Research as Design