Discovering Sonification: Where to begin?

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Presentation for 2021 Virtual Conference of
South Pacific Educators in Vision Impairment

Overview

- What is Sonification?

- Sonification World Chat

- Why and How

- Accessibility

- Early Learning

- Space flight!!

- Where to begin?

What is Sonification

- The use of non-speech audio to represent information or data

- "Sonification is the data-dependent generation of sound, if the transformation is systematic, objective and reproducible, so that it can be used as scientific method."
(The Sonification Handbook, Dr. Thomas Hermann, Ambient Intelligence Group, CITEC, Bielefeld University https://sonification.de/son/definition/)

- What it is not: real sounds, such as produced by animals

Familiar Sonification

- Alerts, earcons, such as email notification sound

- Supermarket checkout beep of scanner

- Geiger counter – click-rate indicates danger

- Alarms, Hospital, such as heart monitor

Why sonification

- Sense of hearing better at identifying patterns and subtle/very brief changes or irregularities that may be missed in visualisation

- When large volume of data: too much visual input at once

- Enables listening while looking at something else (infrequent signals)

- Constitutes an additional mode of access to Multimodal input

- Outreach to audience who may otherwise not be interested in space science

- Ensures Accessibility for people who are blind or vision impaired

Sonification World Chat (SWC)

- Started in February 2020 with 11, now more than 70 members. Who knew so many people were working on this!☺
  Initiative from Kate Meredith, GLAS Education Geneva Lake Astrophysics and STEAM

- Mission statement: Share knowledge and expertise, Sustain Accessibility in Sonification, potentially develop Standards.

- Multidisciplinary group (developers, sound engineers, academics, programmers, musicians, consultants, communication professionals) with top people globally in sonification astronomy research, including astronomers and astrophysicists who are blind.

SWC Sonokids

- Ballyland CosmoBally in Space. Popular Free app. Facts and song around the Solar System.

- New Ballylander: CosmoBally. Signature sound is 'CB' in morse.

- 3D printed model traveled the world.
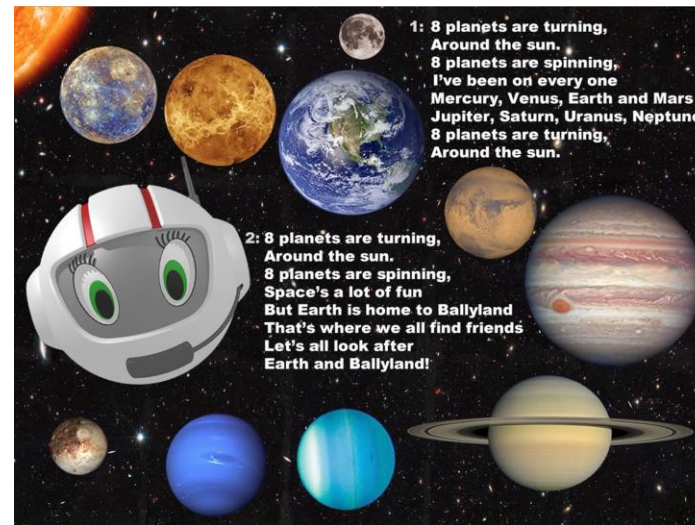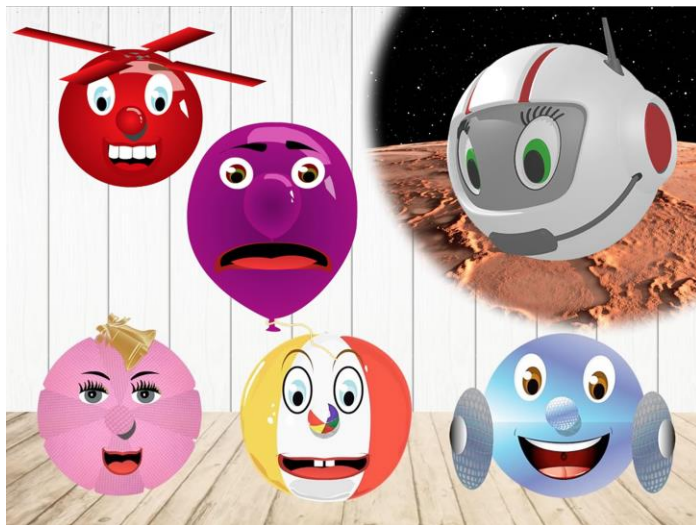
Accessibility benefits Sonification

- Independent access to scientific data

- Faster process for data analysis than exploring tactile graphics

- 'Impression' (coined by presenter): sonification enables a blind person to get a quick overview before diving into the real content: 'quick scan'. Generally Visual: overview > details. Non-visual: details > overview.

- Complex, multi parametric analysis: In some astronomy sonification applications up to 10 overtones may be applied (Swinburne University).

Sonification for accessibility

- *'Listening to the patterns of the universe'.*

  TED Talk by Astronomer Wanda Díaz Merced – who began losing her sight in her 20s. How turning a telescope's digital data into sound can help reveal hidden patterns. Link:

  https://earthsky.org/space/space-data-into-sound-patterns-wanda-diaz-merced

- *'Making data sing'.*

  TEDx Talk by Margaret Anne Schedel (vision impaired). Link:

  https://www.youtube.com/watch?v=PTfmDNUapq0

SWC Australia

- Yuma Decaux

  Astreos Accessible stargazing app
  AstroHunters Podcasts YouTube
  https://astreos.space
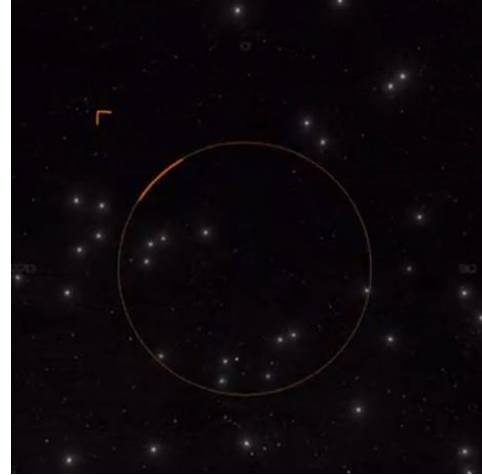
- Jeff Cooke (Swinburne University), Jeff Hannam (RMIT), Garry Foran (Swinburne University) astrophysics.

  Star Sound and Vox Magellan https://www.jeffreyhannam.com/starsound

SWC NASA

Shared a fragment of a sonification of the **centre of the Milky Way** explored by NASA's Chandra X-ray observatory, Hubble Space Telescope, and Spitzer Space Telescope. Each telescope reveals different phenomena and is represented by a different instrument. This audio fragment helped convey the beauty of the image, the vastness of the Milky Way, and the many points of light.

Link: https://chandra.si.edu/photo/2020/sonify/animations.html

Credit sonification video: NASA/CXC/SAO/K. Arcand, M. Russo & A. Santaguida. With thanks to Matt Russo.

SWC Astronify

Space Telescope Science Institute in Baltimore, Maryland (USA). Explore the universe with advanced space telescopes.

Shared fragment: This sonification was made using data from the Kepler space telescope. It is a **sonification of** the **exoplanet** Kepler 12b, a planet orbiting extremely close to its host star. In this sonification, you can hear the star's light being periodically blocked by the planet as it moves in front of its star - astronomers call this a **transit**. With thanks to the Astronify team.

Website: Astronify.readthedocs.io
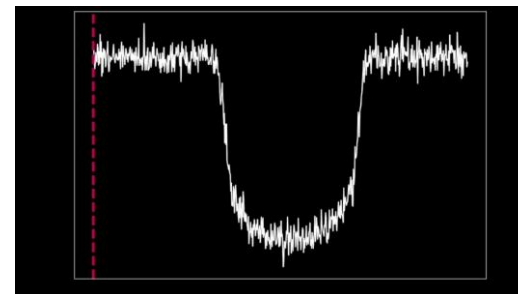
Sonification applications for Maths access

- SAS Graphics Accelerator. https://support.sas.com/software/products/graphics-accelerator/index.html

- Desmos - Graphing calculator for PC. https://www.desmos.com/

- Sensemath – Sonifies mathematical graphs (Available from the AppStore)

- Vital - App for conveying 2D graphics. https://www.vital.education/

- Search Perkins Paths of Technology website for 'sonification' (Diane Brauner). https://www.perkinselearning.org/technology

With thanks to Sonali Marathe.

Early Learning

Sonokids Ballyland suite of educational apps and software.
Winner global Zero Project award for innovative practice in inclusive education.

Early Learning: Ballyland Sonoplanet

- Ballyland apps enable Gamified Learning of essential digital skills

- New app: Early Learning of generic skills and understanding of Sonification concepts. Like the Ballyland Code apps

- Aims to support 'Emergent Sonification Literacy' (term coined by presenter)

- CosmoBally is guide (from Ballyland Cosmobally in Space app)
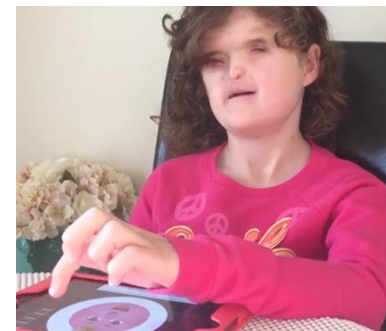
Ballyland Sonoplanet app prototype

The Ballyland sonification app, Ballyland Sonoplanet, which is under development and expected to be launched soon, introduces concepts and principles of sonification through gamified learning.

The three Ballyland Code educational game apps do not teach a specific programming language. Rather, they support students to develop computational thinking and understanding of essential, generic concepts and principles of computer programming which build a bridge to whatever programming language they will learn next.

The new sonification app similarly aims to build foundation skills and conceptual understanding of sonification, which will help students to use sonification tools in the future for their access to science subjects, using a talking calculator, and even further along the line to perform independent research as a scientist.

Interactive sonification

In the new app students can make their own drawing by dragging a finger over the screen, and then sonify the drawing;

There is also a game that involves following a sonified shape with your finger, and removing virtual obstacles.
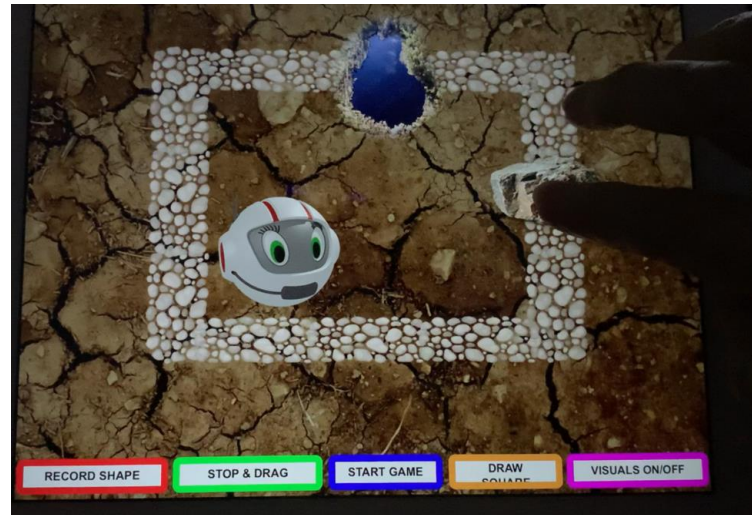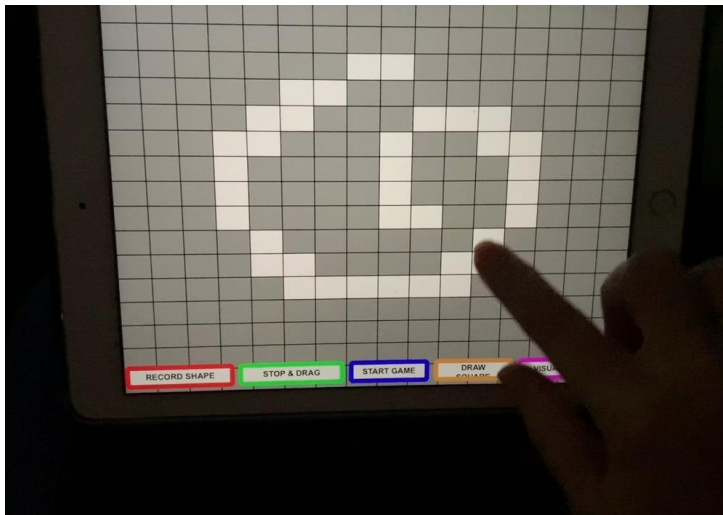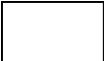
Gamified learning

- Shapes are sonified in a specific way. The algorithm for any sonification depends on the data, situation, and sonification tool that is used. The sonification in the Sonoplanet app is the Sonokids way!

- Matching, Tracing shapes.

- Need to learn the shapes first through tactile models/drawings

- Compare teaching sonification tracing/understanding to tactile literacy skills

Spaceflight experience

- We presented a spaceflight experience.

- Delegates were played four sonifications of shapes on Sonoplanet

- Delegates identified the shapes in the Zoom chat function

- Unfortunately we can't capture this in writing or images. You can listen to the recorded presentation and try to respond to the audio questions yourself.

Welcome to Sonoplanet

- Sonified horizontal line from left to right ⎯⎯
- Horizontal line from right to left ⎯⎯
- Vertical line from top to bottom |
- Vertical line from bottom to top |
- Rectangle ▭
- Even colours can be sonified
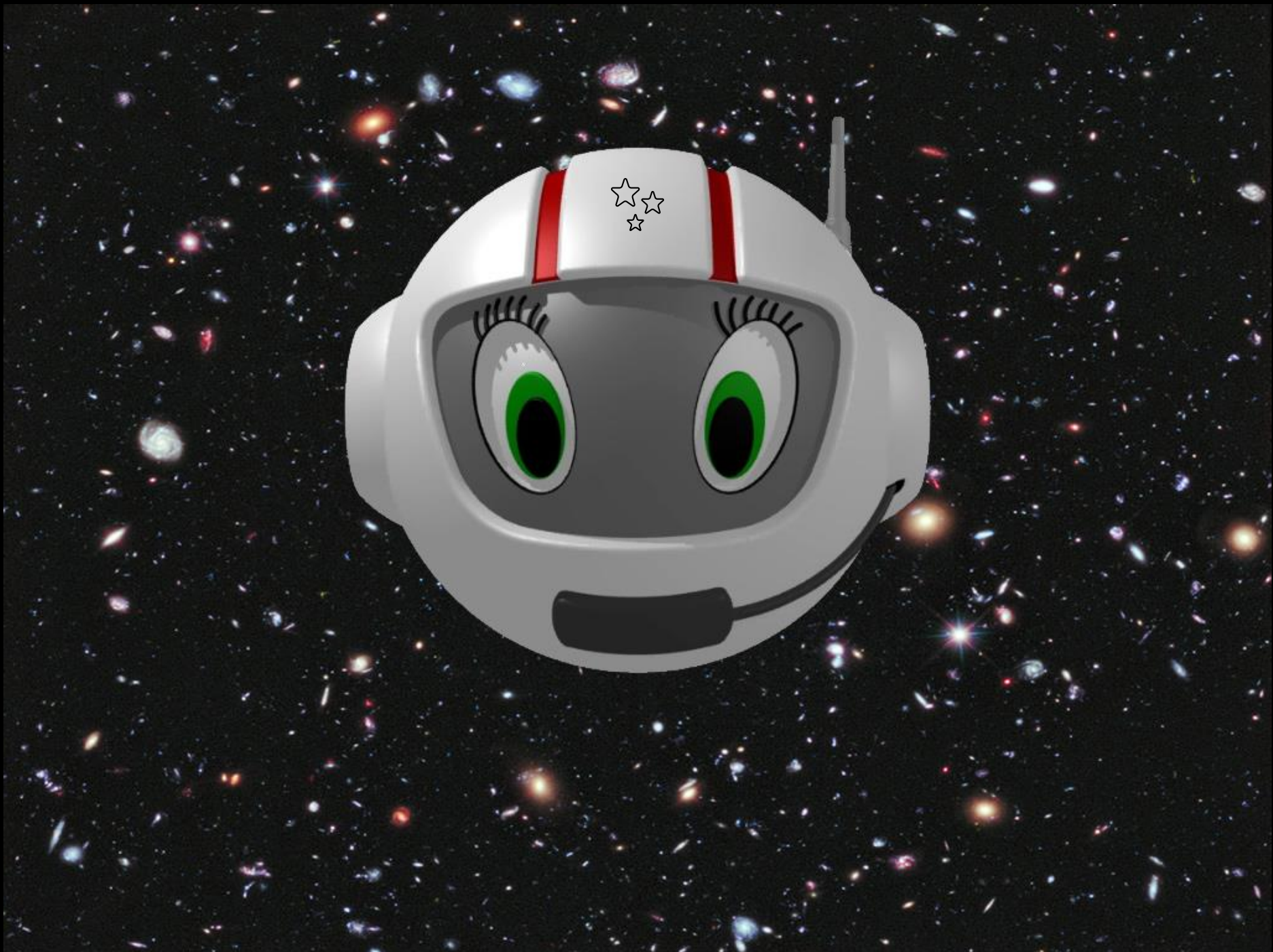
Where to begin? – over to you!

- If we want to harness the power of sonification, where do we begin?

- I hope that I have planted a seed, so that educators will share my enthusiasm and understand the potential of sonification.

- Use the resources, expose your students to sonification, help us with the app, make yourself familiar with sonification tools.

Future

May sonification become a widely accepted, always available alternate format. Then we can sing these new lyrics for a familiar children's song: "Twinkle, twinkle, little star, **I hear in wonder where you are**!"

Twin-kle, twin-kle, lit-tle star   I hear in won-der where you are!

Thank you!

- Please contact us with any questions. Email: support@sonokids.org

- All information about CosmoBally and other Ballyland apps:

  Sonokids Website www.sonokids.org

- Subscribe to the Ballyland Newsletter

- Find Ballyland on YouTube

- Search the Paths to Technology website for 'Ballyland'