

Digital Audio-Tactile Graphics

for Inclusion in Education,
the Workplace and Everyday
Life

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Agenda

- Significance of Graphics in Everyday Life
- Theoretical Foundation
- Graphics in STEM Disciplines
- Examples of Technologies
- „Dotted Pictures“ Demo
- Conclusion

Significance of Graphics in Everyday Life

- Technical, mathematical, and natural scientific contents are regularly conveyed in diagrams and graphics.
- Visually abled persons communicate complex concepts in by drawing sketches.
- Technological advances make graphics increasingly accessible by tactile and audio-tactile representation.



Theoretical Foundation

- Permanent human activity and creativity are dialectically shaped and shaping by evolutionary sense-making and sense-giving in a particular society (Berger & Luckmann, 1966).
- Our steady awareness and coping processes draw on jointly agreed symbols and wordings for collective sense-making (Dewey, 1925).



Theoretical Foundation

- Thus, social construction of technology is achieved by negotiating and politically translating facts, artefacts, and devices as technical objects in a semiotic context, thus generating common symbols laden with proprietary meanings (Prell, 2009).
- *Ontological complicity* with other members of our habitat is established, reducing stress in a specific socio-economic environment (Bourdieu, 1989, 397; Kraus & Gebauer, 2008).

Graphics in MINT Disciplines

- In education, the term of subject didactics has been established (Vollmer, 2014).
- This concept accounts for the particular challenges of teaching complex, multiply interdependent contents.

Graphics in MINT Disciplines

- Not only communication and reproduction of subject-related skills and capabilities are required. Nägele & Stalder (2017) emphasise that, from early childhood, transfer into other domains of our habitats enable us to establish a self in all situations.
- This is why blind and visually impaired persons often find themselves in cognitive isolation (Marinho et al., 2016).

Example Display: Tactile / Audio-Tactile System

Braille Pad (Metec):

Tactile electronic surface

Digit position recorded

Audio information

Several buttons for resolution and orientation

Self-service conversion of graphics by

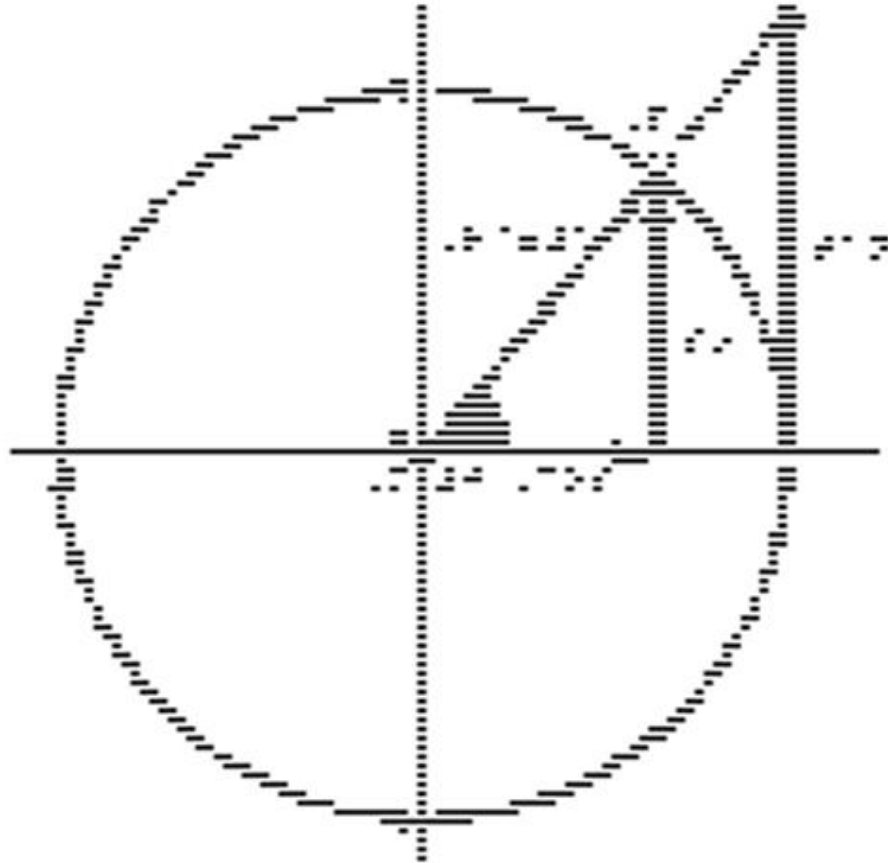
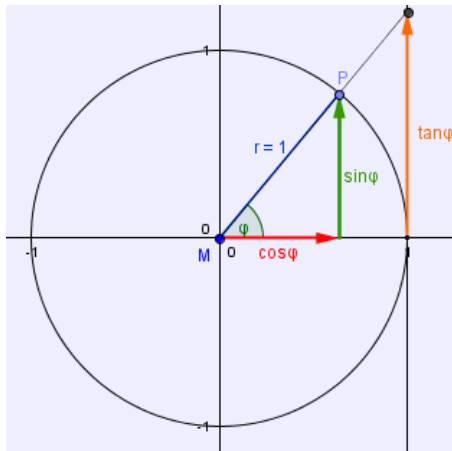
„Dotted Pictures“

Price: from 18.000 € - Prototype – not available for sale

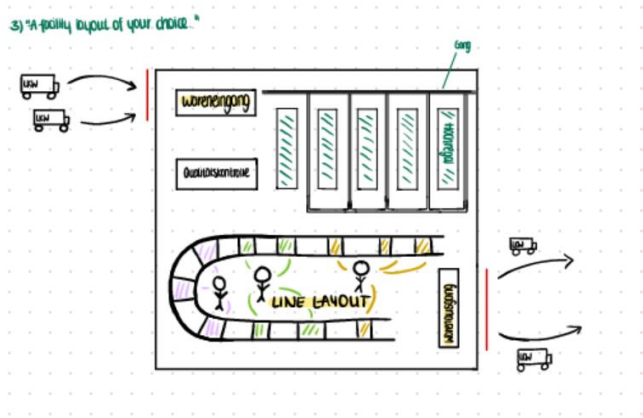
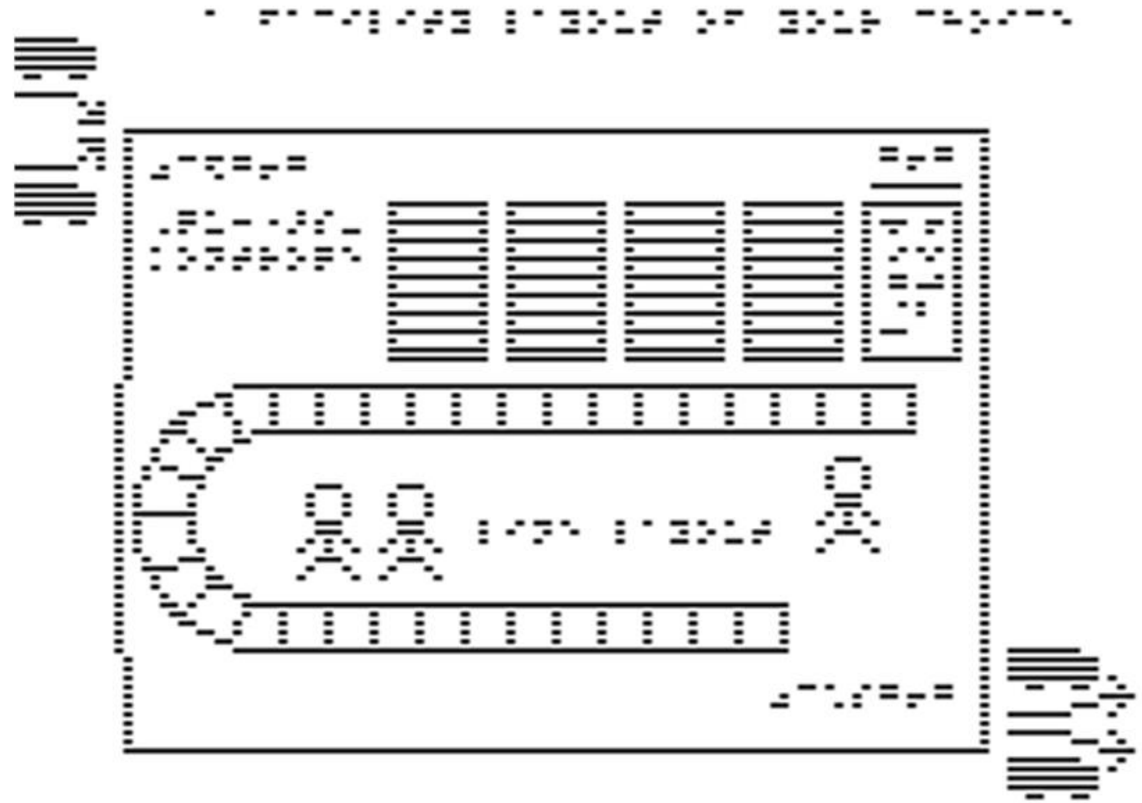
Handling: mobile



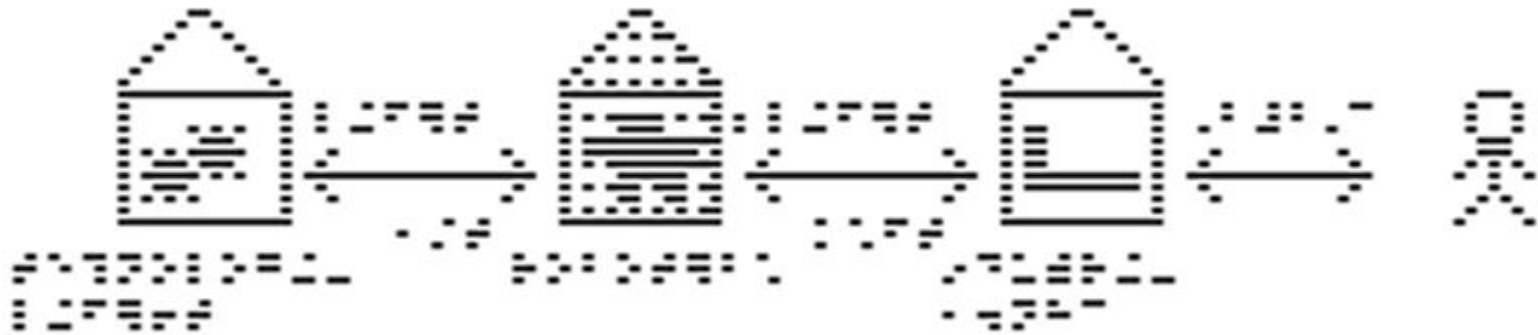
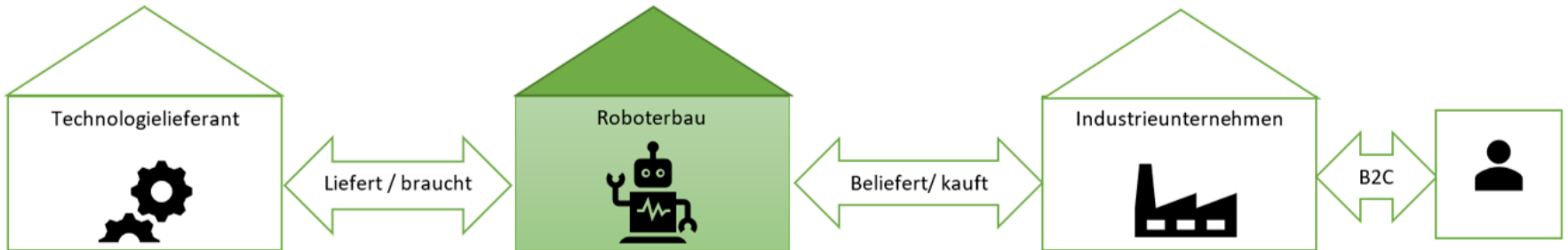
„Dotted Pictures“ Demo: Trigonometry



„Dotted Pictures“ Demo: Logistics Layout



„Dotted Pictures“ Demo: Value Chain





Perspective

- Long-term perspective for application in early childhood programmes
 - So far, print-out of „dotted pictures“ only affordable option
 - Beta programme available on request
 - Other braille pads do not offer real-time display
 - „Motion picture“ style slide show only possible with Metec
 - No available device for sale
- Search for hardware co-development partner

Conclusion

- Graphical representations can open more teaching and learning possibilities from early childhood
- STEM subjects are conveyed more easily
- Professionals with newly acquired blindness can continue working with graphics
- Self-service feature for blind users highly desirable
- However, there is currently a market failure as to performing braille pads which has to be overcome.

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Thank you for your attention!

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