

KAIST

CS 380

Introduction to Computer Graphics

LAB (6)

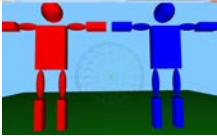

2015.04.08

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## Goals

- Scene graph
  - Build a structure for dealing with objects in a smart way
- Picking
  - Implement user manipulation code

- Note that you have to read the description file (pdf) and the detailed description in the code thoroughly

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## Preliminaries

- You would be better to get familiar with the following concepts to complete this assignment:
  - Class
  - Vector (stl)
  - Pointer
- There are many classes and functions in this homework, **so please read the description (pdf and code) in advance, and start to do some coding.**

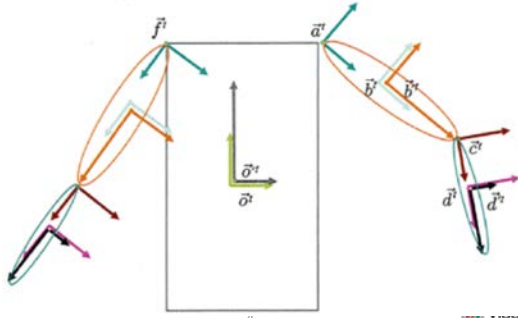
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## Scene graph

- If we move the body of the robot, the connected components should be modified automatically.



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### Scene graph

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- In order to build it, we describe an object frame with the previous object frame, not the world frame.

$$\begin{aligned} \vec{o}' &= \vec{w}'O \\ \vec{o}'' &= \vec{o}'O' \\ \vec{a}' &= \vec{o}'A \\ \vec{b}' &= \vec{a}'B \\ \vec{b}'' &= \vec{b}'B' \\ \vec{c}' &= \vec{b}'C \\ \vec{d}' &= \vec{c}'D \\ \vec{d}'' &= \vec{d}'D' \\ \vec{f}' &= \vec{o}'F \end{aligned}$$

$${}^i d'' c_d = {}^r w' O A B C D' c_d$$

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### Scene graph

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- Other parts would be changed following the scene graph when we modify the object frame  $\vec{o}' = \vec{w}'O$ .

$$\vec{o}' = \vec{w}'O$$

$$\begin{aligned} \vec{o}'' &= \vec{o}'O' \\ \vec{a}' &= \vec{o}'A \\ \vec{b}' &= \vec{a}'B \\ \vec{b}'' &= \vec{b}'B' \\ \vec{c}' &= \vec{b}'C \\ \vec{d}' &= \vec{c}'D \\ \vec{d}'' &= \vec{d}'D' \\ \vec{f}' &= \vec{o}'F \end{aligned}$$

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### Scene graph

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- Tree
  - Parent and child: objects and sub-objects
- Nodes (refer to the pdf file)
  - Transform nodes
    - RBT with respect to its parent frame
  - Shape nodes
    - Geometry to be drawn

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### Picking

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- Render the different scene with their pre-defined IDs without swapping the buffer.
- This rendered image is utilized for picking only, which should not be displayed.

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- Later, we will add animation feature to this program enabling the robots move along the predefined paths.