Simulation Engineering

Assignment 1

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Assignment Description:

To simulate the helicopter movement along the 'yaw' axis using c++:

1. Define essential variables with appropriate type:
   I used the 'double' type in most variables, because we are working with decimals.
   Only one 'int'.
2. Variables with starting values are 7 in total:

Variable	Short Description	Type	Initial Value	Update
T	Torque /kg^2	Double	0.3	-
t	Time /s	Double	0	t += dt
dt	Step in time /ms	Double	0.01	-
Iyy	Moment of intertie	Int	3800	-
velocity		Double	0	velocity += angular_velocity * dt
angular_velocity		Double	0	angular_velocity = (T * t) / Iyy
yaw		Double	0	yaw += velocity * dt

3. Building on Euler Integration we update velocity, yaw, and angular_velocity:
   acceleration = force / mass
   change in position = velocity * dt
   change in velocity = acceleration * dt

   Basically, to simulate a physical movement: start with initial values then calculate the change in state in small steps, thus we looped to track change in state for 'yaw' axis for 10 seconds but update our variables each 10 milliseconds, then logged the state of our object to the console every second, like instructed in the assignment.

4. Output:

```
Starting Simulation ..

Time: 0, yaw: 0
Time: 1, yaw: 1.31566e-05
Time: 2, yaw: 0.000105261
Time: 3, yaw: 0.000355259
Time: 4, yaw: 0.0008421
Time: 5, yaw: 0.00164473
Time: 6, yaw: 0.0028421
Time: 7, yaw: 0.00451315
Time: 8, yaw: 0.00673683
Time: 9, yaw: 0.00959209
Time: 10, yaw: 0.0131579

Finished Simulation
```