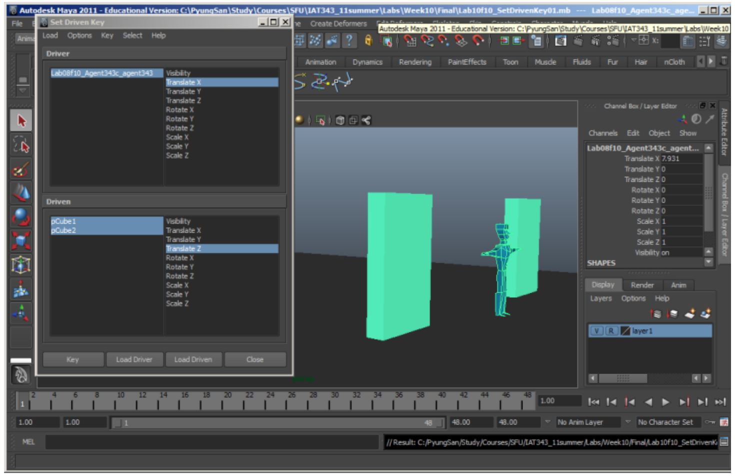
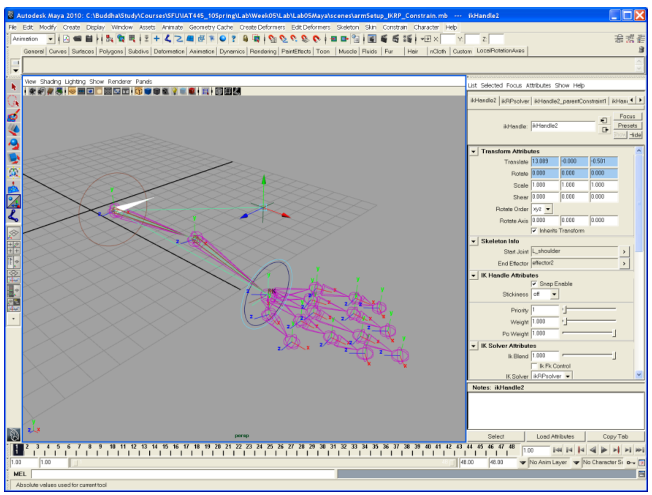
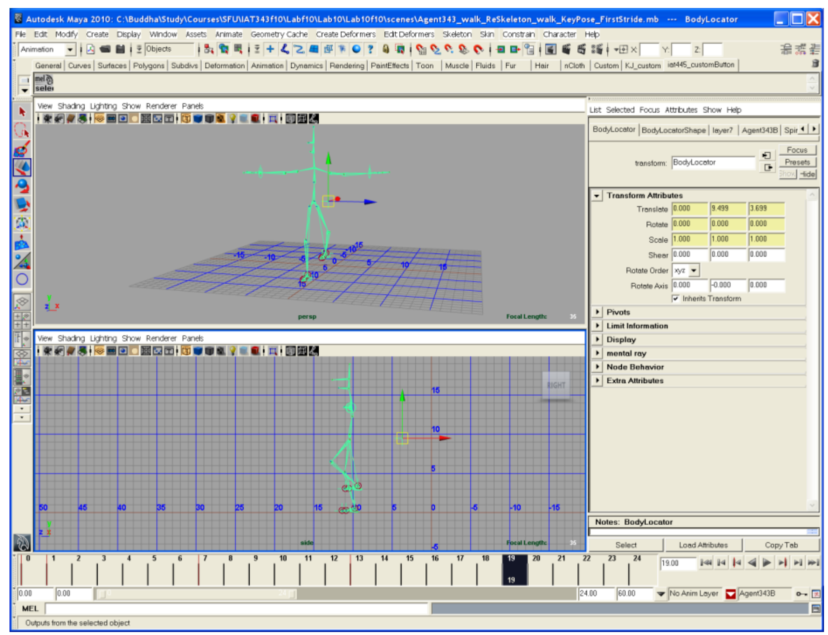
Lab 11

IAT 343
K.J. Lee (kla8@sfu.ca)



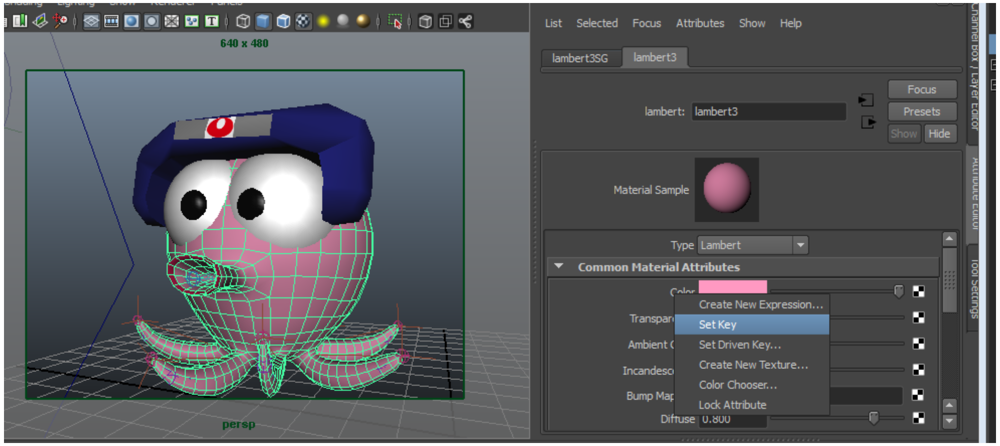
- Ex 1. Set-driven key
- Ex 2. Constraints & Inverse Kinematics
- Ex 3. walk cycle in 2D drawing
- Ex 4. walk cycle in 3D

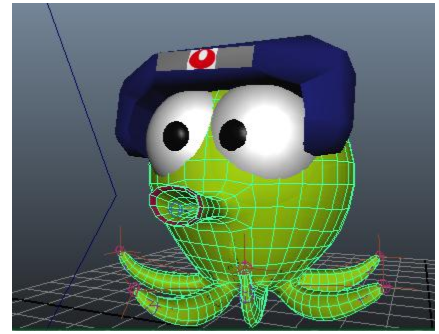




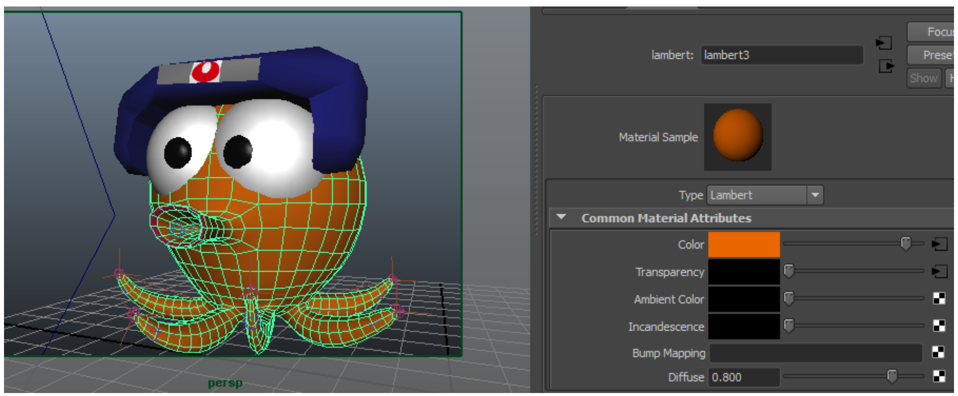
Maya Tips

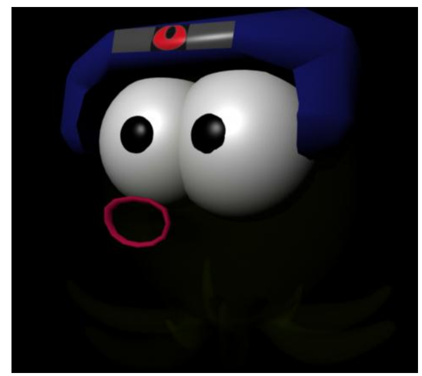
Animating/keyframing Materials

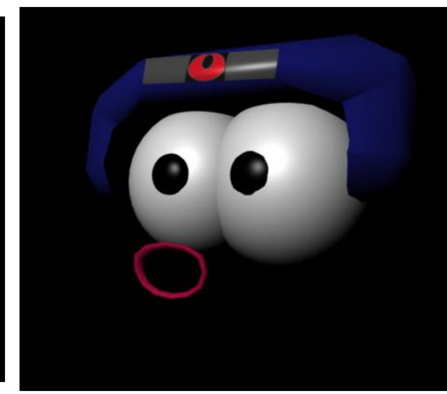




- Ex 1
- Ex 2



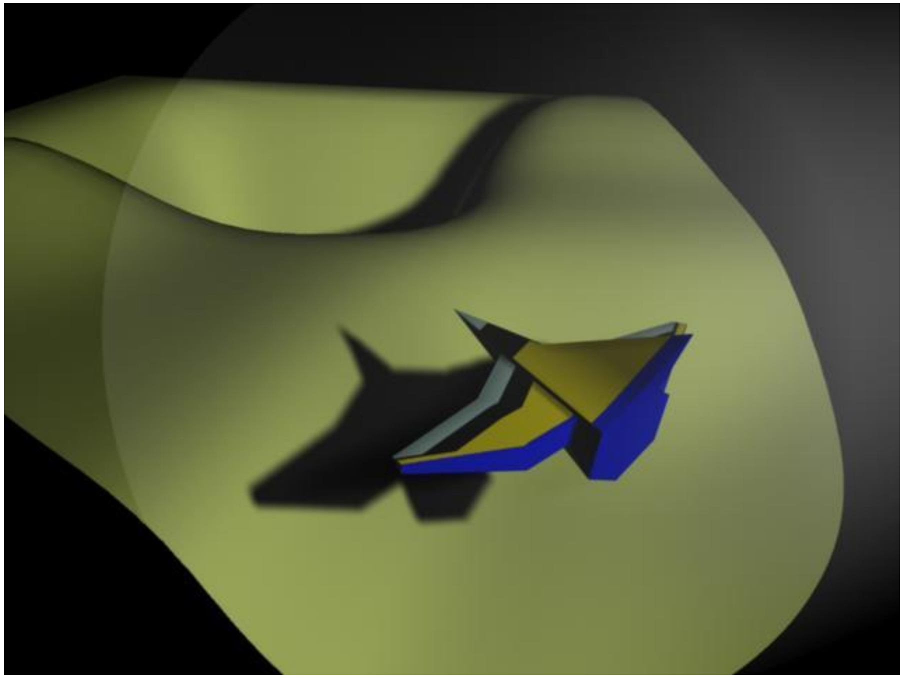


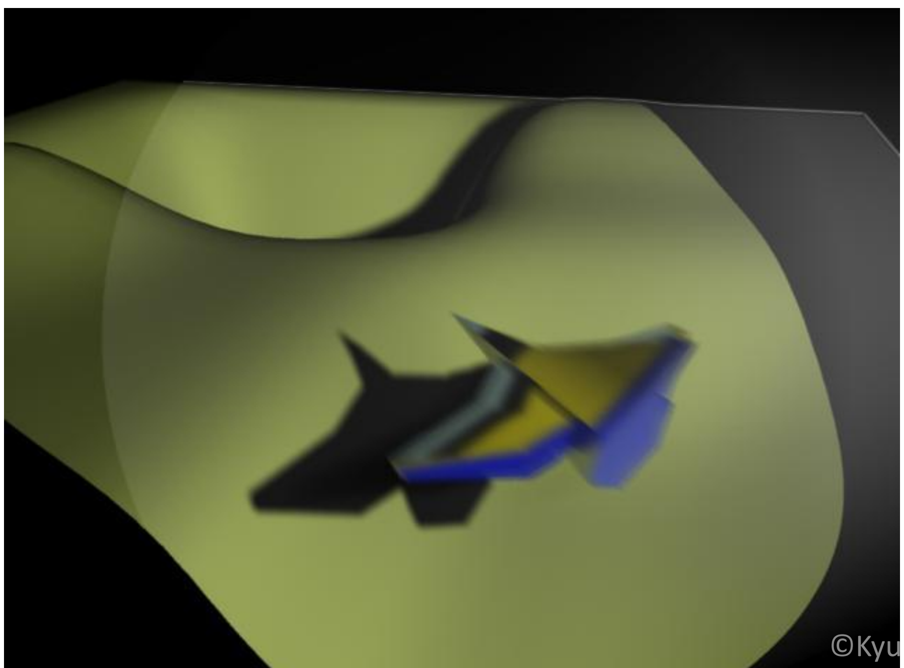


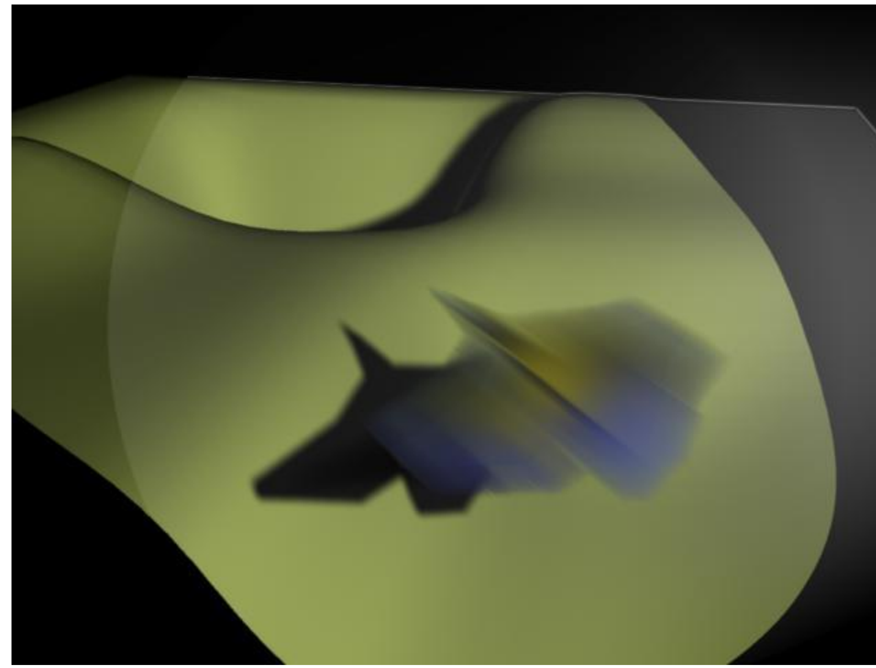
How to animate surface material

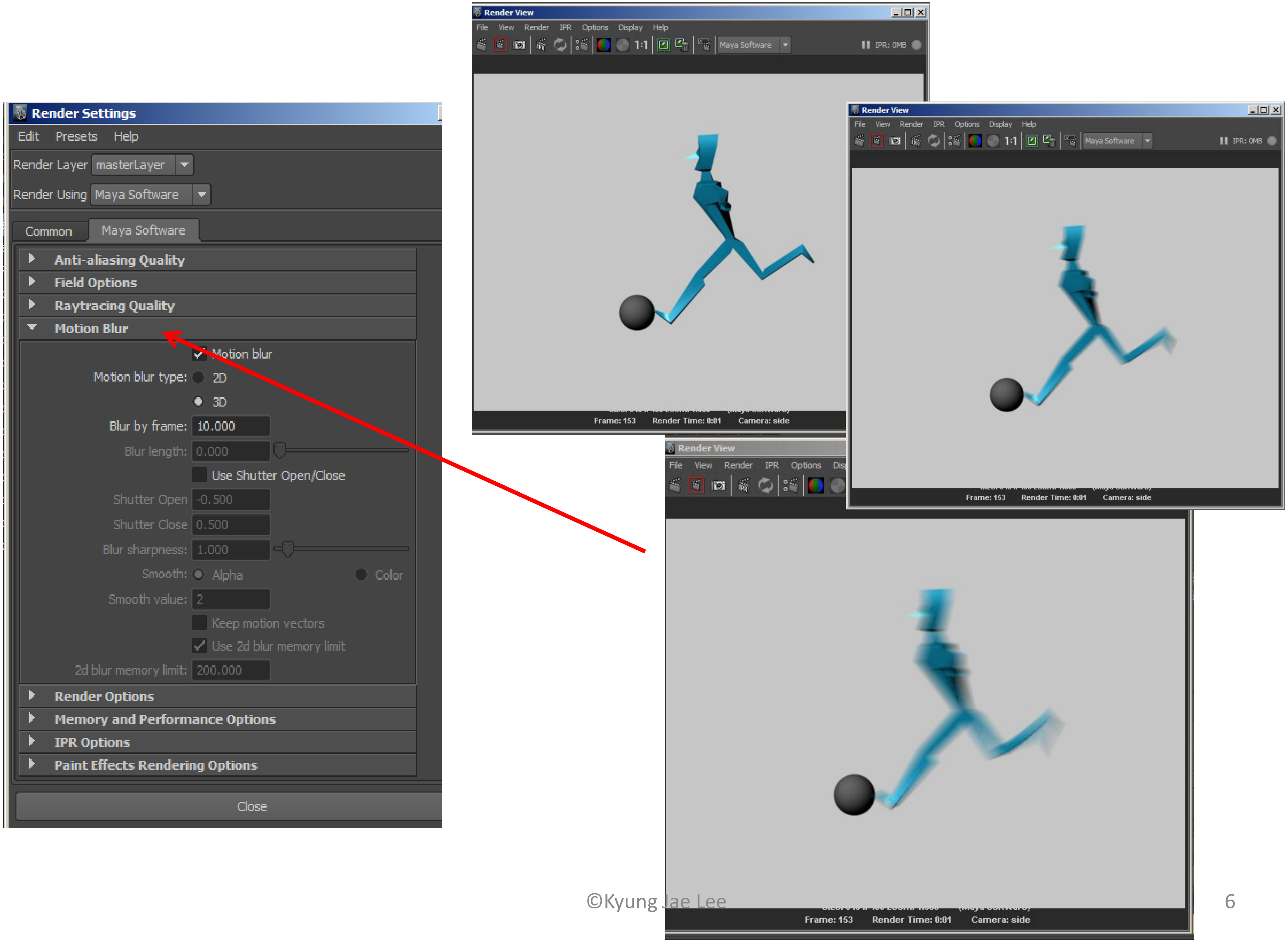
1. Click on a target frame in Timeline area
2. Inside Attribute Editor, press Right Button on a target parameter (i.e., Color) and apply Set Key.
3. Move to another frame. Change current vale of the parameter (i.e., Color). Repeat previous process to add another

Motion Blur

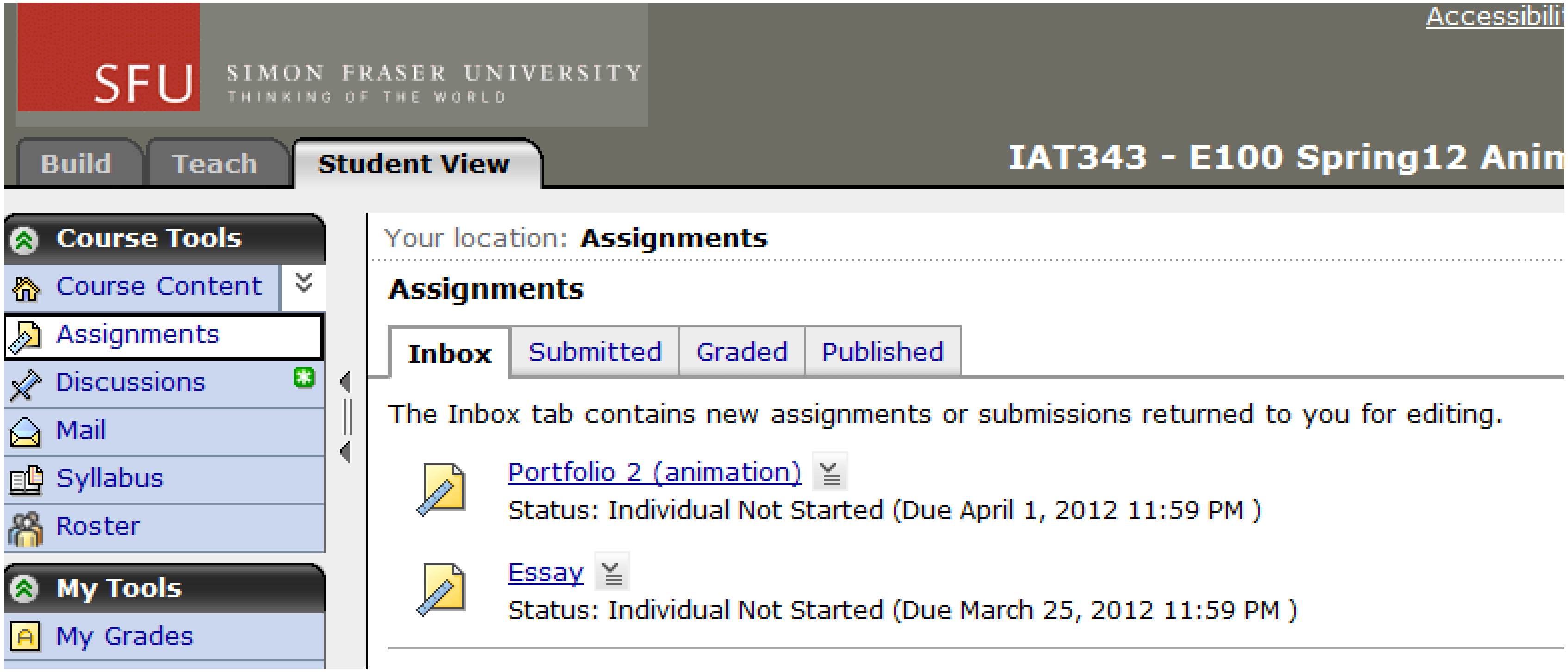







Render Settings
Edit Presets Help
Render Layer masterLayer
Render Using Maya Software
Common Maya Software
Anti-aliasing Quality
Field Options
Raytracing Quality
Motion Blur
Motion blur
Motion blur type: 2D
3D
Blur by frame: 10.000
Blur length: 0.000
Use Shutter Open/Close
Shutter Open -0.500
Shutter Close 0.500
Blur sharpness: 1.000
Smooth: Alpha Color
Smooth value: 2
Keep motion vectors
Use 2d blur memory limit
2d blur memory limit: 200.000
Render Options
Memory and Performance Options
IPR Options
Paint Effects Rendering Options
Close
Render View
File View Render IPR Options Display Help
Maya Software
Frame: 153 Render Time: 0:01 Camera: side
Render View
File View Render IPR Options Display Help
Maya Software
Frame: 153 Render Time: 0:01 Camera: side
Render View
File View Render IPR Options
Frame: 153 Render Time: 0:01 Camera: side

Due Dates



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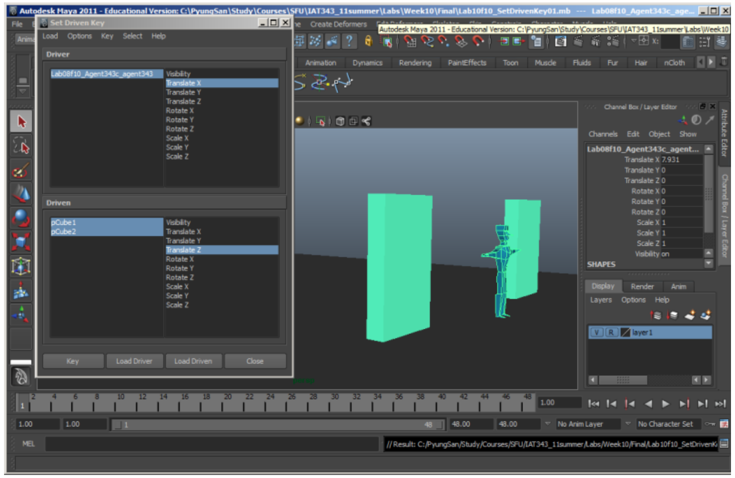
THINKING OF THE WORLD
Build
Teach
Student View
IAT343 - E100 Spring12 Anin
Course Tools
Course Content
Assignments
Discussions
Mail
Syllabus
Roster
My Tools
My Grades
Your location: Assignments
Assignments
Inbox
Submitted
Graded
Published
The Inbox tab contains new assignments or submissions returned to you for editing.
Portfolio 2 (animation)
Status: Individual Not Started (Due April 1, 2012 11:59 PM)
Essay
Status: Individual Not Started (Due March 25, 2012 11:59 PM)

This Week's Lab



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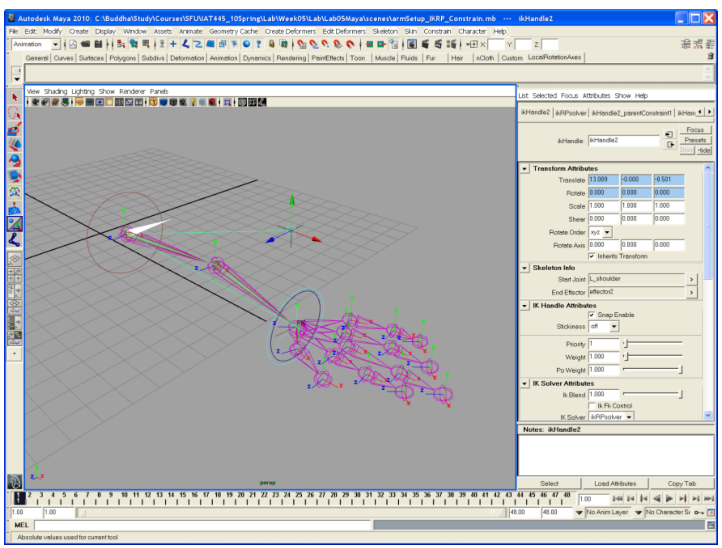
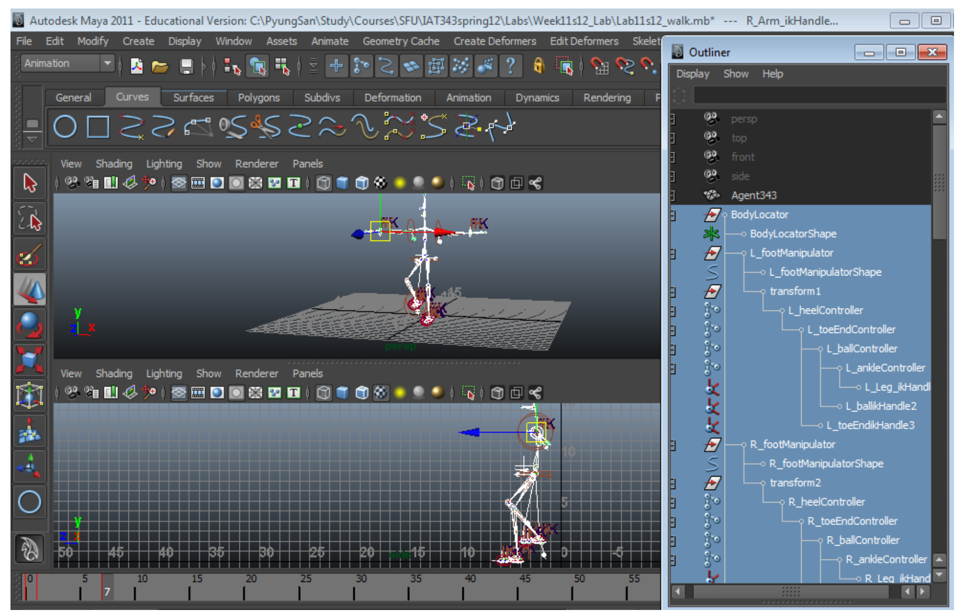




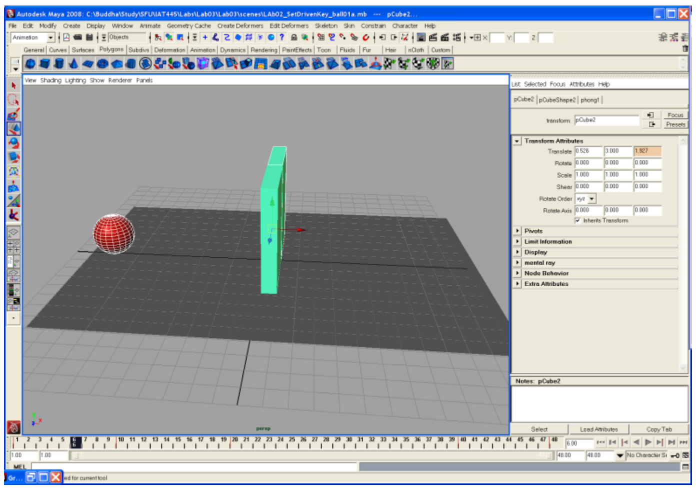
Set Driven Keys

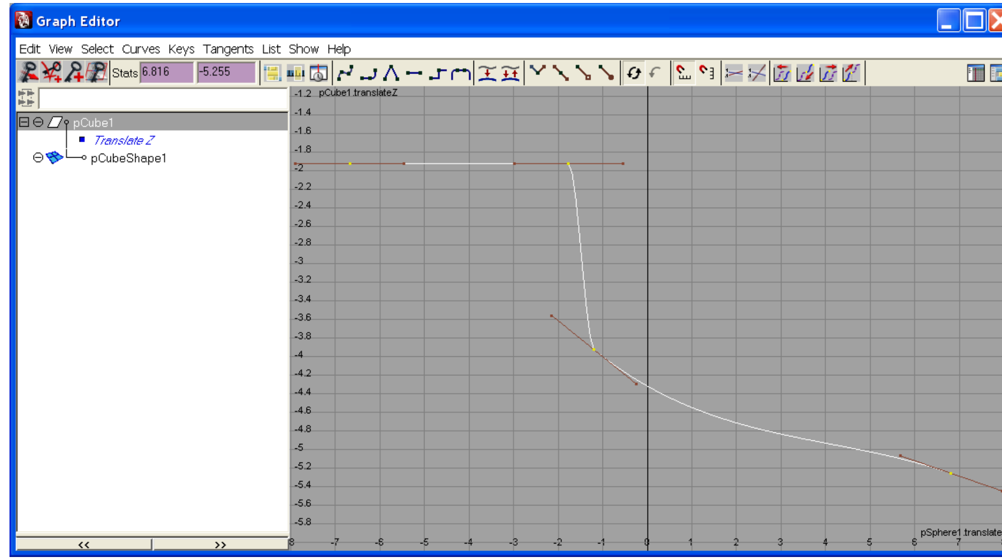
- Driven Keys link the attributes—single or multiple—of one object to the attributes of another object. You can use Driven Keys when you want the attributes of one object to drive those of another object.

- A technique for driving one attribute's animation from another attribute.

- Curve relationship

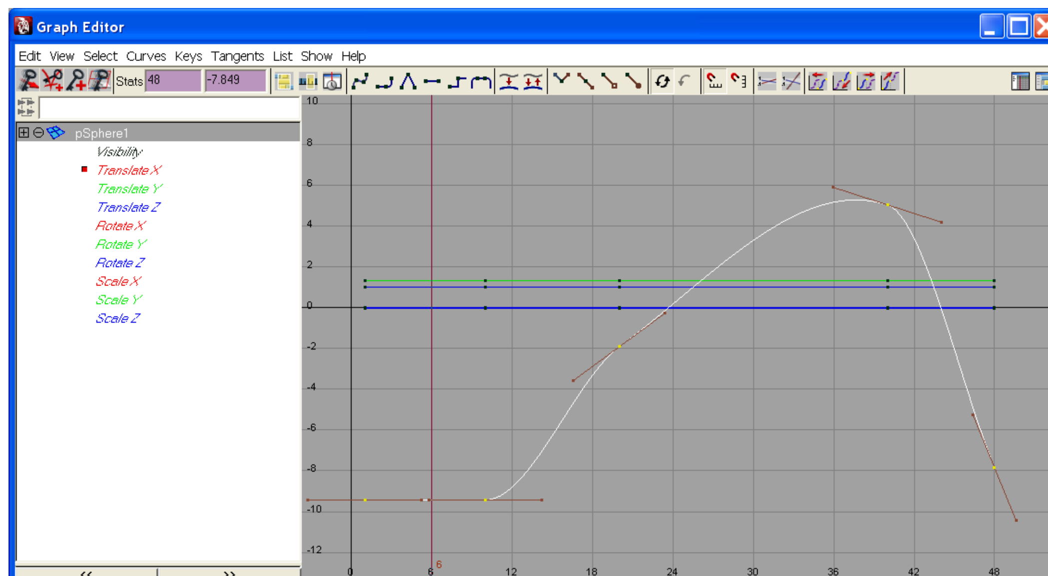
1. Set-driven key





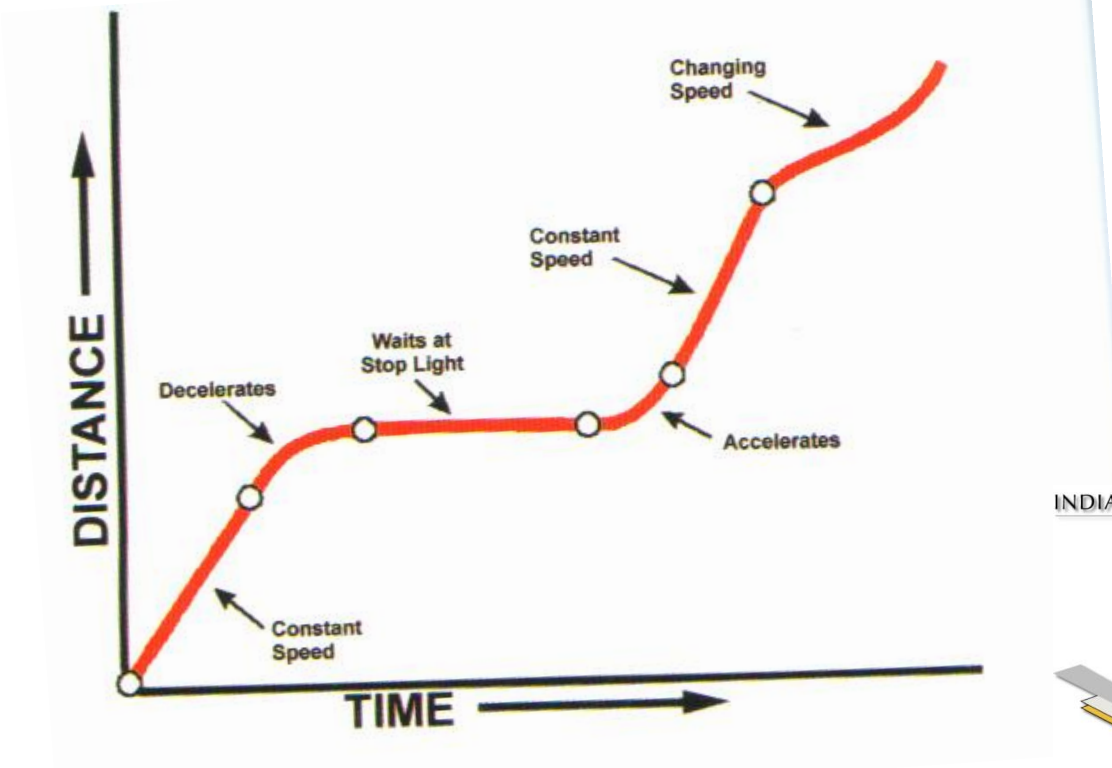
Relation between translateX of the ball and translateZ of the door, no time range

- A technique for driving one attribute's animation from another attribute.
- Curve relationship

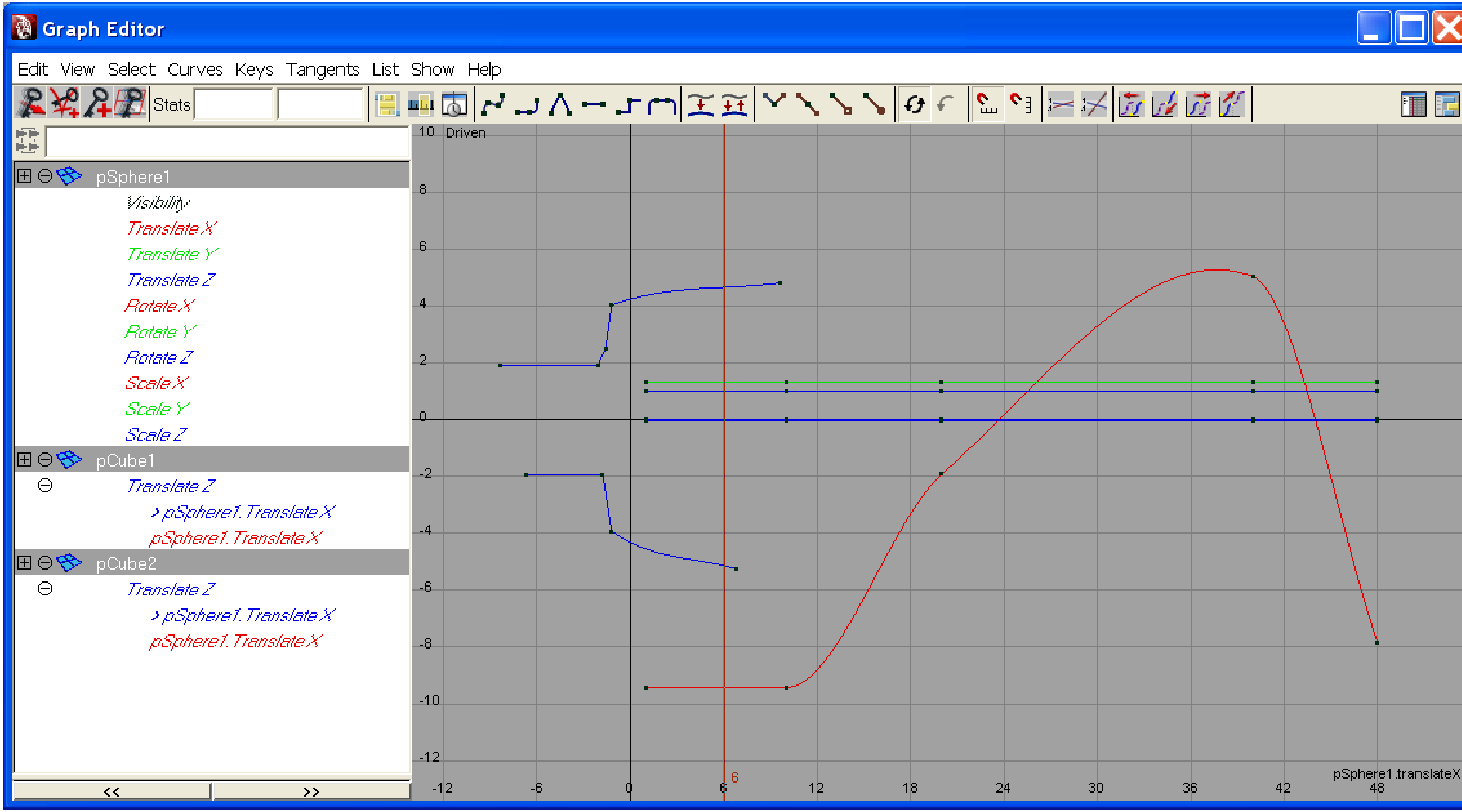


Relation between transformation of the ball and timeline

Understanding Graph

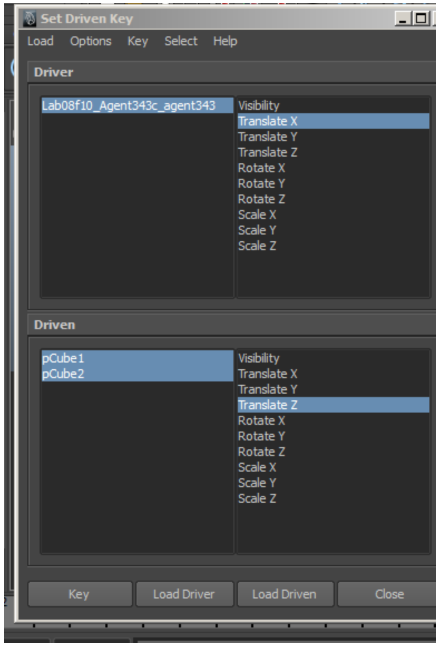


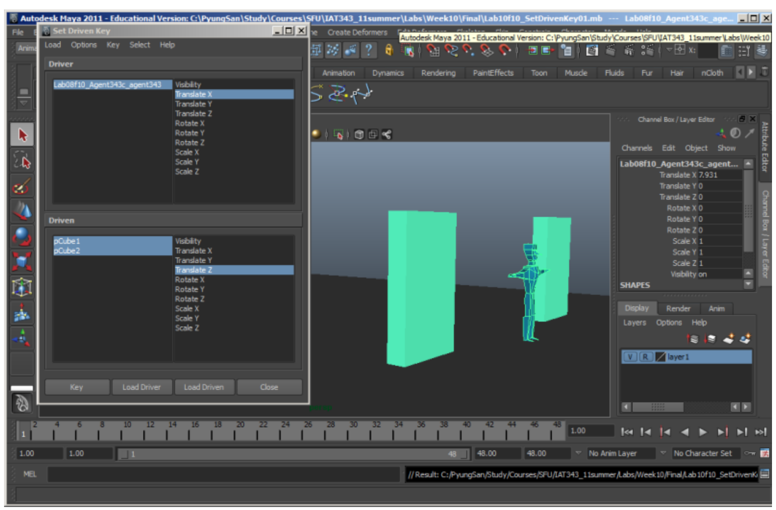
- If graph looks like..
  1. straight, diagonal – steady rate of speed
  2. Curve – accelerating, decelerating or change velocity
  3. Flat – zero speed/stop



Don't get confused between Set-driven Curve and typical motion curves

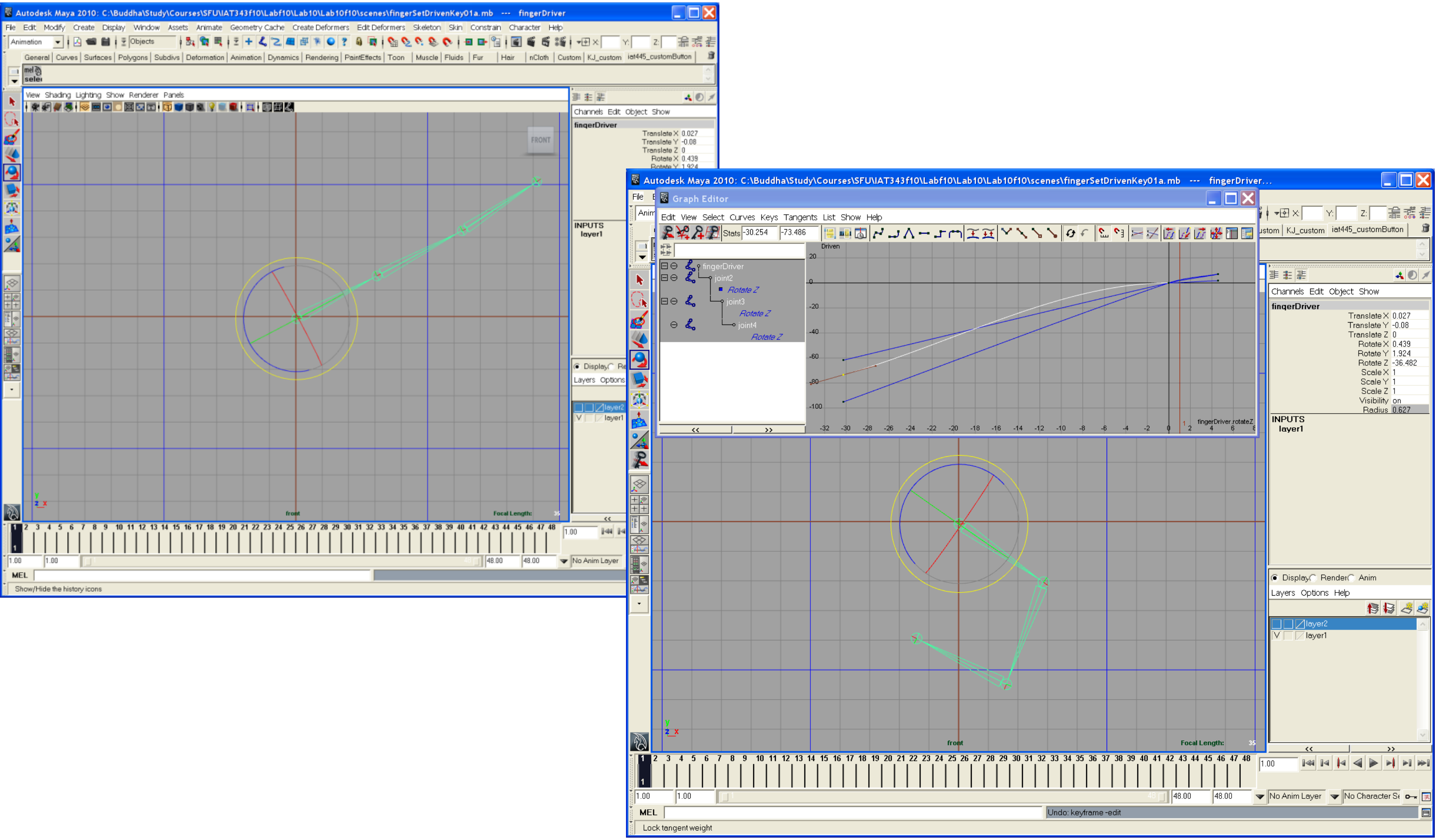
Lab Exercise 1: Sliding a door through Set Driven Key



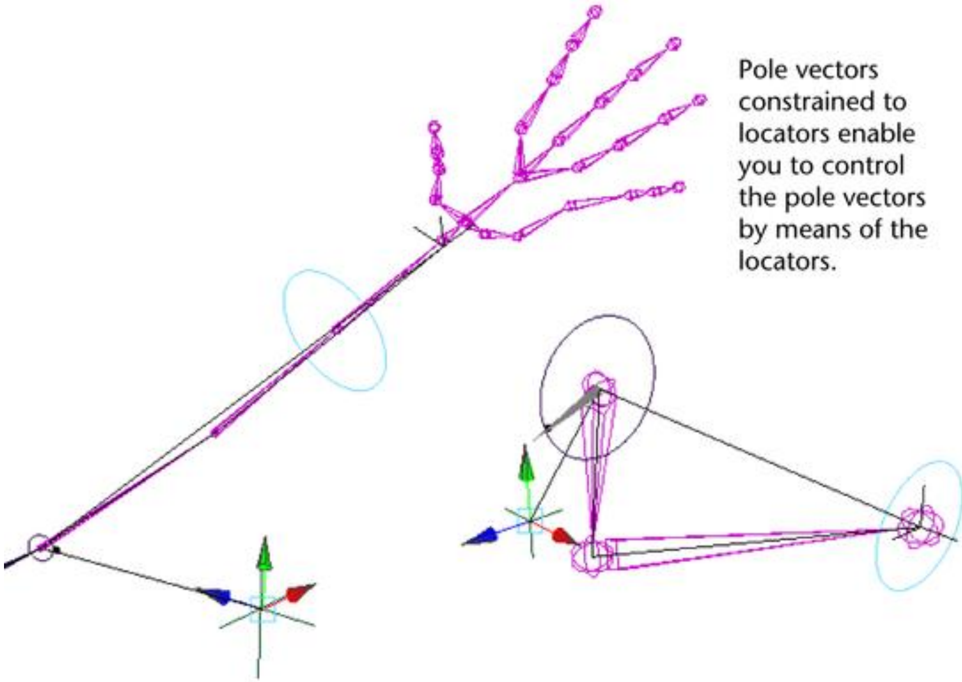


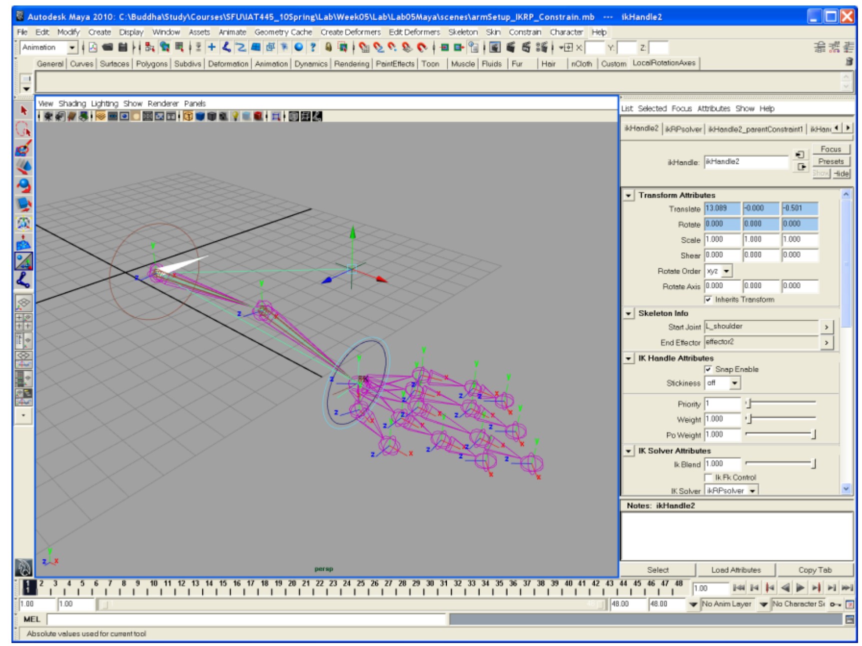
1. Open the file '**Lab1s12_SetDrivenKey**'.
2. Switch to the **Animation** module (F2), select **Animate > Set Driven Key > Set**.
3. Select the agent and press **Load Driver**. Select the two cubes (door) and press the **Load Driven**.
4. Choose an attribute (**translateX**) from the driver (agent) as well as an attribute (**translateZ**) from the driven object (door). By pressing '**Key**' button, we assign the initial relationship.
5. To make it sure about the timing of the agent (before passing through the door), translate the sphere right before the door and press **key**.
6. This time, relocate the sphere and the cubes to simulate the sliding motion
   - agent: positive **TranslateX**
   - pCube2 to positive **TranslateZ** direction and
   - pCube1 to negative **TranslateZ** direction
7. Then, press **Key** to save the current location. Test the simulation by moving the agent back and forth to the door.
8. To animate, add key frames (shortcut key 's') on the agent.
9. **Based on this exercise, design your own set-driven animation different from this exercise. Post it on your site for the mark.**

Simulating finger movement based on Set-Driven Key



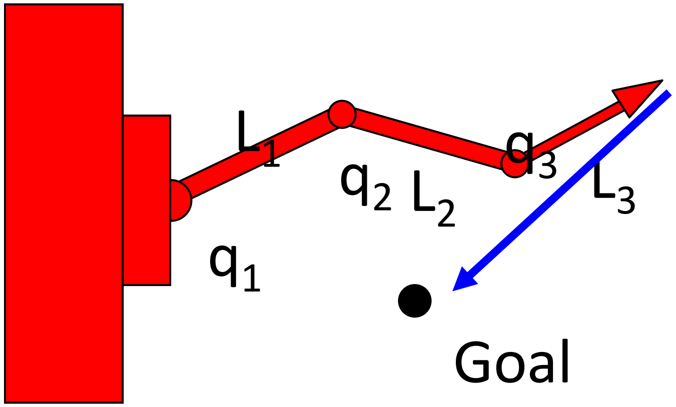
Lab Exercise 2. Arm IK

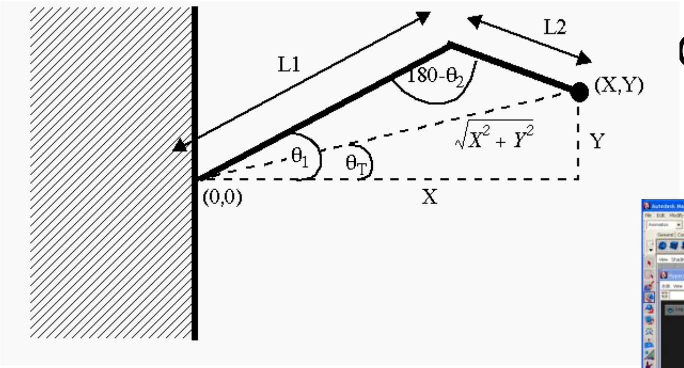




A pole vector constraint causes the end of a pole vector to move to and follow the position of an object, or the average position of several objects.

Inverse Kinematics

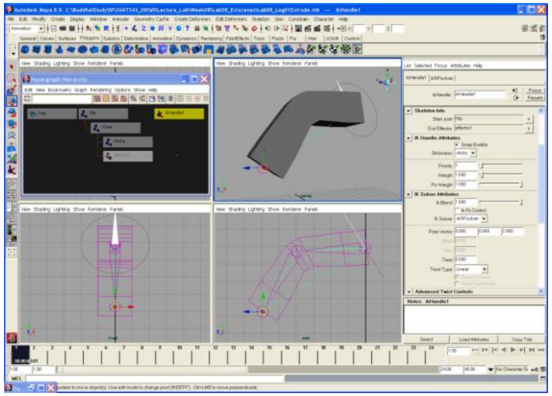


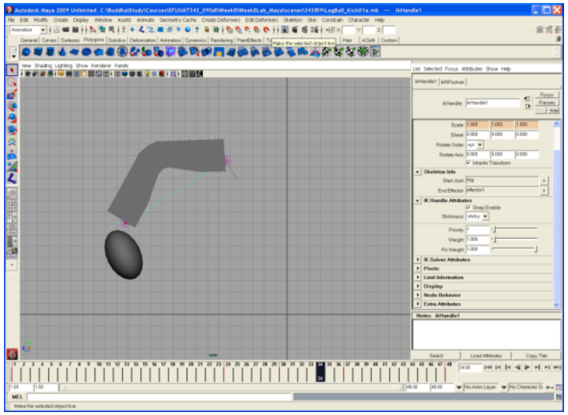


Given arm configuration (q1, q2)

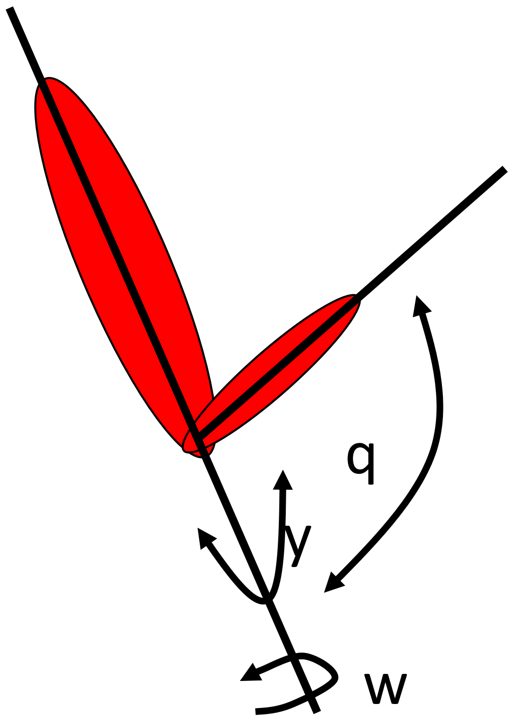
Given desired goal position of end effector: (x,y)

(Parents, 2002)





Joint Representation



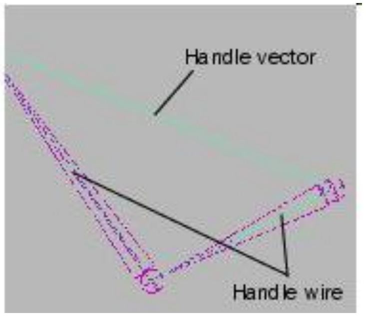
(Parents, 2002).

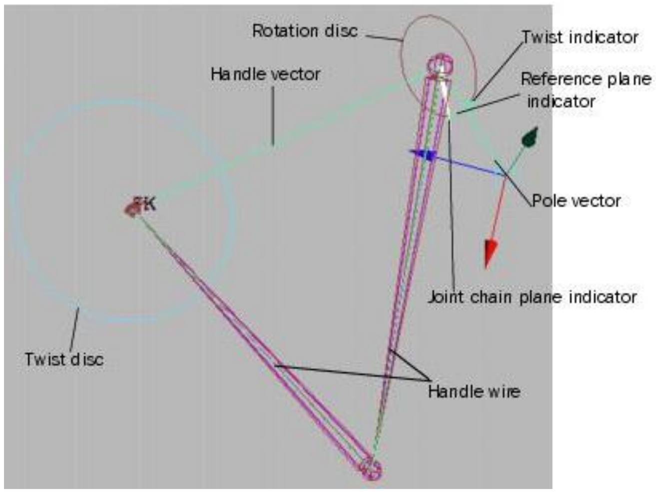
Multiple
Degrees of Freedom

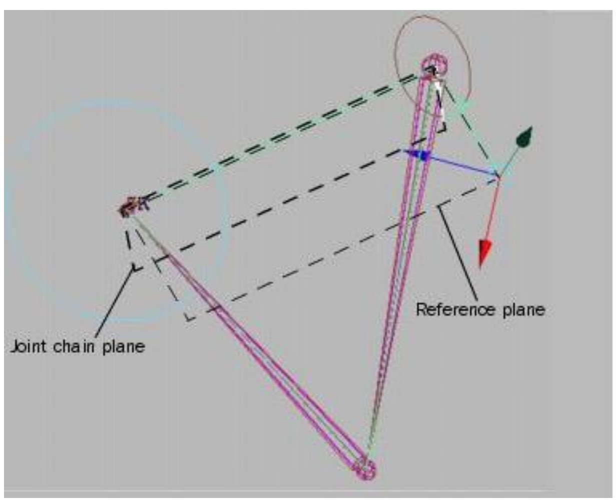
Joint Limits

Axis-angle
quaternions

ikSCsolver vs. ikRPsolver

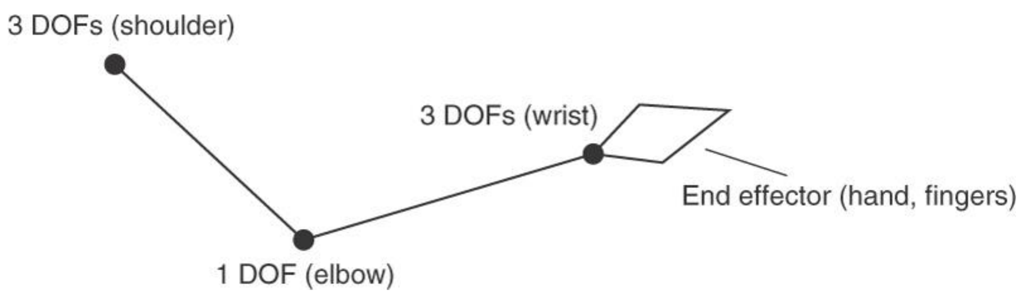




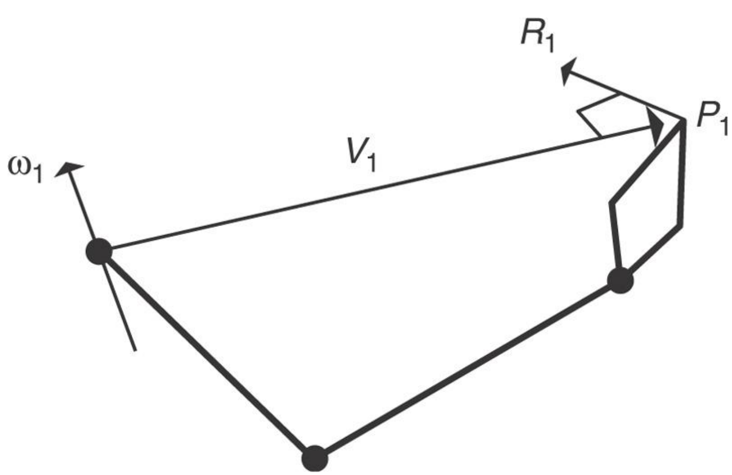


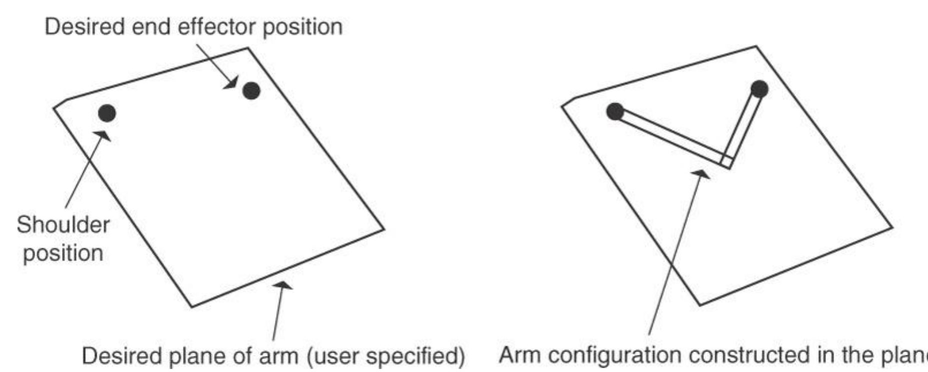
- Difference between single chain and rotate plane IK handles
  - The difference between a single chain IK handle and a rotate plane IK handle is that the single chain IK handle's end effector tries to reach the position and the orientation of its IK handle, whereas the rotate plane IK handle's end effector only tries to reach the position of its IK handle.
  - Since the rotate plane IK handle's end effector only tries to reach the position of its handle, the resulting joint rotations are more predictable. For the rotate plane IK handle, the orientation of its entire joint chain is controlled by the *twist disc* manipulator.

Modeling the Arm



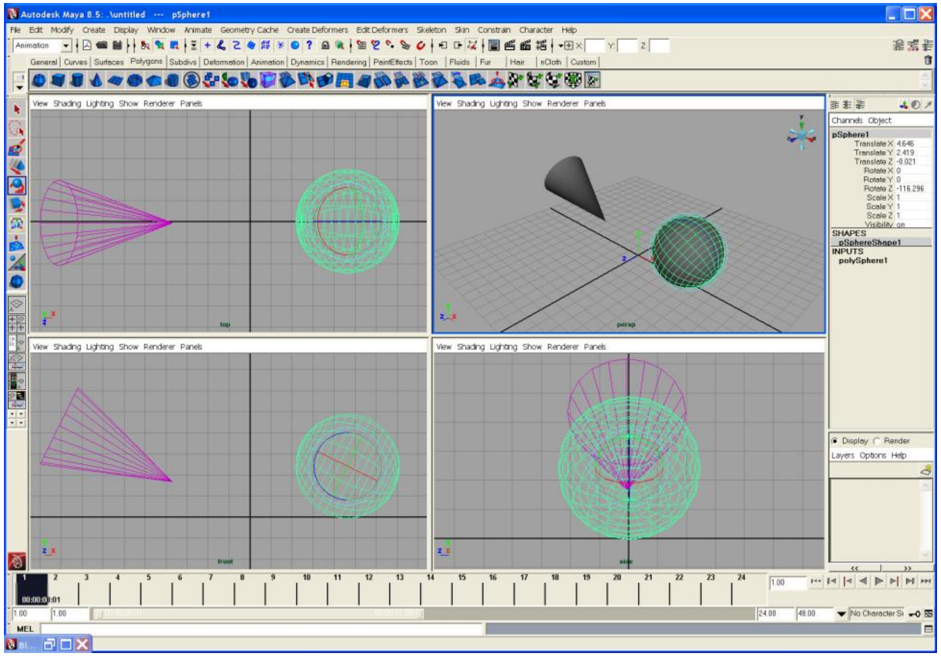
- 7 degrees of freedom
- Elbow rotation (20 to 160 degrees)

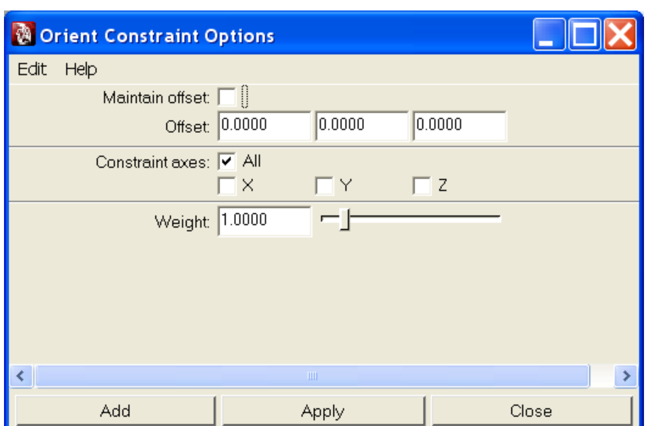




Parents, R. (2002). **Computer Animation Algorithms and Techniques**

Constraints



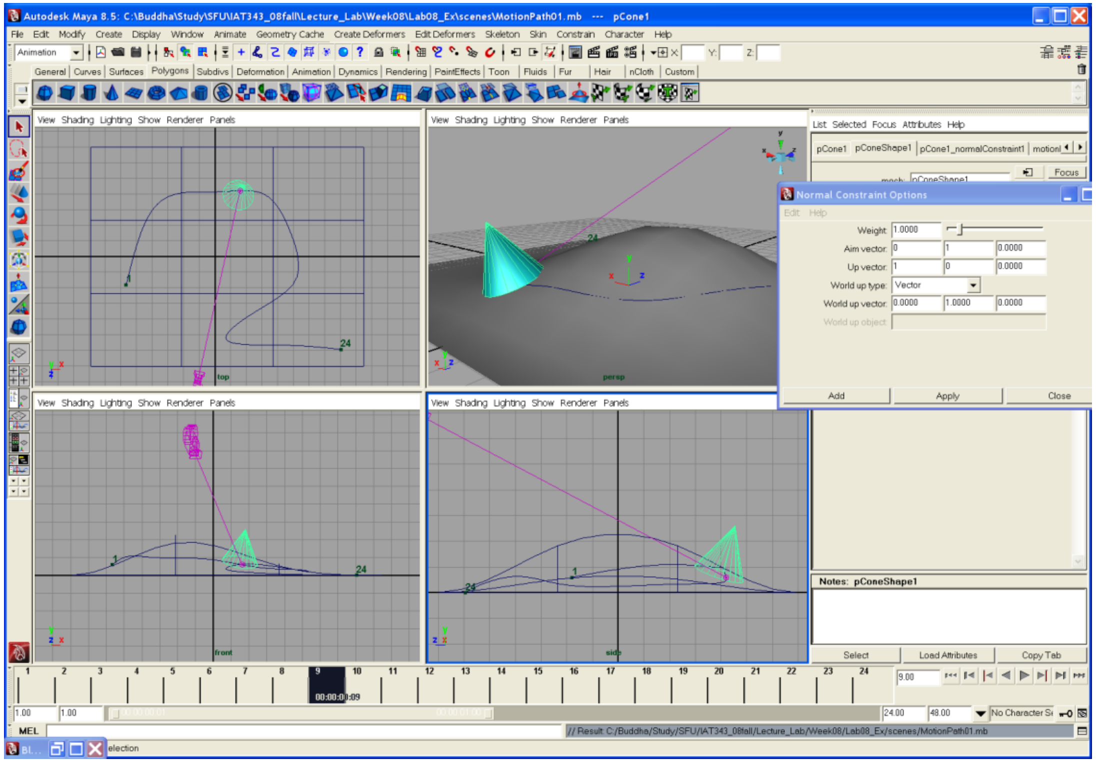


- Constraint is a restriction of the position, orientation, or scale of an object.
- Select the control object first, then choose the controlled object.
- In Animation module, Constrain >
  - Point
  - Orient
  - Scale
  - Aim
  - Parent
  - Geometry
  - Normal
  - Tangent
  - Pole Vector

User Guide > Rigging > Character Setup > Constraints

Constraints - Normal

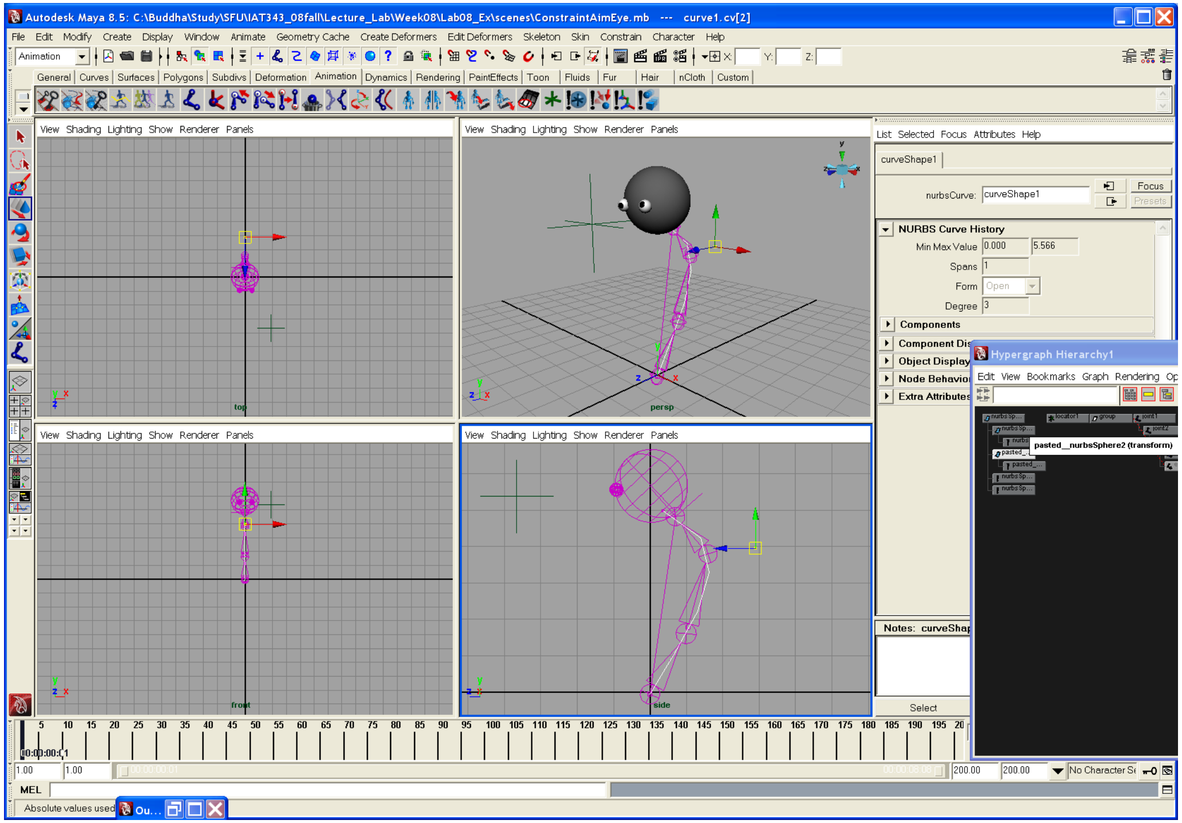
A normal constraint constrains an object's orientation so that it aligns with the normal vectors of a NURBS surface or polygonal surface (mesh). Normal constraints are useful for having an object travel across a surface that has a unique, complex shape. Without normal constraints, moving or animating the object across the surface could be tedious and time-consuming. For example, you might want to have a tear falling down along character's face. Instead of animating the tear directly, you could constrain it to the face's surface.



ConstraintNormal01.mb

Constraints - Aim

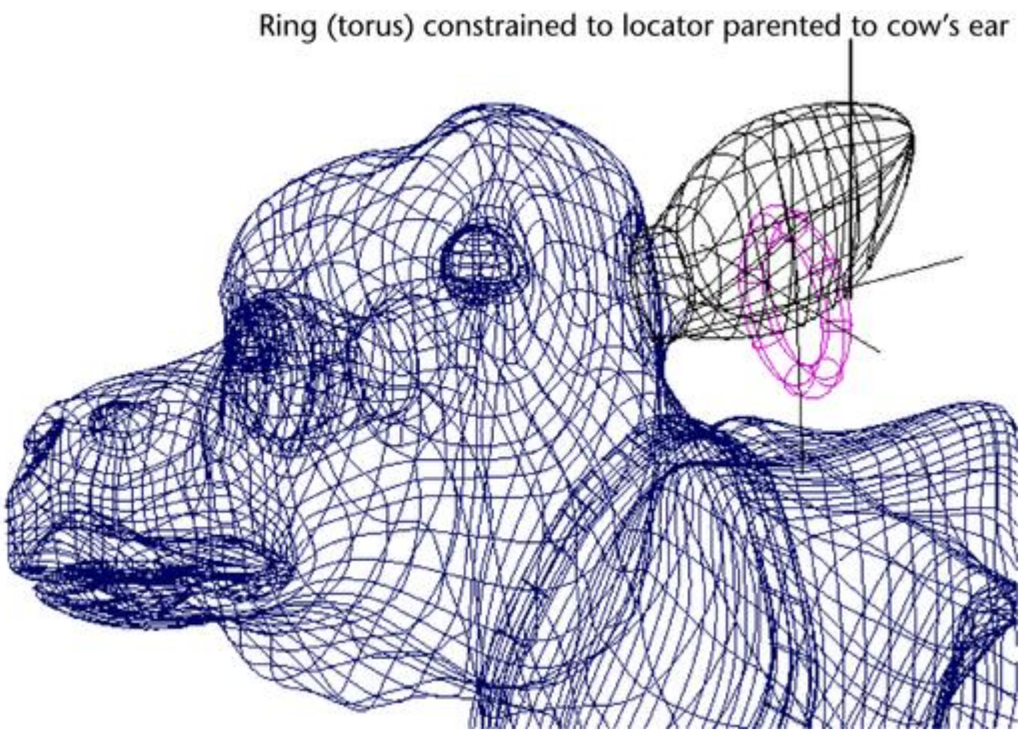
An aim constraint constrains an object's orientation so that the object aims at other objects. Typical uses of the aim constraint include aiming a light or camera at an object or group of objects. In character setup, a typical use of an aim constraint is to set up a locator that controls eyeball movement.



ConstraintAimEyeSpline01.mb

Constraints - Point

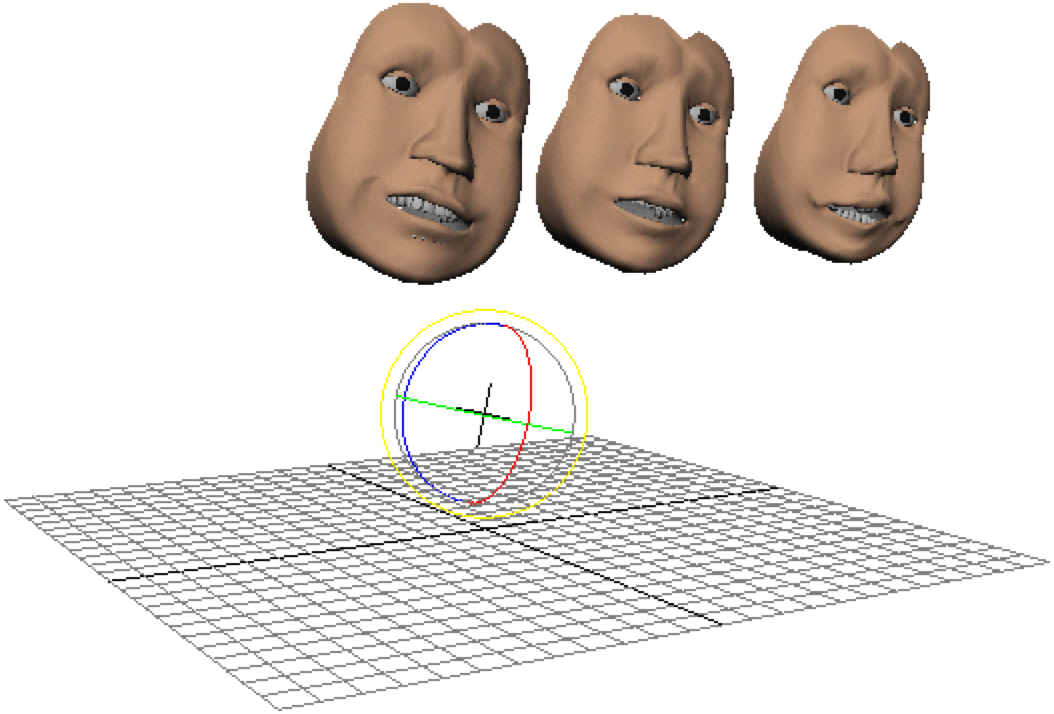
A point constraint causes an object to move to and follow the position of an object, or the average position of several objects. This is useful for having an object match the motion of other objects.



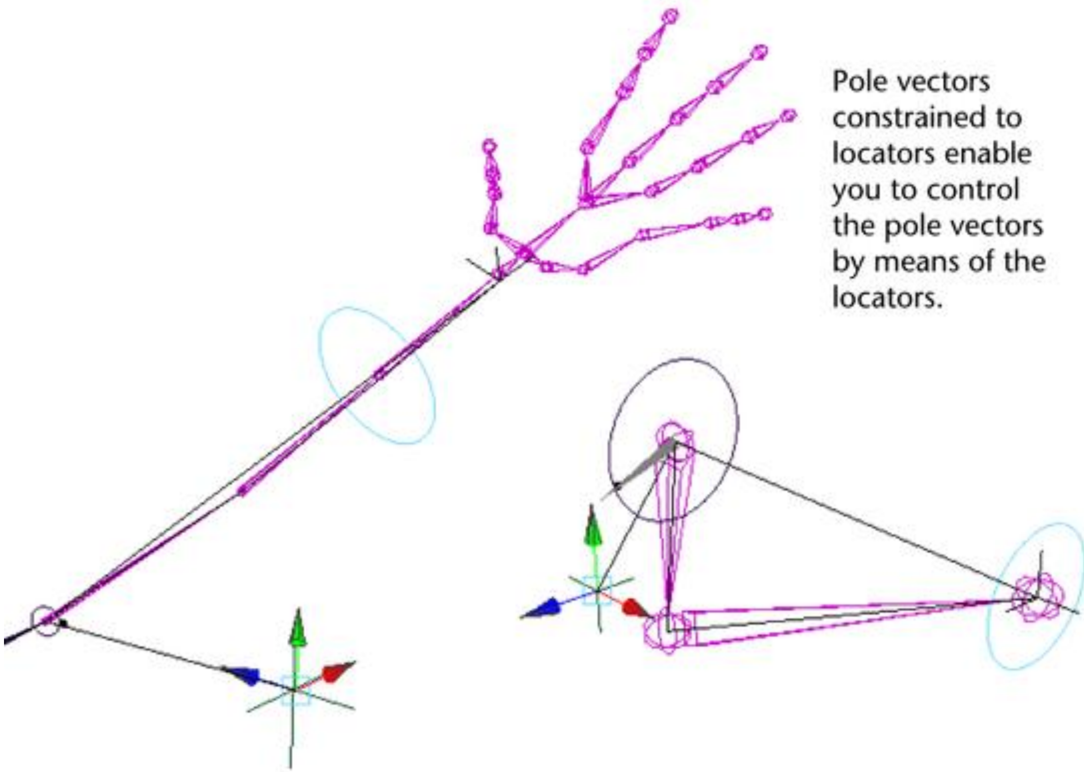
ConstraintNormal01.mb

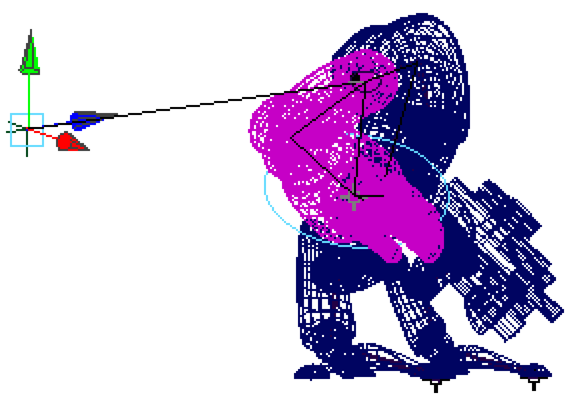
Constraints - Orient

An orient constraint matches the orientation of one object to one or more other objects. This constraint is useful for making several objects orient simultaneously. For example, you can make a group of characters all look in the same direction at the same time by animating one character's head and then constraining all the other character's heads to the head you've just animated.



ConstraintNormal01.mb





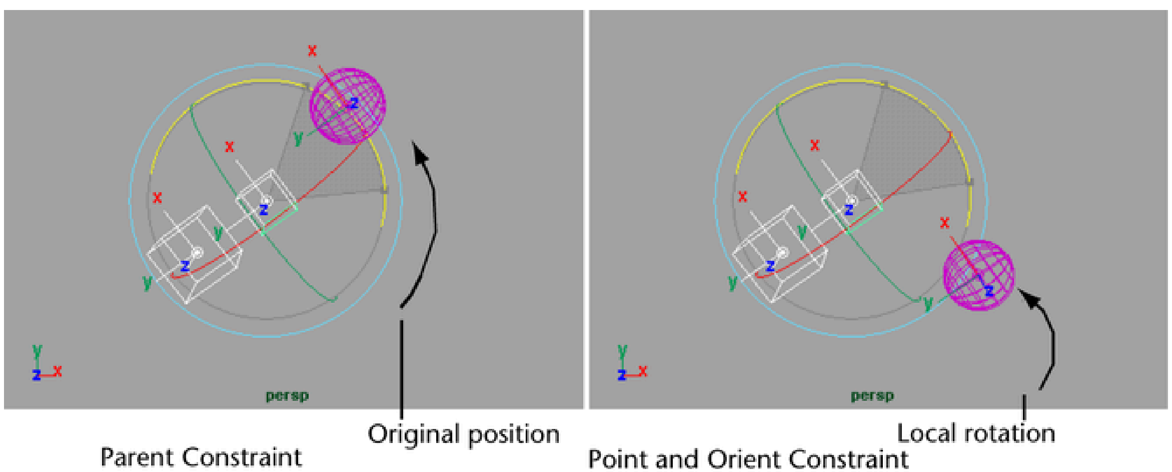
User Guide > Rigging > Character Setup > Constraints > Types of constraints > Pole Vector constraints

Constraints - Parent

With a parent constraint, you can relate the position—translation and rotation—of one object to another, so that they behave as if part of a parent-child relationship that has multiple target parents. An object's movement can also be constrained by the average position of multiple objects.

When a parent constraint is applied to an object, the constrained object does not become part of the constraining object's hierarchy or group, but remains independent and behaves as if it is the child of its targets. The constraining object is also known as the target object.

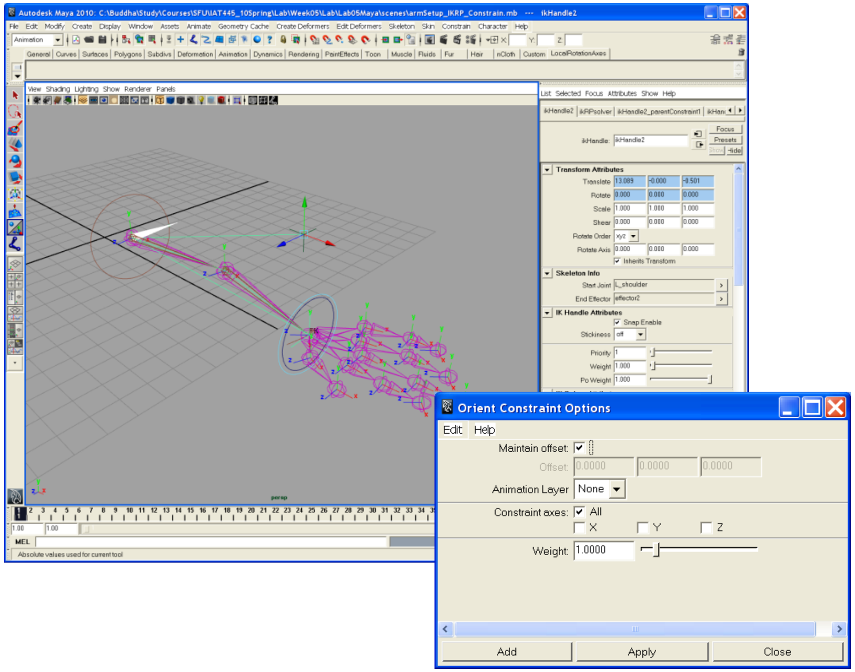
An object with a parent constraint does not behave the same as an object with a point and orient constraint. When a Parent constraint is used, rotating the target object(s) affects the constrained object's rotation along the world axis. When a Point and Orient constraint are used, rotating the target object(s) affects the constrained object's rotation along its local axis. This is shown in the following figure.

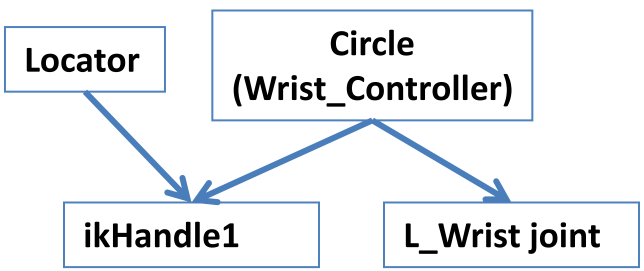


User Guide > Rigging > Character Setup > Constraints > Parent constraint > Parent constraints

ConstraintNormal01.mb

Lab Exercise 2. Arm IK





Apply Modify > Freeze Transformations to normalize transformation matrix.

Design IK handle

1. Open '**Lab11s12_arm.mb**'.
2. Open the IK handle settings (**Skeleton > IK Handle tool>Option box**) and select ikRPsolver.
3. Create an IK chain by clicking on the **L_shoulder**, then click on the **L_wrist**.
4. To design a hand manipulator, create a **NURBS circle**(rename it: **Wrist_Controller**) in orthographic Side View and position it on the center of the wrist (to snap the **circle** to the **L_wrist**, press/hold 'v'**)**.
5. Build constrain relationships
   i. Apply **Constrain > Parent** between the circle and the **Ikhandle** (select the circle first, then the **Ikhandle**).
   ii. Before applying **Constrain > Orient** between the circle and the **wrist** joint, turn on **Maintain offset** option in the **Constraint Orient** option box.
   iii. Create a locator(**Create > Locator)** and put this control object behind the elbow. Then, apply **Constrain > Pole Vector** between the **locator** and the **Ikhandle**.
6. Move and rotate the circle to test the movement of the wrist.
7. Move up/down on the locator to test the arm movement.
8. Is it necessary to build any other constraint relationship?

Simulating 3D character walk

What could be an ideal walking simulation in 3D Animation?

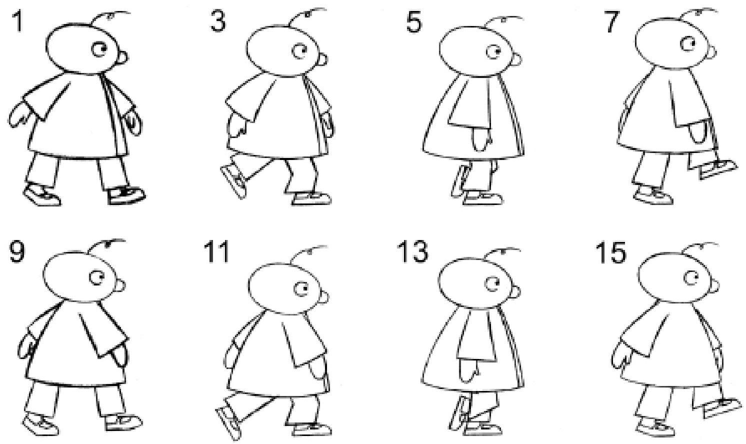
Physically reasonable, artistically controlled
(or physically accurate as well as visually satisfying/pleasing

(Parent, 2002)

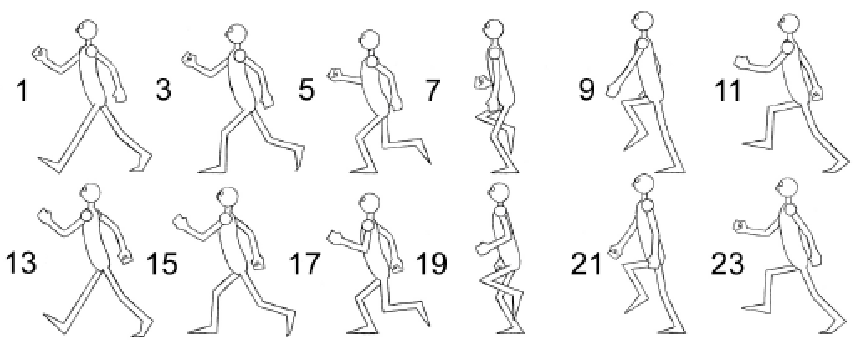
http://www.youtube.com/watch?v=HhHwnrlZRus

http://www.youtube.com/watch?v=1wK1Ixr-UmM

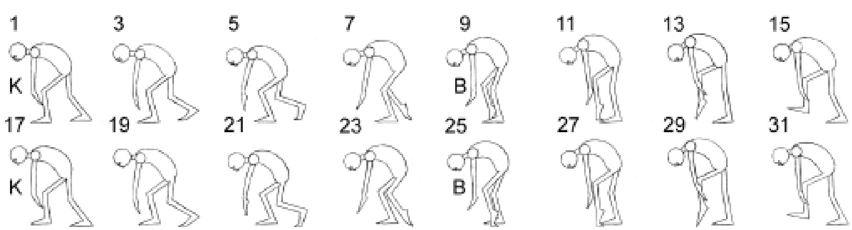
http://www.youtube.com/watch?v=3wLB_5KiqoM



Stylized walk.



Basic walk.



Sad walk.

Image Source
Roberts, S. (2007). *Character Animation: 2D Skills for Better 3D*

Lab Exercise 3: Walk cycle sketch

Quick sketch of Walk cycle (scan and post it on your individual site)
Draw one full walk cycle of your partner in both Side and Front views.

1. First, identify a number of key body parts (hip, shoulder, feet, hand, elbow, head etc.). To represent these parts, simple shapes (stick man figure using circle and line) can be used.

2. Ask your partner to pose minimum 5 static poses and draw the key body parts and the ground (flat or hill).

    1. Draw a T-pose of your partner.
    2. Initial walk pose (both feet on the ground).
    3. Move forward and down (usually bend the forward knee)
    4. Cross over pose with one foot lifted (the point where one foot passes the other leg)
    5. Up pose with the lifted leg pass over the other leg
    6. One foot landing.

   Repeat the previous steps with leg switched

    7. Move forward and down (usually bend the forward knee)
    8. Cross over pose with the other foot lifted (the point where one foot passes the other leg)
    9. Up pose
    10. The other foot landing.

3. Ask your partner to walk (either normal walk or stylized walk with personality) and put frame numbers on all the key poses.

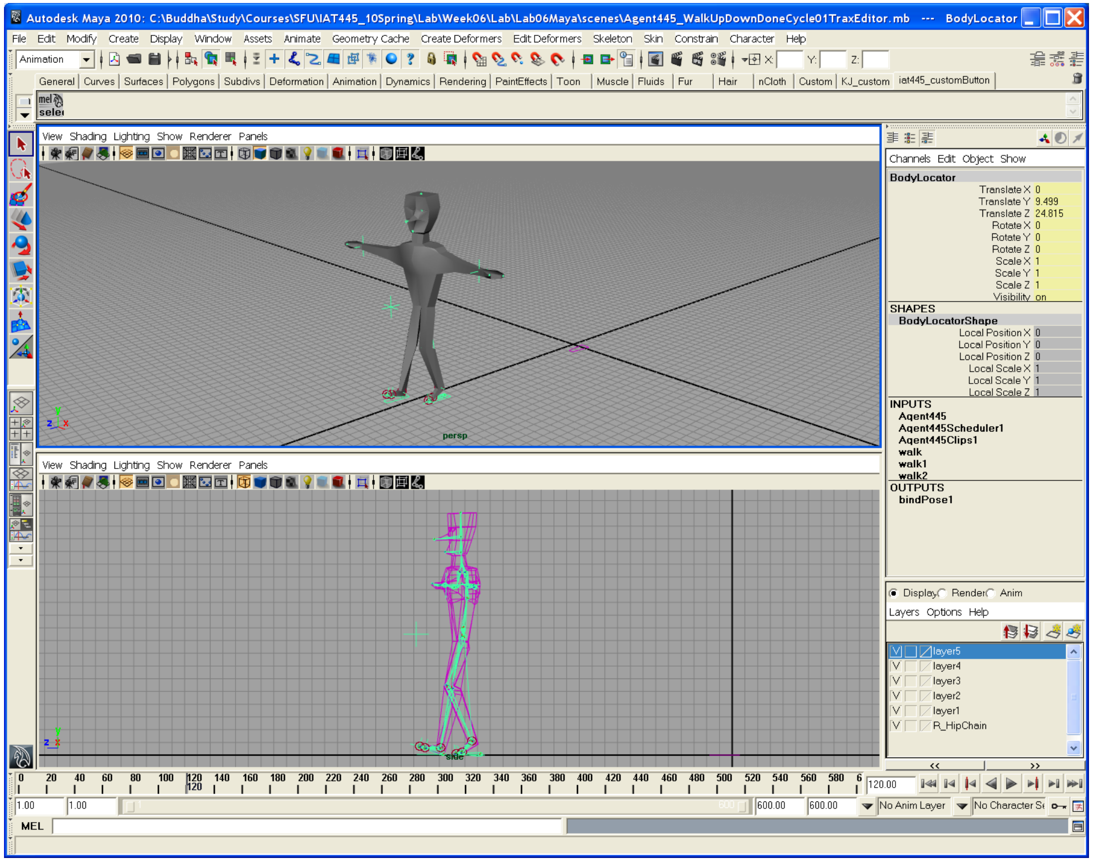
4. Add as much detailed description of each pose across key body parts expressing unique walk (i.e., size, balance, style etc).

Extra: Could add a center line of the body.

Scan your drawing and post it on your site for grading!

Side View					
Frame # & Description					
Front View					
Frame # & Description					

Preparation before Walk cycle

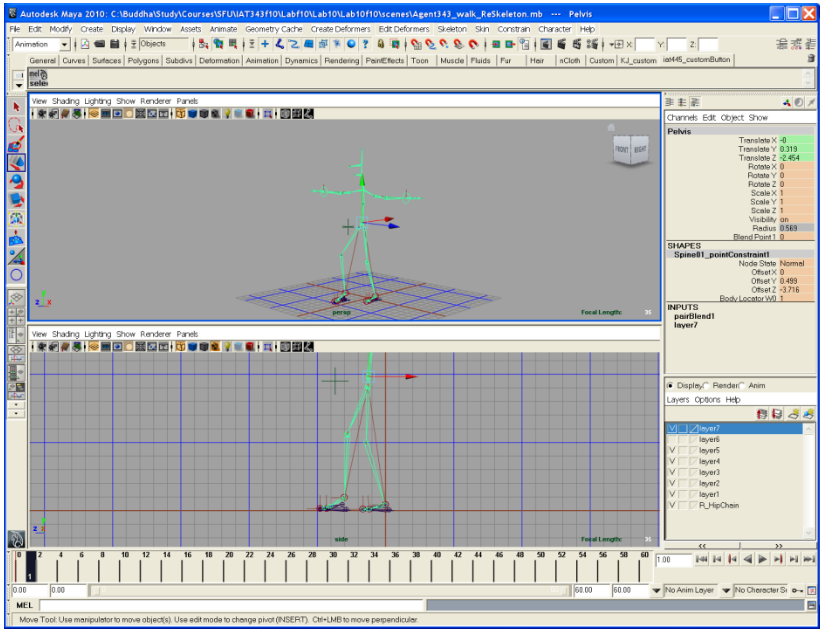


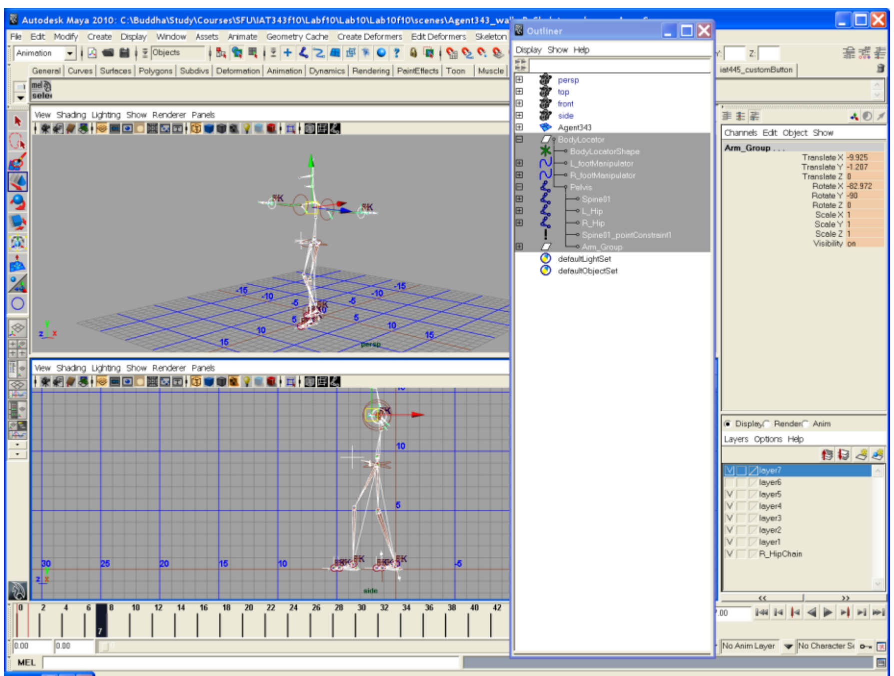
Viewport Layout

1. Panels > Layouts > Two Panes Stacked
2. View > Predefined Bookmarks > Right (or Left) Side

Keyframing:

•press ‘s’ or shift-w" to set only **Translate** keyframes





Lab Exercise 4: Character Set

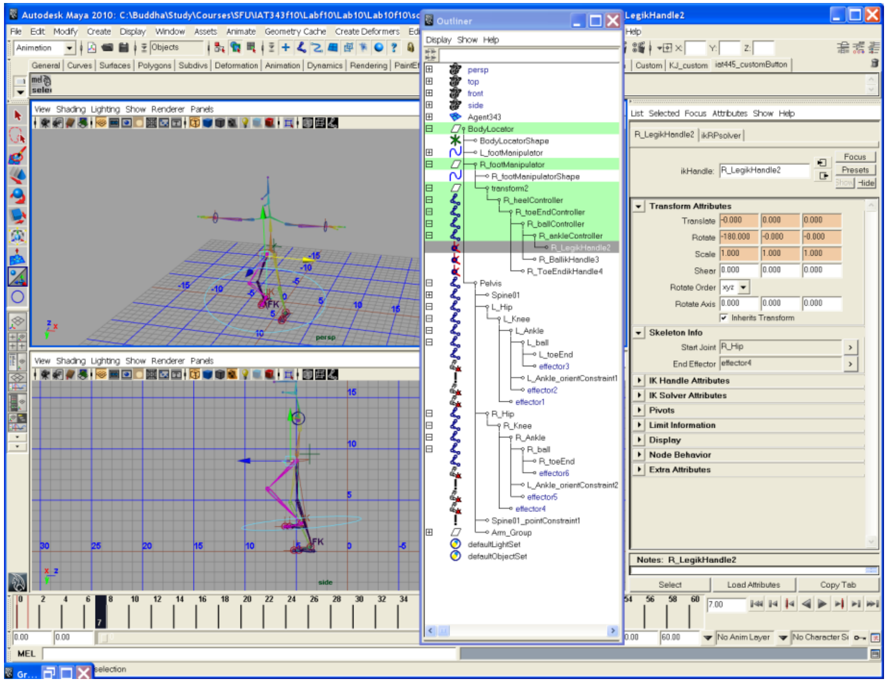
4.1. Reference pose & Initial Pose

1. Open ‘**walk.mb**’ file. We are going to base this exercise from the walk of your partner. To keep the current ‘T’ pose as a reference at frame ‘**0**’, change the beginning frame as ‘**0**’. Select the all the nodes under the **BodyLocator** (**Edit > select hierarchy**). Press ‘s’ (or Animate > Set key) to add a key pose at frame ‘0’.

2. Click at frame ‘**1**’ and make an initial walk pose through adjusting position-orientation of major body parts (e.g., foot, pelvis etc.).

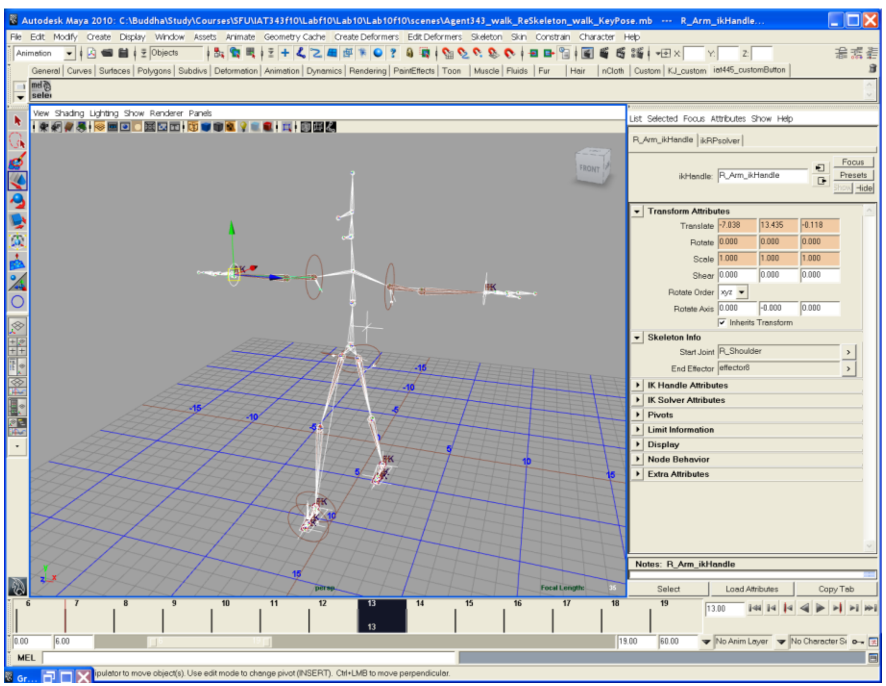
3. Zoom into the lower body part. When step forwarding, we need to move the foot and lower the body.
   - Move the **L_footManipulator** forward to 5 unit.
   - Select the Pelvis and lower the body and move forward a little bit.
   - Focus on the movement of the key parts such as foot, pelvis and body locator rather than trying to add all the details of other parts at the same time.
   - If satisfied with current pose, select the all the nodes in the hierarchy (**BodyLocator**) and press ‘s’ to keying.

4. To check whether the two key poses properly animated, scrub between frame 0 and 1.



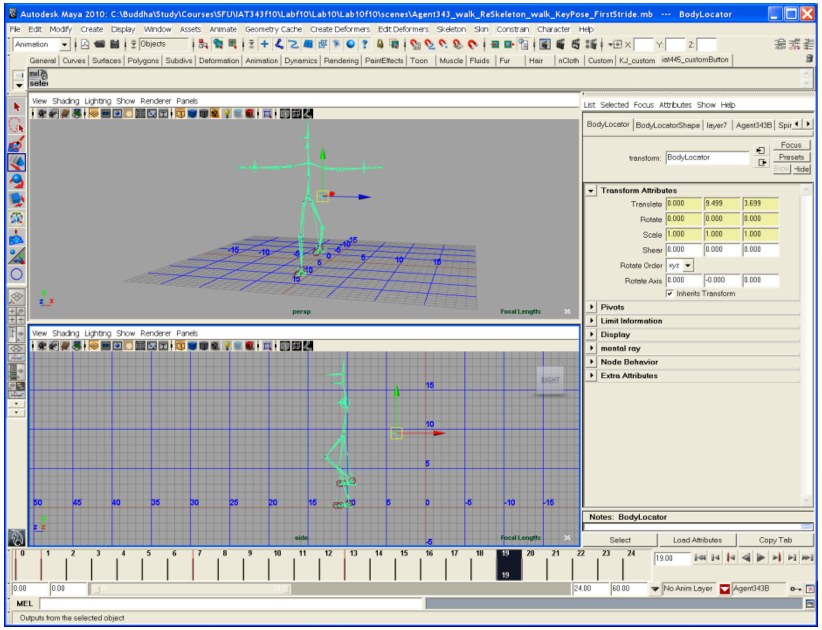
4.2. Cross over pose; lift right foot

1. Move to frame **7**.
2. Select the **R_footManipulator** and position it in the air above the left ankle and below the left knee (cross-over position).
3. To adjust the rotation of the knee, select the **R_Leg_ikHandle**, and press **'T'** to bring up the universal manipulator tool. Select the arrow to adjust the knee direction (review last week lab: ikRPsolver).
4. Select the pelvis and move up a little bit.
5. Select the all the nodes and apply keying by pressing 's' (or **Animate > set key).**
6. Move the time slider between 1 to 7.



Right foot landing

1. Move to frame **13**.
2. Select the pelvis and move down as well as lower a little bit.
3. Select the **R_footManipulator** and position it on the ground(landing position) at unit 10 approximately.
4. Select the all the nodes and apply keying by pressing 's'.
5. Move the time slider between 1 to 13.
6. Review your work from Front view whether it is necessary to rotate other parts (shoulder, pelvis , ankle etc.)



4.3. Cross over pose; lift left foot

1. Repeat the previous process for the left leg.
2. Move to frame **19**.
3. Select the **L_footManipulator** and position it in the air above the left ankle and below the left knee (cross-over position).
4. To adjust the rotation of the knee, select the **L_Leg_ikHandle**, and press ‘T’ to bring up the universal manipulator tool. Select the arrow to adjust the knee direction.
5. Select the pelvis and move up a little bit.
6. Select the all the nodes and apply keying by pressing ‘s’.
7. Move the time slider between 1 to 19.

Left foot landing

1. Move to frame 24.
2. Select the pelvis and move down as well as lower a little bit.
3. Select the **R_footManipulator** and position it on the ground(landing position) at unit 10 approximately.
4. Select the all the nodes and apply keying by pressing ‘s’.
5. To see the result, move the time slider between 1 to 24.
6. Save your file.
7. For the submission, make a walk cycle (with 3 full-cycles) representing the personality of your partner.
8. Generate a video file (screen capture) and post it on your site.

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