

# Collaborative Storytelling using Mobile Robots

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# in this talk ...

We will mainly tell you about

- what we have done so far in one of our projects
- lessons learned

We will not tell you explicitly about

- learning issues
- (research) issues related to DIGITEL

Hopefully, however,

- you find something interesting or useful to you.

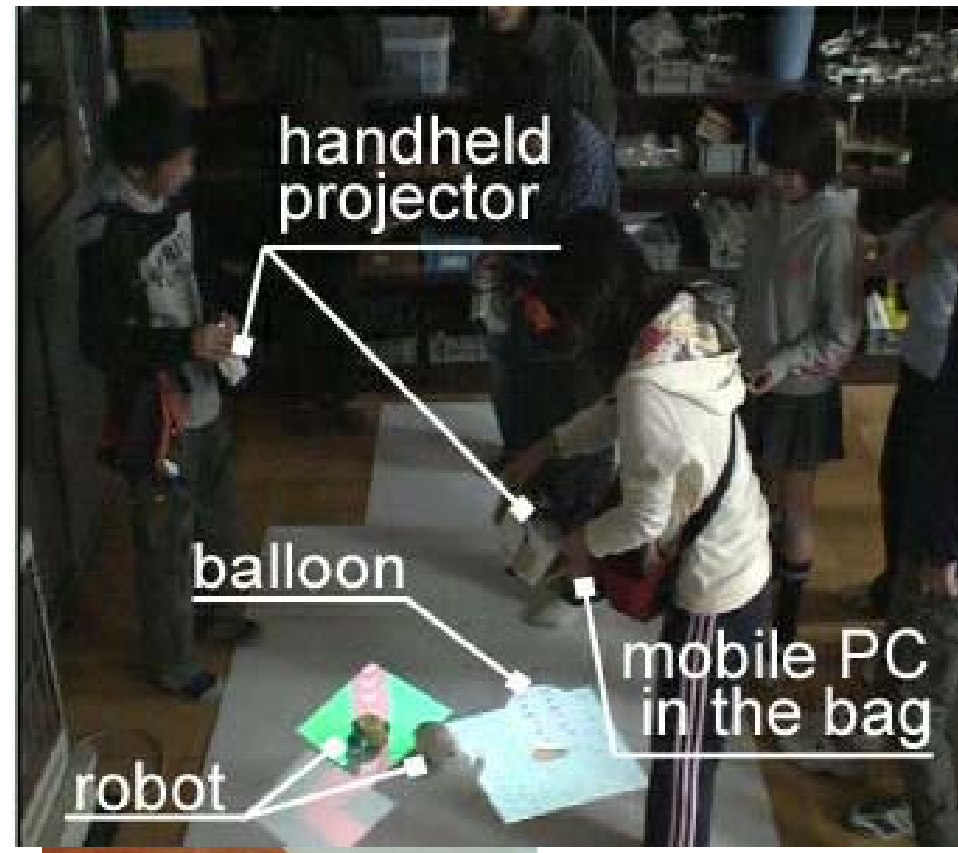


# GENTORO Demo Video



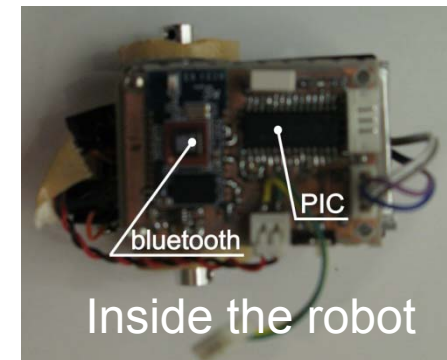
# System Configuration

- Handheld projector  
(a USB camera attached)
- Mobile PC
- Robot



# Mobile and Inexpensive Equipment

- Children can manipulate robots and express their story in any location, as all the equipment are mobile.  
→ Children can take the robot wherever they like.
- Affordable devices
  - handheld projector (30,000 JPY = 300 USD ~)
  - mobile PC (30,000 JPY ~)
  - USB camera (2,000 JPY ~)
  - robot (2,000 JPY ~)



# Storytelling

- Why storytelling? --- implications for learning support

*“Think of how the effects snowball. The more children engage in telling stories, the more command they get over language. With more language, they can understand more detail in the story they hear. That gives them a better idea of how stories hang together. So the better their own storytelling and retellings get, the more experience they’ll bring to reading stories and writing them.”*

Marie Clay, ***Different Paths to Common Outcomes*** (1998)

- Instruction Method
  - Development of language skills (reading, writing, listening, vocabulary, ...)
  - Logical thinking for consistent stories
  - Comprehension support
  - Creative / artistic expressions
  - Ethical issues
  - ...



# Storytelling using Computational and Physical Media



StoryRooms



Magic Carpet



PETS



KidsRoom



StoryMat

# Key Ideas of GENTORO

- Tools for *nurturing children's creativity and imagination.*
- Help children in *externalizing their idea in their mind* and *represent it by using virtual and physical entities in the real world.*
- **Collaboration**
- **A kind of storytelling, but more like film-making** --- like a stop motion animation, puppet theater, *tokusatsu* (special effects) film!
- **Appreciating and evaluating children's artwork.**



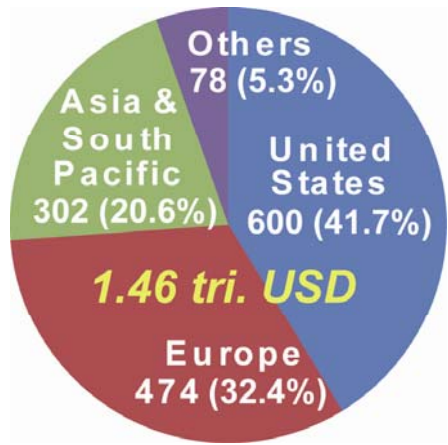
# Film-making rather than Storytelling

- Children do not perform as characters of their story, rather ***play behind-the-scenes roles***.
- Children can ***work as producers or creators***.
- GENTORO asks individual children to do different tasks, but ***work in a collaborative and coordinated manner***.
- Children can design not only ***story scripts***, but also ***graphical scenes, behaviors of robots*** in the scenes, and ***physical objects*** (a.k.a miniature film sets.)
- Utilizing robots and mixed reality technologies to ***increase the level of the reality*** and ***decrease the amount of tasks*** requested for story expressions by children.

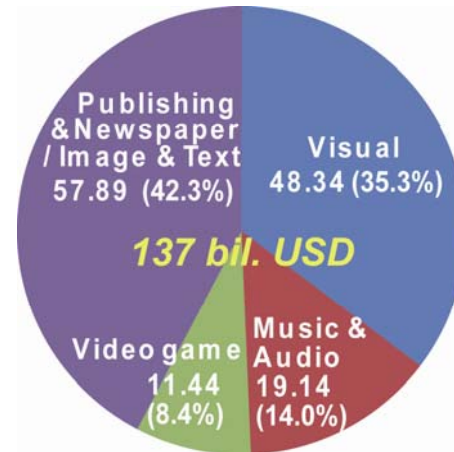


# Social Background

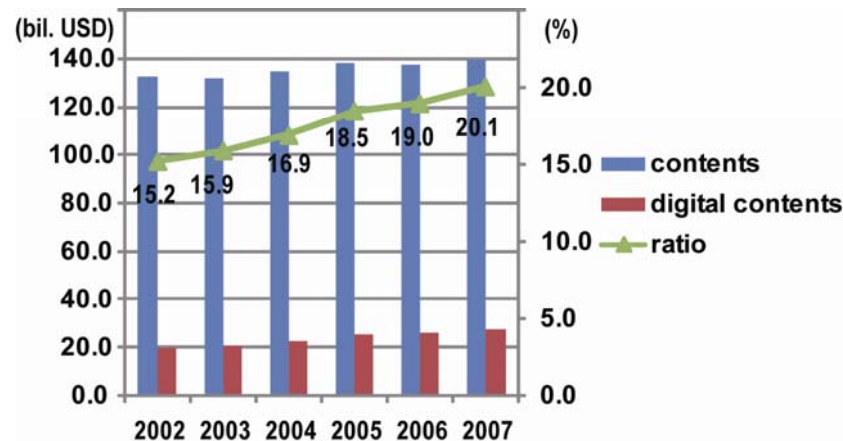
Sources: "2008 Digital Contents White Paper"



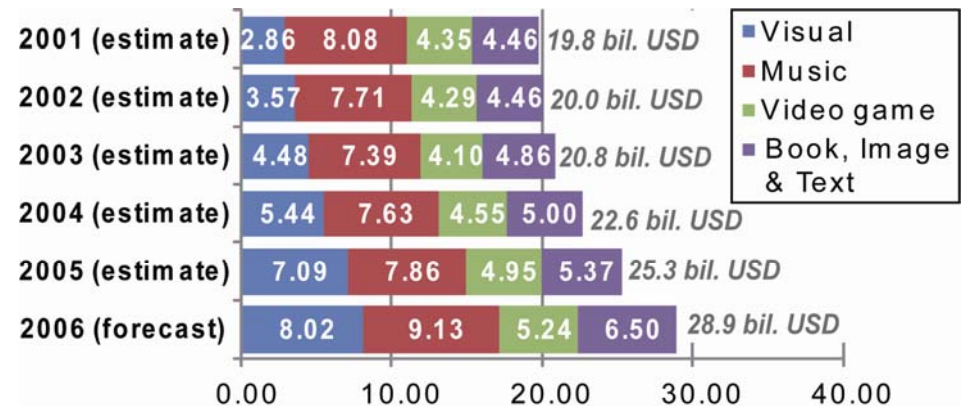
Market sizes of world contents industries (year 2005, billion USD)



Market sizes of Japanese contents industries (year 2005, billion USD)



Growth of digital contents market in Japan



Japanese digital contents by segments (billion USD)



# Social Background (cont.)

- Creative and attractive contents (movie, game, comic, animation .. ) as strategies for global competition in contents industries.
- Cultivating abilities and skills to work as creators and producers is becoming a critical issue.
- Nurturing children's imagination and creativity!



<http://www.meti.go.jp/>



# What Children Do using GENTORO?

## Story design

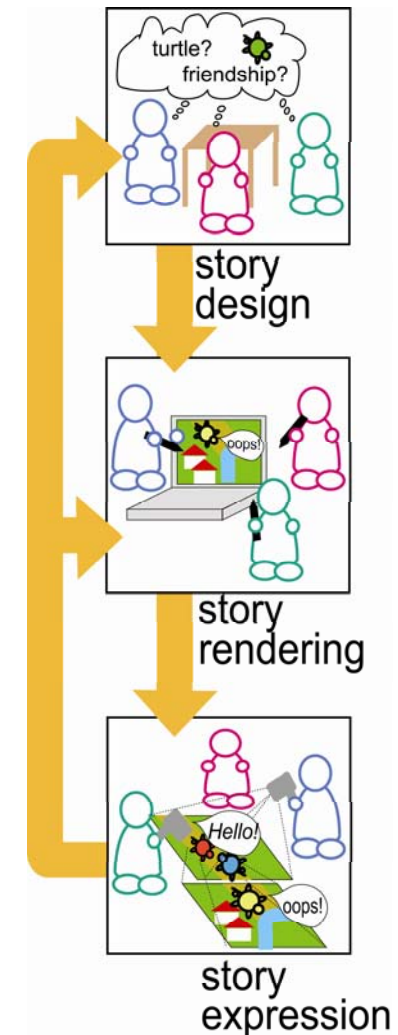
- theme, script -- designed through discussions
- storyboarding (rough sketches of scenes)
- usage of physical objects

## Story rendering

- scene drawing
- design of robot moves

## Story expression

- making a robot play as an actor



# What Children's Abilities are Enhanced?

## Story design

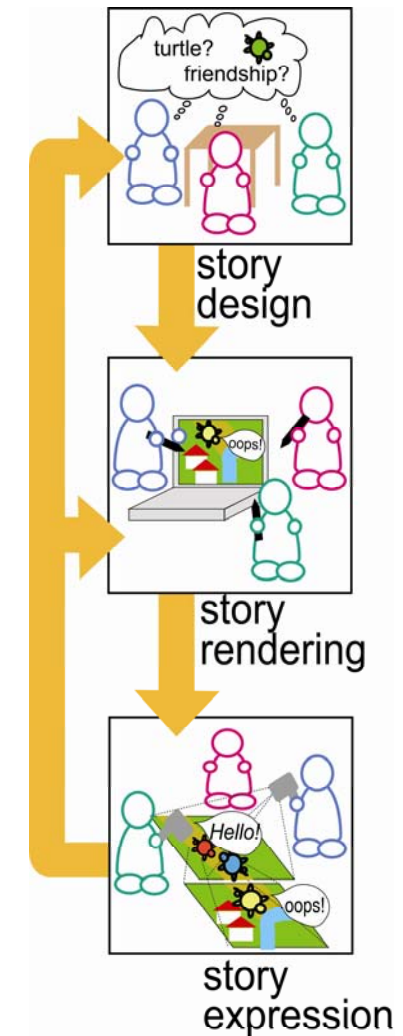
- **creative** idea generation for story (theme, script)
- **logical** thinking by designing story plots
- **linguistics** skills and abilities

## Story rendering

- **artistic** drawing
- **spatial** design (robot, physical objects)

## Story expression

- collaboration
- **Reflection** through the story play



# Motivation, Engagement, and Curiosity

- Children generally show considerable interest in a robot.
- Children are curious about the robot of GENTORO, probably because it seems smart.
- Children like interactions in the physical environment.
- Children like animations and *tokusatsu* films.



# Motivation, Engagement and Curiosity (cont.)

- Children are well motivated and engaged, maybe because they can make a robot play in their story (scripts written and scenes drawn by them).
- Embodied participation strengthens the commitment to their collaborative tasks.
- Synchronized and coordinated actions are certain levels of challenges for children and require their concentration, to make their storytelling successful.
- Children want to be creative --- they want to create an original story different from the other children.



# Examples



A scene describing “Robot in forest”



A scene describing “Robot and Kanji”



# Children as Critics



# Lessons Learned

For supporting children's creativity and imagination,

- Different tasks that need different capabilities
- Physical interaction and embodied participation that enhance engagement in their tasks
- Active designer and creators
- Outcomes and feedback through activities
- Moderate level of challenges
- Entertaining tool and media
- Shared and explicit target




# Issues Remain to be Done

- Evaluations
  - e.g. how can the system make children creative?, gender differences, ...
- Learning effects and applications
  - e.g. (foreign) language learning
- Theoretical framework
  - constructivism / constructionism
  - multiple intelligences
  - flow
  - ....
- Contributions to DIGITEL communities



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*Thank you for your attention!*

