

## Current state of Infty system to make STEM documents accessible

The 3rd International Workshop on  
 "Digitization and E-Inclusion in Mathematics and Science"  
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## Short History

- 1996-1998 Formation of InftyProject
- 1999 First domestic workshop held by InftyProject → Annual workshop.
- 2003 Release of InftyReader (free version) and InftyEditor
- 2005 Establishment of the NPO: Science Accessibility Net
- 2006 Release of InftyReader (product version, including commercial OCR engines by Toshiba and Media Drive inside), and ChattyInfty
- 2006-2009 Development of Braille editor and convertor for Japanese math documents
- 2006-2012 Large volume digitization of mathematical journals using BatchInfty and CharImageManager → *Improvement of the recognition rate of InftyReader*
- 2010-2012 ChattyInfty3 - Multimedia Daisy / EPUB3 production system using high quality Japanese speech engine AITalk. (Collaboration with the Japan Braille Library)
- 2014-2015 ChattyInfty3 online (Collaboration with the Japan Braille Library)
- 2015 *Copy & Paste as Math* into ChattyInfty/Word documents using InftyReader
- 2015 PdfReader(=Inftyreader+pdfminer)

<http://www.sciaccess.net>

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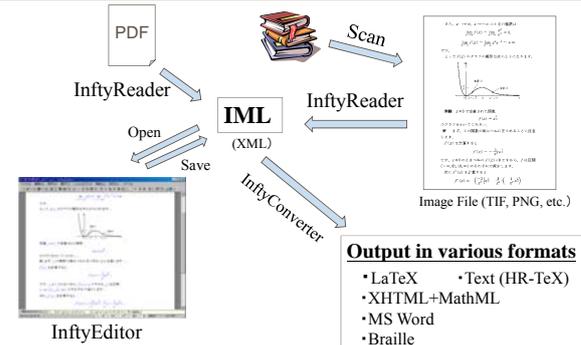
## Infty System

- Released software :  
 (available on the web site <http://www.sciaccess.net/en/>)
  - InftyReader --- Math OCR
  - InftyEditor ---- Math document editor
  - ChattyInfty ---- Math document editor with speech output
  - ChattyInfty3 --- Authoring tool of Multimedia Daisy / EPUB3
- Japanese only (<http://www.sciaccess.net/jp/>):
  - ChattyBooks --- Multimedia DAISY / EPUB3 Player
  - IMLtoBraille and BrailleInfty  
 --- Braille Transcriber and Editor

<http://www.sciaccess.net>

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## InftyReader & InftyEditor



<http://www.sciaccess.net>

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## BatchInfty for large scale digitization

- Large scale digitization  
 → Adaptive method is efficient

1. Trial recognition  
 → Get character features from the target document  
 → Make User Dictionary for the target document
2. Final recognition using the obtained UserDic.  
 → Improvement of the recognition rate.

1. [BatchInfty](#)
2. [CharImageManager](#)

<http://www.sciaccess.net>

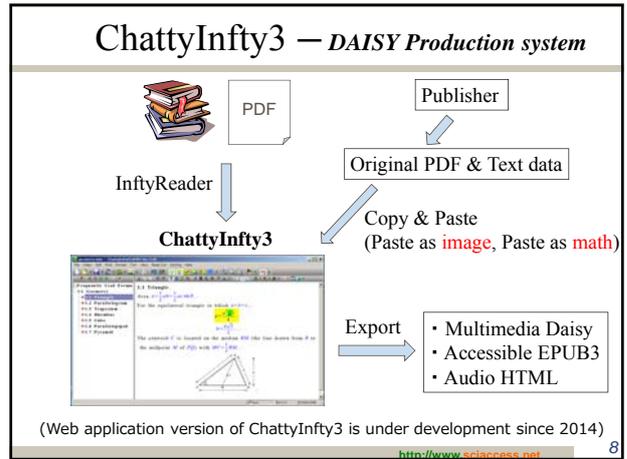
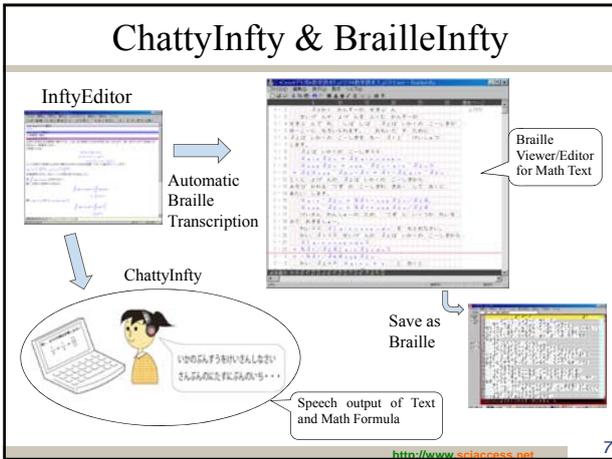
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## Digitization by Science Accessibility Net

- Math Journals, Proceedings (approx. page number, main languages)
  - 14 journals of Math. Soc. Japan, etc. (165,000, English, French, German)
  - Koukyuroku (Proc.) R.I.M.S Kyoto Univ. (300,000, English, Japanese)
  - 2 Series Proc. of Symposiums (50,000, English, Japanese)
- Books
  - For visually impaired individuals (Math, Physics, Chemistry) (99 books)
  - Multimedia School Textbooks (Math, Science, etc.) (93 books)
  - Feynman Physics lecture (Text Daisy/EPUB3) (3 volumes, 1,478, English)
  - Math books published by Math. Soc. Japan (3 books, 1,200, English)
  - Proc. International Conferences of Math. Soc. Japan (3 volumes, 1,300, English)
  - For a publisher (Math Formulae Dictionary) (2 books, English, Japanese)
  - Old book of English (14th Century) (19 volumes, about 7500 pages)

<http://www.sciaccess.net>

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## Daisy Book Production

Multimedia DAISY produced by ChattyInfty

The diagram compares a standard PDF page with its DAISY equivalent. In the DAISY version, **Read-aloud sentences are high-lighted** and **Math is also high-lighted and read out**.

- DAISY=Digital Accessible Information System
- International standard format of accessible e-content
- DAISY4 c EPUB3

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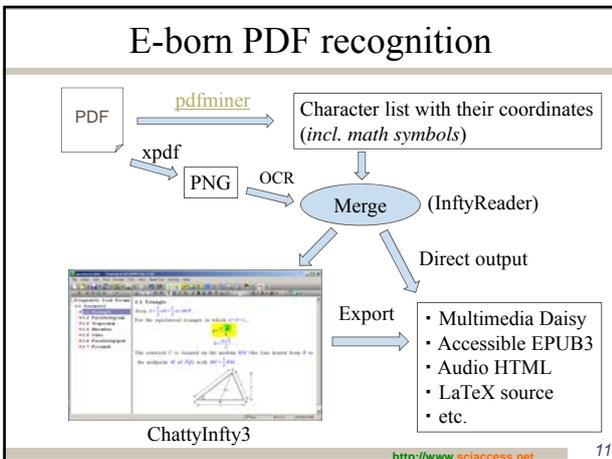
## Daisy Book Production

- The Japanese Society for Rehabilitation of Persons with Disabilities produces school textbooks in Multimedia DAISY in collaboration with 18 voluntary/non-profit organizations. In 2015, more than 3000 schoolchildren and junior high school students are subscribed.
- The Japan Braille Library makes senior high school textbooks in Multimedia DAISY on demand.
- Multimedia Daisy School Textbooks produced by Science Accessibility Net using ChattyInfty3:

Year	2011	2012	2013	2014	2015
Number of volumes	6	22	20	16	29

Fields: Mathematics 66, Science 17, Social study 2, History 1, Geography 1, Politics 1, Japanese Language 3, English 2.

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## Performance of InfyReader

- Accuracy depending on the source (Current state)

Source	Recognition		Segmentation		Doc. Structure
	Text	Math	Text/Math	Figure/Table/Text	
Bad image	△	×	×	×	×
Good image	○	◎	○	△	×
E-born PDF	◎	◎	◎	△	×

Bad image --- Low resolution, noisy, etc.  
 Good image --- 600DPI or 400DPI  
 The number of touched/broken characters is less than 1%

E-born PDF --- PDF produced by LaTeX system, Editors like Word, etc.  
 It includes character and symbol font information inside.

Doc. Structure --- Document structure (Title, Headings, Index, Comments, etc.)

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