Discovering Sonification - Experience

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Presentation for the 2021 Online Conference of the
Round Table on Information Access
for People with Print Disabilities

Overview

- What and Why of Sonification
- Accessibility
- Outreach and Education
- Early Learning
- Space flight to Sonoplanet!!
- Results
- Next steps

Put on your headphones! Prepare to use Zoom Chat

What is Sonification

Technology for all, using non-speech audio to represent information or data

- “Sonification is 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)
- Musical and artistic sonifications

Familiar Sonification - examples

- Alerts, earcons, such as email notification sound
- Geiger counter – click-rate indicates danger (higher = more radioactive)
- Navigations apps

Why sonification

- Sense of hearing better at identifying patterns and subtle/very brief changes or irregularities that may be missed in visualization
- When data visually too dense or small to analyse
- Large volume of data (too much visual input at once)
- Listening while looking at something else (infrequent signals)
- Additional (alternative) mode of access (Multimodal input)
- Outreach
- Engagement (games)
- Accessibility for people who are blind or vision impaired

Why Sonification in Astronomy

Sonification is used in different STEM fields (mathematics) but particularly in Space science, astronomy, astrophysics.

Large volume of data and vast distances: special tools to get closer

But then still most of the universe is outside the visual spectrum.

Use different types of telescope: radio, optical, infrared, X-ray and gamma-ray telescopes.

Non-visual analysis valid and important tool.

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

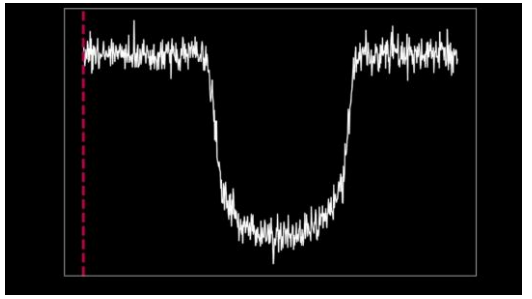
Credit sonification video: NASA/CXC/SAO/K. Arcand, M. Russo & A. Santaguida. With thanks to Matt Russo.

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



Accessibility Benefits Sonification

- Access in real-time
- Independent access to scientific data
- Faster process for data analysis than exploring tactile graphics
- ‘Impression’: quick overview before diving into the real content: ‘quick scan’. Visual: overview > details. Non-visual: details > overview.
- Freedom of exploration, not bound by visual representation and frameworks.

Sonification World Chat (SWC)

- Started in February 2020 with 11, now more than 85 members. Monthly Zoom meetings. April was # 13. Initiative from Kate Meredith, GLAS Education Geneva Lake Astrophysics and STEAM
- Mission statement: Share knowledge and expertise, Sustain Accessibility in Sonification, potentially develop Standards (no standards – the algorithm for any sonification depends on the data, situation, and sonification tool that is used).
- 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.

Sonification World Chat - Working Group LEARN

- Phia Damsma since March 2021 Lead of multidisciplinary, international working group ‘Learn’, meet once a month via Zoom.
- Create awareness of value, accessibility and impact. See sonification as part of a toolkit.
- Create Online repository sonification information, resources, tools
- Develop Education Curriculum (year/grade 6 – 8) with lesson plans

Early Learning

Zero Project
AWARD WINNER
2020

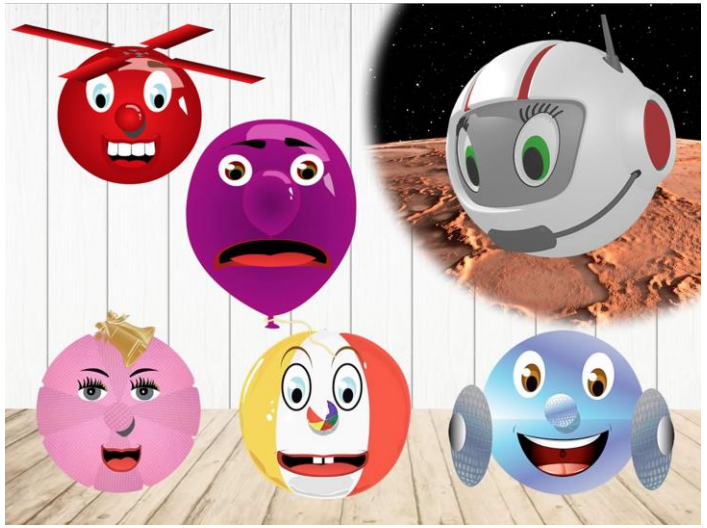
Sonokids Ballyland suite of educational apps and software.
Winner global Zero Project award for innovative practice in inclusive education.

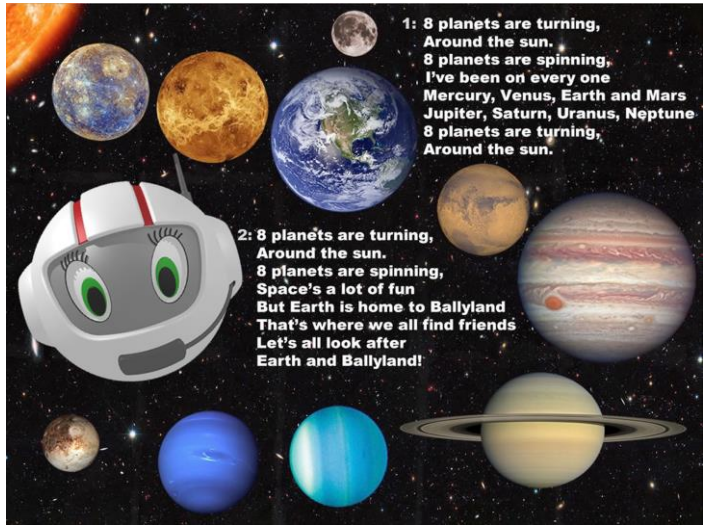
Ballyland CosmoBally in Space

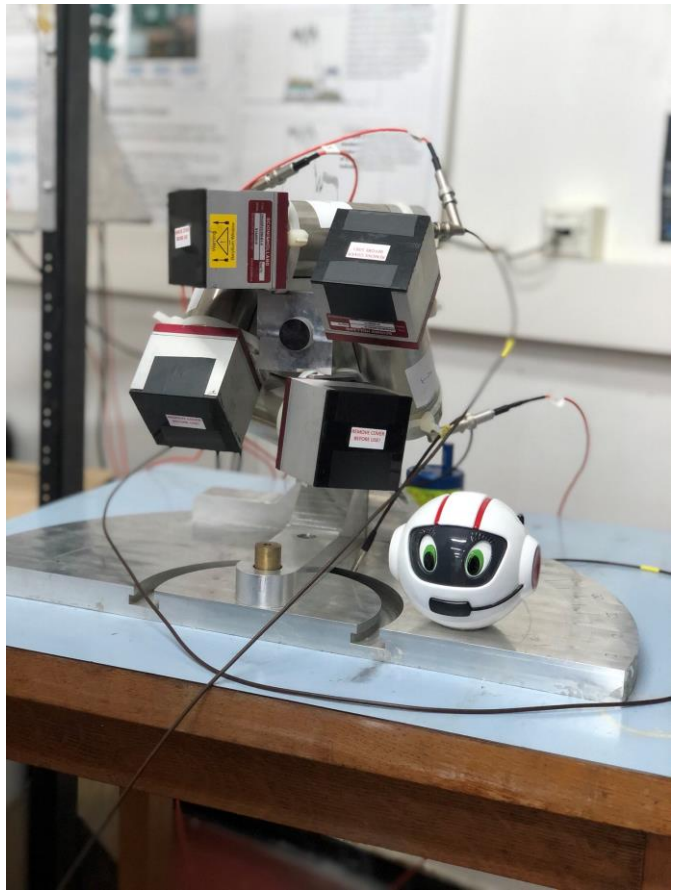
FREE! More than 100.000 downloads. Android and iOS.
CosmoBally is new Ballylander – and astronaut.

Available on the App Store

GET IT ON Google Play







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.

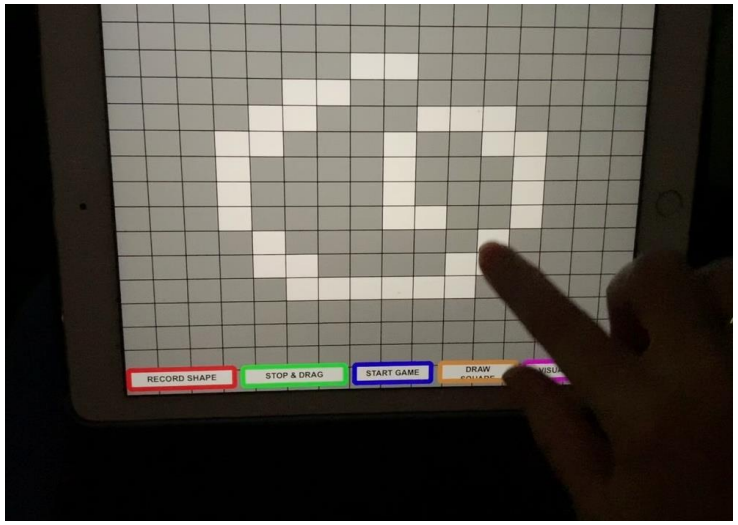
The three Ballyland Code educational game apps do not teach a specific programming language. Rather, they support students to develop computational thinking and understanding of essential, generic concepts and principles of computer programming which build a bridge to whatever programming language they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

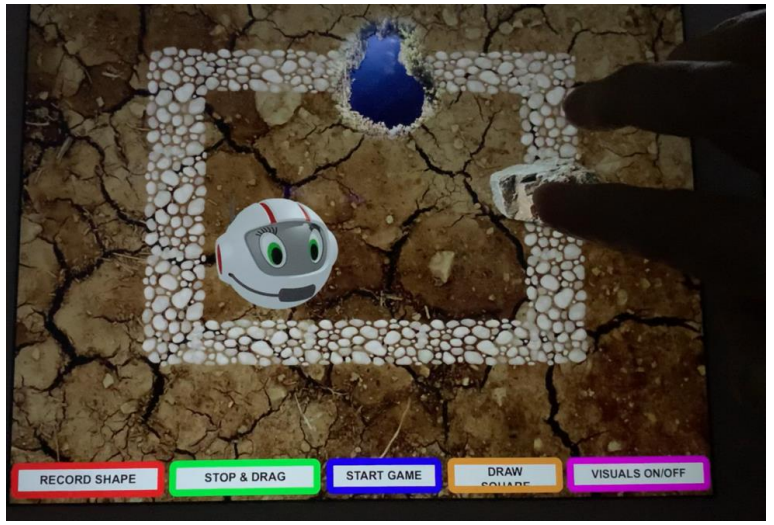
The new sonification app similarly aims to build foundation skills and conceptual understanding of sonification, which will help students to use sonification tools in the future for their access to science subjects, using a talking calculator, and even further along the line to perform independent research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

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.
- Aims to support ‘Emergent Sonification Literacy’ (term coined by presenter)
- CosmoBally is guide (from Ballyland Cosmobally in Space app)

Sonoplanet Interactive Sonification



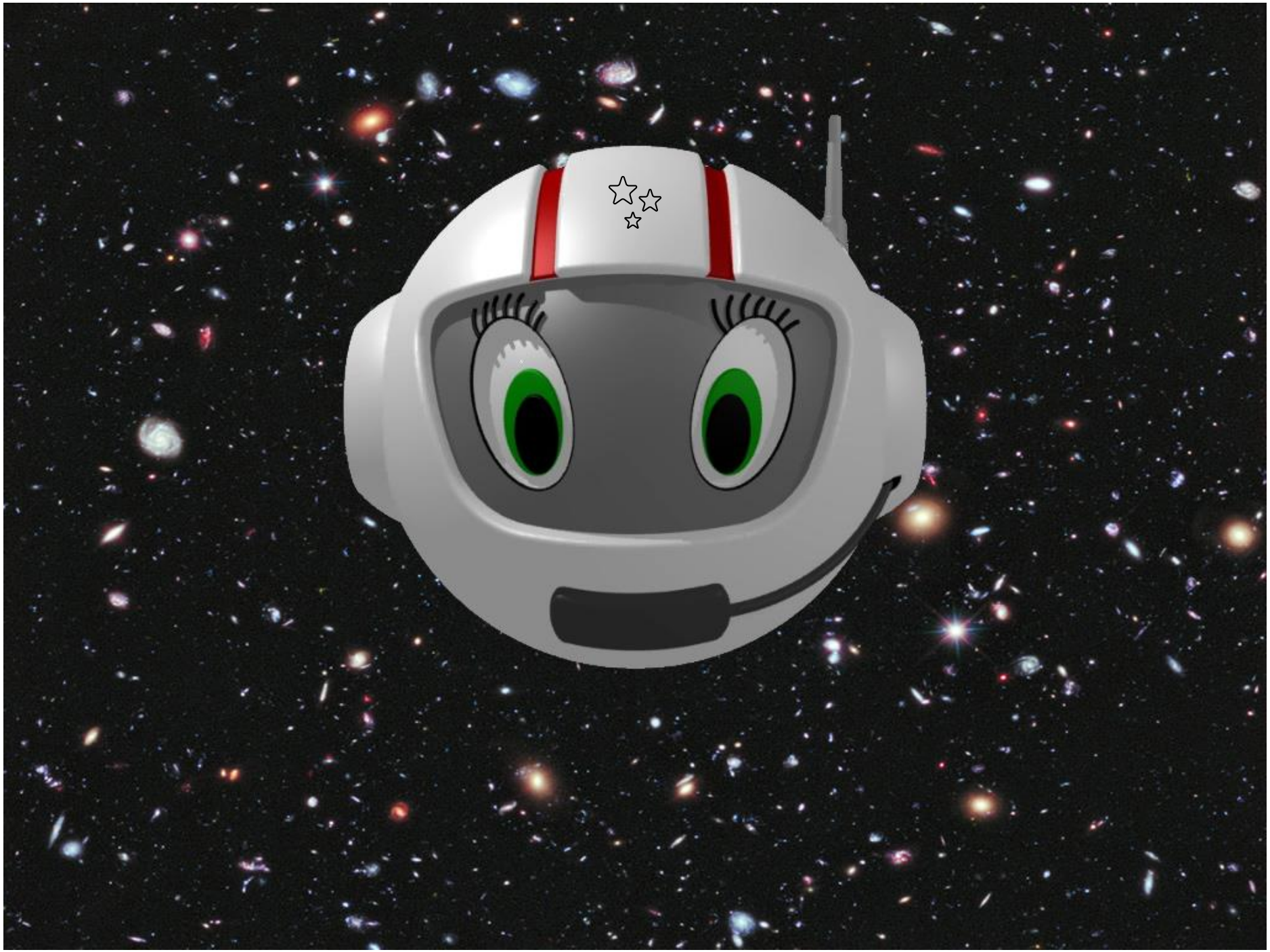


Applied sonification (shapes, locations)

The sonification in the Sonoplanet app is the Sonokids way!

Spaceflight experience

- We presented a spaceflight experience.
- Delegates were played four sonifications of shapes/lines on Sonoplanet
- Delegates identified the shapes and responded in the Zoom chat function

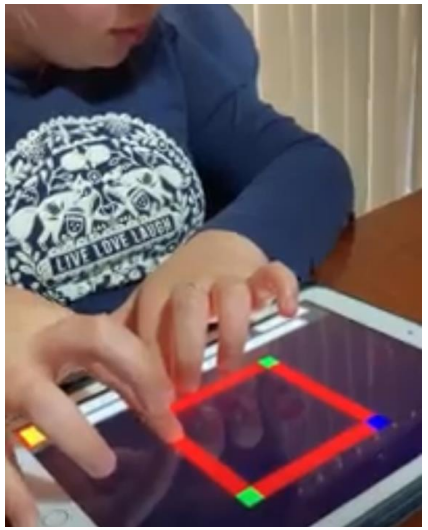


Successful algorithm

- Sonification results from SPEVI 2021 and RT 2021
- Sonokids sonification algorithm is easily understood by delegates, including those who are blind or vision impaired. The results from the Spaceflight chat responses will be further researched.
- With no visual feedback, and hearing the sonification for the first time, the wide majority of people were able to correctly identify a horizontal line from left to right, or from right to left, a vertical line from top to bottom or bottom to top, and sonification of a rectangle or a circle.

Successful algorithm

- User testing of sonification app prototype
- Accurately indicate the exact progress of a sonified line being drawn, following along in real-time with a finger hovering over the screen as if drawing the shape in the air.
- Trace the sonified lines on the screen, dragging finger in straight line (using iPad edges as an anchor and other hand for support).



What’s next?

- Awareness – please help spread the word
- SWC and SWC Working Group will continue. Repository
- Monash University ARC Linkage grant/Round Table/Sonokids, Please contact us if you want to become a partner for this submission.
- Sonokids Early Learning Ballyland Sonoplanet app. Students and others are invited to join the testing team!

Thank you!

- Please contact us with any questions, or to be informed of new developments, including the education curriculum under development. Email: support@sonokids.org
- All information about CosmoBally and other Ballyland apps: Sonokids Website www.sonokids.org