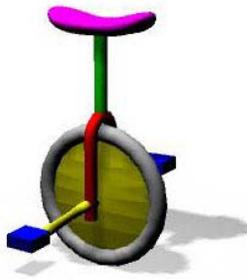


Basic 3D model of a Unicycle.



Introduction

Product modelling is about precision. In this prac you will model a unicycle from scratch. You will use direct input to textfields, rather than simply selecting an object and transforming it (move , rotate , scale ) by mouse movement alone. For example, if you want to move an object 500mm in a particular direction, you will type 500 into the appropriate field. This allows for a level of precision not possible with point, click and drag alone. The other tool used for precision modelling is 'snaps'. This will be covered in a later prac.

Remember to set your units to millimetres first! And set up the camera clipping planes from prac01.

Save as unicycle01.mb in a folder called prac02.

Modelling

To create a wheel for your unicycle you need a tyre and rim/hub.

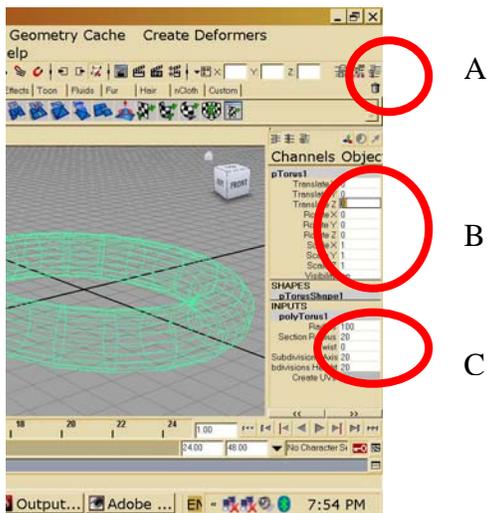
- Create a polygon Torus
 - Create > Polygon Primitives > Torus
 - Select Channels Panel for input (A)
 - Set translate to 0 0 0 (B)
 - Radius 100 x Section Radius 20 (C)

So the tyre doesn't get in the way of the next part, let's hide it:

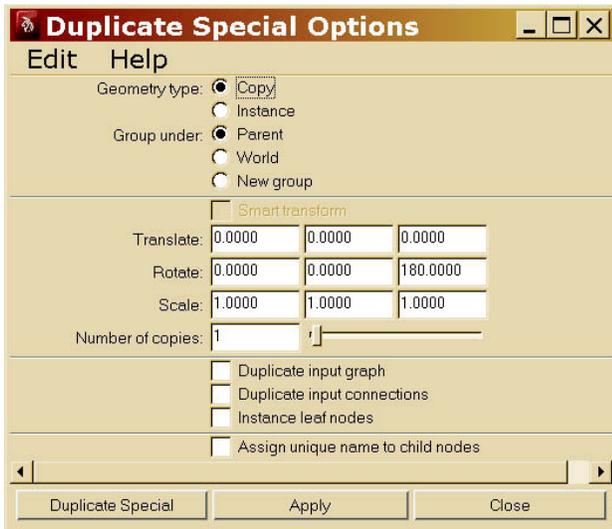
- Select torus/tyre
 - Display > Hide > Hide Selection (hide torus)

- Now let's create the rim/hub for our wheel.
 - Create polygon cone (Radius 100 x Height 20)
 - Translate 10 in Y direction (0 10 0)

- Copy this once:
 - Edit > duplicate special
 - rotate 180 Z (0 0 180)
 - 1 copy
 - Duplicate Special as shown below:



Undo	Ctrl+z
Redo	Z
Repeat "performDuplicateSpecial 0" g	
Recent Commands List	
Cut	Ctrl+x
Copy	Ctrl+c
Paste	Ctrl+v
Keys	
Delete	
Delete by Type	
Delete All by Type	
Select Tool	
Lasso Select Tool	
Paint Selection Tool	
Select All	
Deselect	
Select Hierarchy	
Invert Selection	
Select All by Type	
Quick Select Sets	
Duplicate	Ctrl+d
Duplicate Special	Ctrl+D
Duplicate with Transform	D

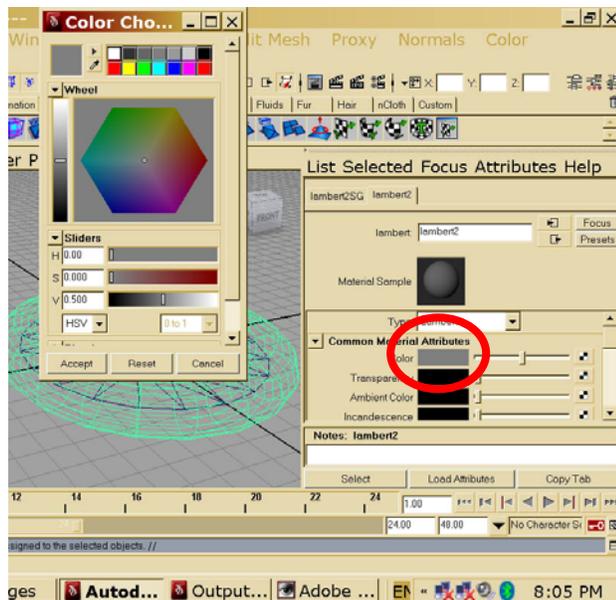


Select the new/old object and move it down -10 Y

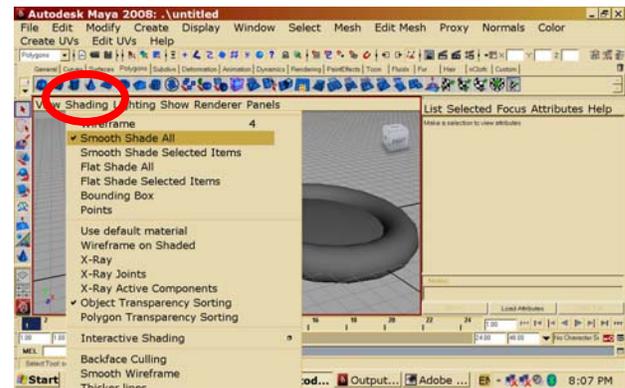
Next, we want to join the two cones together to form the rim/hub for our wheel. Select both cones (select one, hold down shift and select the other)
 Mesh > Booleans > union

Now turn the torus/tyre back on.
 Display > Show > All

Select Torus
 Rht Click (hold down) > assign new material > lambert > colour (click on colour swatch)
 light grey colour > accept
 name the new lambert material 'grey'



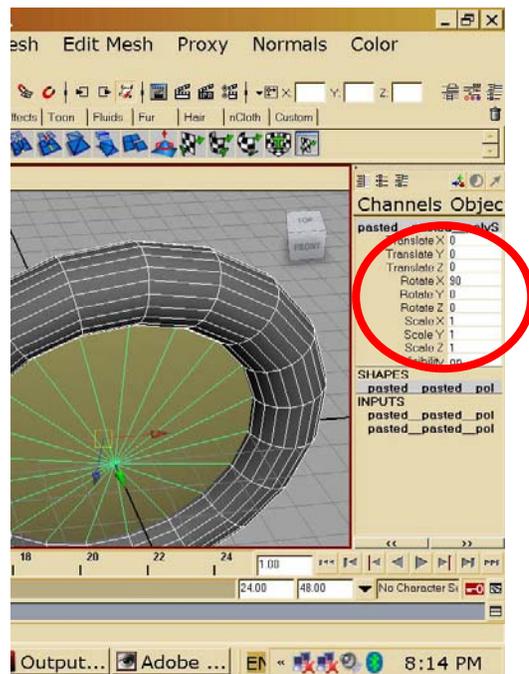
Now let's see what it looks like.
 Shading > Smooth Shade All



Next we want to colour our rim/hub. Select the Boolean-joined cones

Rht click > assign new material > lambert > white/cream colour
 Name the new lambert material 'cream'

Now we want to stand our wheel up. Select all the parts of the wheel
 Rotate 90 about x-axis



We want the tyre and the rim/hub to stay joined so we can move them around as one. To do this we need to 'combine' them (not Boolean).

While both objects are selected:
 Mesh > Combine

Constructing the unicycle frame

Ok, now we are ready to construct the rest of our unicycle.

Move the wheel up so it is on the grid plane (150 Y).

Hide the wheel. Select the wheel:
Display > Hide Selected

The fork needs to have a bend applied to it. For this we use a NURBS cylinder.

Create a NURBS cylinder.

Create > Nurbs Primitives > Cylinder
r=15, spans=100, hr=50
translate (0 0 0)

Now we need to apply the bend modifier.

Change to Animation Menu mode

Create Deformers > Nonlinear > Bend
Curvature = 3.14 (180⁰ in radians!)

Notice how, if you move the control, the curve gets bigger or smaller, and if you select the cylinder itself (now bent) and move it, something similar but opposite happens.

move the control (-75 -232.5 0)
move the cylinder (0 -45 0)

To be able to move our deformed object around without just affecting the deform controls we need to delete its 'modified' history. Select the cylinder:

Edit > delete all by type > history

Now it's just a regular shape again (without the modifier controls attached). But its 'pivot point' is not centred on the object.

Modify > Center Pivot

Next, rotate and translate the fork into position above the wheel

Translate (-45 435 0)
Rotate (0 90 0)
Add red colour material

Make a polygon cylinder to connect with the seat, and position it above the fork:

r = 10, h = 150
translate (0 360 0)
RMB > Assign Existing Material > Red

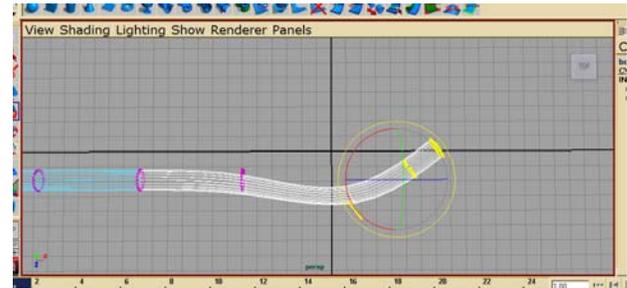
Freestyle modelling - axle

Ok this time you have a bit more freedom to make the curve for the axle. You're going to 'eyeball' the curvature.

Hide everything.

Make the axle using a nurbCylinder (r=10, s=12, hr=50):
translate (0 0 0)
rotate (90 0 0)
view from above (turn perspective off)
set view to wireframe

RMB click and set to control vertex



Select 6 rows of vertices. Rotate 90⁰. move selected vertices back towards the bend and forward until you get the proper bend. To correct the distortion at the bend, select only those vertices at the elbow and rotate, scale and move until a smooth bend is formed.

Now select the first 4 rows of vertices and repeat – creating a smooth bend in the opposite direction. Use the grid as a guide to get the correct spacing.

Do the same to the other end.

Turn perspective back on,
View > Default Home
RMB click on axle > Object Mode
Your axel is now complete.

Move it into position (0 150 0). Assign the red colour to your axle.

Pedals

Make some polygon block/box type pedals (70x30x70) and position them either side of the axle.

Seat

Finally, make a seat from a nurbSphere (r=300, sections=12, spans=5)
Squash using vertex controls
Be careful which vertices are moved
You will need to scale overall when finished and position.
RMB > change back to Object Mode

Assessment Criteria

Assessment will be conducted in class over the desk. You will be asked to demonstrate that you have mastered the skills covered in this practical. The sorts of questions you may be asked include:

- 1) Is the wheel the correct proportions and in the correct location?
- 2) Are the bends in the correct orientation and/or symmetrical?
- 3) Have you applied at least 3 different colours to different objects?
- 4) Are locations and dimensions precise and logical?
- 5) Is your Boolean hub well formed?