Daejeon, South Korea

**All4One : A Moderated Sketching Tool for Supporting Idea-Generation with Remote Users**

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1. Research Background

Early stage of design

1) Good **brainstorming** is highly **visual and physical** (Kelly et al., 2001)
2) Benefit of **Moderated** Brainstorming (Oxley et al., 1996; Chan et al., 2016)
3) However, current **remote** collaborations are **not physical** and **not moderated**.
2. Related Works

**Computer-supported collaborative drawing tools**
- Bly et al., 1990
- Tang et al., 1991
- Ishii et al., 1992
- Kasahara et al., 2012
- Yuill et al., 2013
- Zhao et al., 2014

**Tangible sketch-supporting tools**
- Rekimoto & Sciammarella, 2000
- Schkolne et al., 2001
- Zhen et al., 2013
- Lee et al., 2014
- Leon et al., 2014
- Surface studio, Tilt Brush
2. Related Works: **Collaborative** drawing tool

Many drawing sharing tools for remote and also co-located people

But, they are all *peer to peer interaction without moderation*
2. Related Works: **Tangible** drawing tools

Easier and intuitive interaction with digital 2D, 3D drawings

*ToolStone* (UIST 2000)  
*Tango* (CHI 2013)  
*CurationSpace* (2016)

Most of them are **not** for remote collaboration
3. All4One

Brainstorming Participant

Brainstorming Participant

Brainstorming Participant

Moderator
3. All4One System
3. All4One : Mobile sketching application
3. All4One: Whiteboard system

- Whiteboard
- HD webcam
- A beam projector
3. All4One: Tangible MarkerTools

- Push Button
- Soft Potentiometer
- Marker Box

130mm

- Move
- Flip
- Swipe
- Press
- Change Color
- Scale
3. All4One : Working Prototype

Overall usage
4. Workshop

How this system can be used in real setting for boosting idea generation?

- Four graduated students from industrial design department - aged 21 to 32 years old (M24.7, SD 4.7)
- Icebreaking with short demo of All4One system
- One brainstorming moderator
  One collocated participant
  Two remote participants
- Voice chat was opened in the background of the system
- Concept design – a toy for children in 30 minutes
- Post workshop interview
5. Result

• Three complete ideas for a toy (a car, a bear, a mobile)
• Drawings + Voice chat + hand written text + gesture (moderator)
5. Result

Moderator

- Collected and compared diverse ideas
- Used a marker pen to draw over projected sketches
5. Result

Moderator

• Superimposed ideas from different participants to add details
• Assigned implicit roles to the participants to redraw specific parts
• Combined ideas in a single sketch
5. Result

Participants

• One participant sketched on a paper than took a picture to share it.
• The other participant took a picture of a real product and sent it.
6. Discussion and opportunities for design

• Resembles brainsketching (Wan Der Lugt, 2002)
  : Accumulation of ideas, Keep adding details
6. Discussion and opportunities for design

• Moderator use **mixed tools**: pen, eraser and marker tools
7. Limitation and future work

• Due to the design setting, the moderator did more than moderating, a composer of an orchestra.

• Working history (more control on revision history)

• Expressiveness of drawing tools

• Automatic identifying users

• Option to select synchronous/ asynchronous collaboration modality
Summary

1) It is hard to do the **early design** process using **current remote tools**.

2) **Good Brainstorming** is visual and physical (Kelly et al., 2001)

3) A **Moderator** can facilitate idea generation (Oxley et al., 1996; Chan et al., 2016)

**All4One** — remote moderated drawing system, tangible tools for a moderator, tablet for remote participants.

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#Appendix
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