Customization of the Appearance for Humanoid Robot

Hanxiang Xu\textsuperscript{1, 2}, Shihui Guo\textsuperscript{1}, Nadia Magnenat Thalmann\textsuperscript{1}
\textsuperscript{1}Nanyang Technological University, Singapore
\textsuperscript{2}Xiamen University, China

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Appearance of Robot

Endoskeleton

Put on the Shell
Appearance of Robot

- Sandy Winkelman 2014

Manual design the appearance of robot
Related Work

- Interactive design of 3D-printable robotic creatures
  
  (Megaro et al. 2015)

- Computational interlocking furniture assembly
  
  (Fu et al. 2015)

- Printing 3D objects with interlocking parts
  
  (Song et al. 2015)
Methodology

Input 3D mesh
(Unfit for robot)

Automatic
Programming

3D printable
models
(Fit for robot)

For Casual user | Easy to customize

Automatic generate 3D printable model
Methodology

User-Input Model

Robot Endoskeleton

Shape Matching

Collision Detection

Smoothing

Adding Thickness

Split into Assembled Parts

3D Printed Model
Shape Matching

Match the shape of **endoskeleton** and input **segmentation part**.

- **Oriented Bounding Box (OBB):** the minimum volume which is aligned with the object axis and encloses all vertices of a specific mesh.

- **Interior Bounded Box (IBB):** the maximum volume which is aligned with the object axis but is enclosed by all the mesh vertices.

Segmentation part  IBB of mesh  OBB of robot  Matching result
Collision Detection

Remove the collided faces to avoid collision.
Smooth the Edges

Border Edges:

- Vertex
- Edge

Smooth
**Method:** Step1 - Offset vertices along normal vector in one direction.
Step2 - bridge the border edges of them.
Add Screw Holes

Design screw holes unit.
Add screw holes on the mesh.
Split into combinational parts

Use the cylinder of screw hole unit to split the mesh into two parts.
Final Result

Render image

3D printed shell
Summary

- Provide an intuitive tool to non-professional users and allow them to customize their personal robot.
- 3d printable model can be obtained via this project.

Future Work

- Find a more appropriate IBB to obtain a better appearance.
- Design the user interface.
THANK YOU!

Hanxiang Xu
Email: xvhanxiang@gmail.com