To Stylize or not to Stylize?
The Effect of Shape and Material Stylization on the Perception of Computer-Generated Faces

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RELATED WORK

Affinity (Shinwakan)

Human Likeness

Uncanny Valley

Healthy Person
Uncanny Valley – Empirical Research

Familiarity

Eeriness

Honda Humanoid Robota

Gemenoid – F (Prof. Ishiguro)

Humanoid from Hanson Robotics

Realism

[MacDorman et al. 2006]

— different characters
Uncanny Valley – Empirical Research

Familiarity

Realism

Super Mario

Alex Shepherd from *Silent Hill Homecoming*

Emily (Emily Project)

[Tinwell et al. 2011b]

— different characters
Related Work – Render me Real? ...

- Toon Pencil
- Toon Flat
- Toon Shaded
- Toon Bare
- Toon CG

- Human III
- Human Basic
- Human SSS
- Human HQ1
- Human HQ2

[McDonnell et al. 2012]

— no shape variation
Why bother?

• Entertainment
  – VFX and Computer Animation
  – Games

• Future Markets
  – Robotics in Healthcare
  – Personal Virtual Assistant
Anthropomorphism

[Seyama and Nagayama 2007; Burleigh et al. 2013].
One single stylization dimension?

- Tintin
- Cloudy
- Pocoyo
- Tron
- Tangled
- A Scanner Darkly
Overview of Experiments

1. Looking for Important Scales
   a) Shape and Material
   b) Lighting and Shading
   c) Texture

2. Check for Generalization

3. Importance of Expression
Experiment Design

• 20 or more participants/experiment
• university students (avg. age 24)
• all variations rated by each participant
• seven-point Likert scales

• Analysis
  – Repeated measure ANOVA
  – Tukey HSD for post-hoc
STIMULI CREATION
ca. 400 stimuli in total
SHAPE AND MATERIAL

Experiment 1a

Material

cartoon  middle  realistic

cartoon  middle  realistic

cartoon  middle  realistic

Shape
Results - Realism

- mainly affected by shape

👍 realistic materials for realistic shapes

👎 realistic materials for stylized shapes
Results - Appeal

- realistic materials
- strong mismatches in stylization
- similar to familiarity and reassurance scales
SHADING AND LIGHTING

Experiment 1b
Results - Appeal

The graphs show the appeal of lighting and shading across different shapes: cartoon, middle, and realistic. As the shape becomes more realistic, the appeal decreases, indicating that cartoon shapes are perceived as more appealing compared to realistic ones.
Experiment 1c

middle  realistic  blur 25px  blur 50px
Results

- Realism non-significantly affected

- Blurred textures

- For realistic shapes not significant, but widely accepted in research [Fink and Matts 2008]
SHAPE AND MATERIAL

Experiment 2

even pigmentation
Results

✓ realism results confirmed

👍 even skin pigmentation
👎 realistic materials
👎 strong mismatches in stylization
Expression Recognition

mostly outstanding recognition
(20% random pick)

Mixed with weak surprise
Expression - Appeal

- expressions vary

- anger
  (negative expression)
Appeal

Realism

Uncanny Valley

CONCLUSION
Conclusion

• material (texture) influences appeal
Conclusion

realistic Material < realistic Shape < realistic Shape & Material
Conclusion

- Differentiation between shape and material crucial
- Peak at material style ≈ shape style
• realistic albedo with uneven pigmentation
• non-matching material and shape stylization
• angry expression

• smooth skin
• matching material and shape stylization
• neutral/positive expression
• read paper!
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http://graphics.uni-bielefeld.de/publications/sigasia2015

funded by
Exp.1a: Results - Reassurance
Exp.1a: Results - Familiarity

- **Appeal:**
  - Cartoon
  - Middle
  - Realistic

- **Familiarity:**
  - Cartoon
  - Middle
  - Realistic
Exp.1b: Results - Realism

- **Material**
  - DI and HS
  - DI and SS
  - GI and SS

- **Shapes**
  - Cartoon
  - Middle
  - Realistic
Exp.1c: Results - Realism

The chart illustrates the relationship between realism and various materials across different shapes. The x-axis represents the shape (cartoon, middle, realistic), and the y-axis represents realism. Different lines indicate different materials, such as cartoon, middle, realistic, 25px blur, and 50px blur.
Exp.1c: Results – Reassurance and Attractiveness
Expression - Intensity

• constant across material stylizations

realism decreases intensity
One single stylization dimension?