Bullet Challenge
4-Wheels Drive Hill Climb

1 Goals of the challenge

The main goal of this challenge is very simple. You have a 4 wheels drive (4WD) vehicle and you must climb to the top of the hill with it. As you may notice the hill is in fact a 10 steps staircase. The step height increases linearly at each new step from 0.1 meter to 1 meter.

To climb this staircase your 4WD vehicle needs tires so you will have to:
1. Create tires.
2. Put tires on the rims.
3. Choose the shape and the physical properties of the tires.

2 Advices

All kind of documentation (bullet API reference, wiki, forum) is allowed. We recommend you to download the bullet SDK, and look at the source code of the SoftDemo application. The SoftDemo contains many examples (especially the `void Init_ClusterCar(...)` function) which are very useful to succeed this challenge. So it might be interesting for you to compile and execute this demonstration just to understand what the source code does.

3 Rules of the challenge

The only modifications you are allowed to do on the vehicle are:
1. Put tires on the rims.
2. Change the engine velocity and the torque impulse.

It is forbidden to start and stop the engine several times during the climbing. The engine should be start only once and when the engine is stopped the climbing is over. It is allowed to reorient the vehicle if is not correctly aligned with the staircase before the engine start but it is forbidden to pull or reorient the vehicle with the mouse to help the climbing.

4 Instructions

1. First download the base project and execute it. If the project works correctly you should see the same result than the screen shot on the left.
2. Press 's' to start and stop the engine. The back wheels of the vehicle should stop on the 4th stair.
3. Find the function `btRigidBody * FourWheelDrive::createWheel(...)` and complete it. You can create new functions if you want.
4. Create 4 soft tores that will be the tires.
   Useful function: `btSoftBody* btSoftBodyHelpers::CreateFromTriMesh(...)`
5. Add joins to the tires to fix them on the rim.
6. Change the material properties of the tires and the engine power (`const int maxMotorImpulse` and `const int maxMotorVelocity`).
   Useful structures: `btSoftBody::Material` and `btSoftBody::Config`
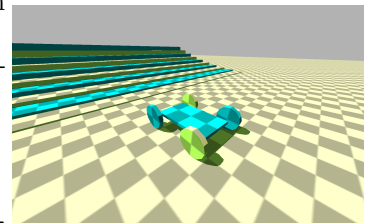
5 Marking

The tires (8 points)

- The 4 tires are created and they looks like tires and not like a piece of cloth. (4 point)
- The 4 tires are correctly fixed on the rims.(4 point)

The climbing challenge (12 points)
Each stair climbed by the back wheels give you 1 point (0.5 point by back wheel). The 2 last stairs count double.