

## Project #2 – 3D Graphics – Design of a race car track

### Description:

Making use of the knowledge you have gained from course theory and the homework assignments, you **and your partner** are to construct a 3D world in the form of a race car simulator. Your “world” should be viewable both from a 2D “top view” perspective as well as a 3D “driver view” perspective. For this Project, you will use OpenGL.



### Minimum Requirements for this project:

- Clearly, some degree of matrix transformation and projection will be required to transfer your moving world to your 2D computer screen each and every time step.
- Generation of an oval-shaped track upon which the simulation will occur
- Generation of a model car which will move about the track. Realize, that in “top view” mode, you will only see the top of the car, while in “driver mode”, you will only see the control panel of the car. In other words – your car model can be fairly basic, and yet still perform its required functions – you really only need to “model” the details of the car that will be seen during the simulation.
- Simple detail objects to be placed about your track which provide some frame of reference – as an example, grass, trees, road signs, and asphalt paint patterns come to mind.
- Keyboard/mouse capabilities for controlling/navigating your car around the track.
- The user should be able to toggle in between “top view” and “driver” mode interactively.
- Double buffering capability.
- The addition of colors to your simulation.

### **Additional (and desirable) functionalities to consider:**

- You might want to incorporate some very basic “dynamics” (i.e. acceleration, deceleration, braking, “turbo boost”, etc.) into your car. Clearly, a binary car (one that is only “on” or “off”) is not very realistic.
- You may wish to incorporate keyboard or mouse keys for the gas pedal, for the brake pedal, for switching gears, etc.
- You may wish to have more than one track configuration – perhaps: circular, rounded rectangular, figure 8, randomly shaped configurations, etc.
- The addition of basic textures (environment, road signs, material patterns, etc.) will greatly enhance the realism of your simulation.
- Clearly, level of detail for your vehicle model can range from “simple” to “highly sophisticated”. The choice is yours as to how much time and effort you wish to spend modeling your car or cars.

### **A few advanced functionalities to consider (i.e. above and beyond the call of duty):**

- Working gauges which convey relevant information (i.e. speedometer, rpm’s, warning lights, a compass, etc.) on the control panel of the car.
- To enhance your simulation, you could add other (opponent) cars to the track, each having randomly-generated motion patterns. Which leads to the next item.....
- Collision detection!

### **Grading criteria will be based upon the following:**

- A functional computer program that exhibits the *minimum* requirements listed above. You will be expected to demo your program for the instructors during their office hours **during the week immediately after** the Project is due.
- Your ability to incorporate some of the “additional functionalities” into your program.
- Special consideration will be given to those students who are able to incorporate “advanced functionalities” into their program.
- Screen captures of your software and 2D images generated with your software.
- An 8-10 page organized, typewritten, and concise description of your program and its features. In your report, you should briefly describe how tasks were partitioned amongst group members.
- For sake of completeness, please supply a printout of your computer code. To save paper, please print your code text in small fonts, and if possible, on both sides of the page. Include this printout as an additional Appendix to your 8-10 page typewritten report.

**You are to work in groups of 2 on this Project. No exceptions.**

**Due Date: December 7, 2001, BEFORE class.**