

# Animating a Bicycle - Modeling

CS475M: Computer Graphics - Assignment 2, Part 1

Due Date: 30/09/2016

## 1 The Assignment

This assignment is aimed at producing an animated (very) short film by the end of the course. There are many steps to making an animation that involve a combination of aesthetic and technical skills. In this course we will learn many of these basic technical aspects. The aesthetic quality of the final result is, however, dependent on how much thought/effort you put into it.

This is the first part of this assignment and it deals with modelling a bicycle.



Figure 1: A Bicycle

**TO DO:**

1. Create a Bicycle model as shown in Figure 1 as a hierarchical model as explained in class.
2. The body frame, the axle and spokes can be modelled as cylinders, the wheel as a torus, the pedals as cuboids, the pedal shafts and the seat as any suitable shape.
3. The model has only hinge joints at the axle of the wheel. The pedals are connected to the axle via the pedal shaft. All hinge joints have only one degree of freedom i.e., rotation about the axle axis by an angle  $\theta$ . Make sure that your hierarchy allows you access to this parameter - we will need it in Part 3 of the assignment to move the bicycle. The pedals can be assumed to be rigidly attached to the pedal shafts.
4. You are free to choose your own dimensions for the bicycle. You can make the wheel size different and make more unique designs.
5. The brakes and braking mechanism need not be modeled.
6. Bonus Item: The chain and gear arrangement that drives a bicycle is harder to animate. Attempt to model this only after rest of the bicycle is complete.
7. Bonus Item: Model a rider. Only the legs of the rider may move as the pedals are pushed.
8. NOTE: No Bonus marks will be given unless everything else is complete - so complete the rest of the assignment before attempting the bonus!

**DO NOT:**

1. Compile and produce an *a.out*. Learn how to use a Makefile, as used in assignment 1.
2. Write code for non-inlined functions in header files.
3. Hardcode your inputs into the program. This is ok to start with but please move on to file input finally.

**MARKING:**

- Modelling the bicycle properly (2 wheels with spokes, 2 pedals, frame, seat, handle): 50 marks
- Modelling the back wheel and pedal joints properly (i.e., changing the angle rotates the wheel and the paddles): 20 marks

- Modelling the front wheel and handlebar joints properly (i.e., changing the handle angle rotates the wheel about a vertical axis through the handle bar and the wheels rotate about the axis too): 20 marks
- Rendering the model correctly : 5 marks
- Report : 5 mark
- Bonus : chain and gear (20 Marks), Rider (20 marks)
- Total : 100 marks + 40 Marks (bonus)
- Deduction - I am expecting everybody to write properly formatted, indented and structured code from now on. Untidy code will be penalized.
- Late submission will follow a policy of graceful degradation with a 25% penalty for each day's delay (i.e., you get zero marks if the assignment is more than three days late after the due date.)

**TO SUBMIT:**

1. A Tar-Gzipped archive of the complete source code (and only source code). It should compile using the given Makefile on any Ubuntu system.
2. A link to a html report page on the assignment that should contain some details about what you implemented and images of some the results that you generated. Put the link in a README file in the archive you submit.
3. The submission will be through the submission portal.