Touch & Detach

Physics-based Unbinding and Observation of Complex Virtual Objects in 3D Space

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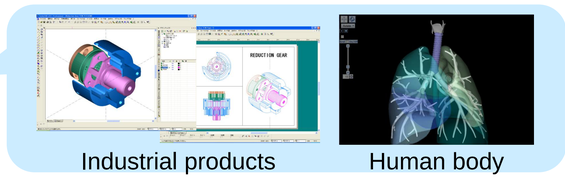
My website is http://www.rm.is.ritsumei.ac.jp/~otsuki/e/
and you can get this poster & paper data from here →

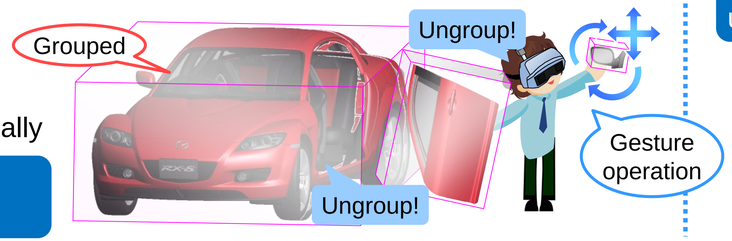
Background

Developing a mixed reality system
for **manipulating complex 3D virtual objects**
by **gesture operations**



In general current modeling software,
for **operational efficiency**,
parts of such a complex 3D object are
- **grouped in a multi-level hierarchy**
- manipulated together, but not individually

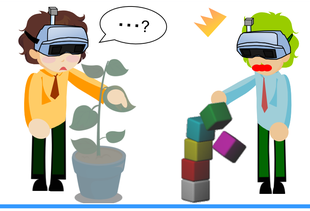
However, ungrouping operations are often necessary



Problem

Users do not experience
the feeling of interacting with
physical objects

This limitation can cause unexpected separation of objects



In the real world…

Objects are connected and
bonded together by materials such as….

To detach them, **the appropriate force**
must be applied at **the appropriate position**

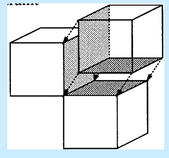
These prevent undesirable detachment

Proposed method “Touch & Detach”

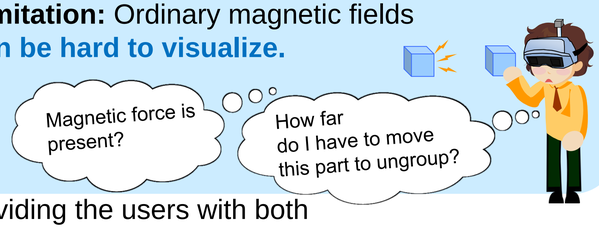
Implementing these real-life metaphors
for ungrouping in virtual world.

Related work: Magnet metaphor
(Kitamura et al., 1998)

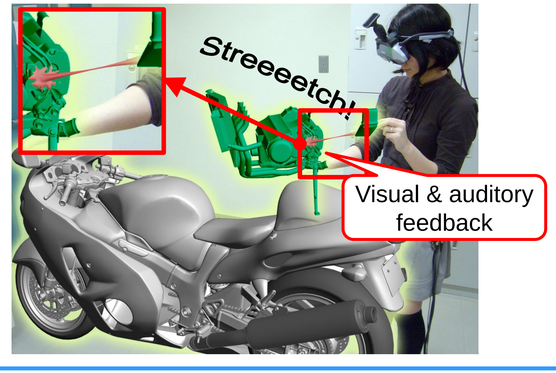
Magnetic force was applied to
the manipulation of
virtual objects in virtual reality space



Limitation: Ordinary magnetic fields
can be hard to visualize.



Providing the users with both
visual & auditory feedback based on the metaphor



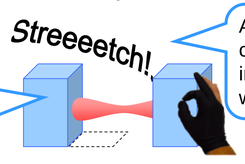
Rubber-like glue metaphor

The user can **check the current state** with visual and auditory feedback while detaching.

When the user

- moves a part from its initial position:

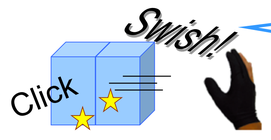
Connection expands and contracts like a rubber band depending on the distance between parts



Auditory feedback changes are in synchronization with visual feedback

- releases the part in the effective area:

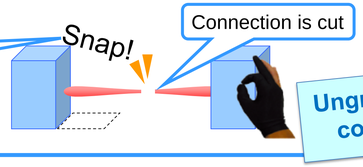
When it returns to the initial position, a clicking sound is provided



Wind sound

- moves the part outside of the effective area:

Snapping sound is provided



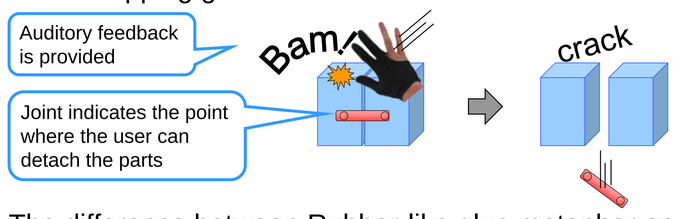
Ungrouping is completed

Joint metaphor

The user can **ungroup multiple groups simultaneously**
with a slapping gesture.

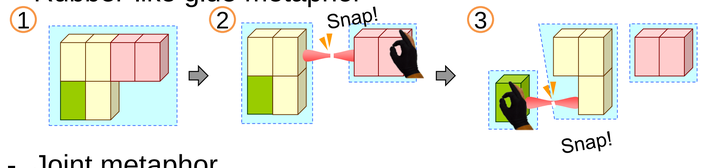
Auditory feedback is provided

Joint indicates the point where the user can detach the parts

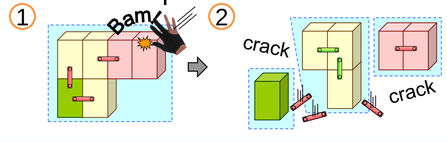


The difference between Rubber-like glue metaphor and Joint metaphor is:

- Rubber-like glue metaphor



- Joint metaphor



From an informal user study

We compared user operations with and without use of the metaphors and collected user comments.

- **All users preferred the operations using the metaphors**
  because the beginning and completion of detaching was clearer and the operation was comfortable.

Our method avoids unexpected operations and improve user satisfaction