



Gyroscopic Boat Stabilization System

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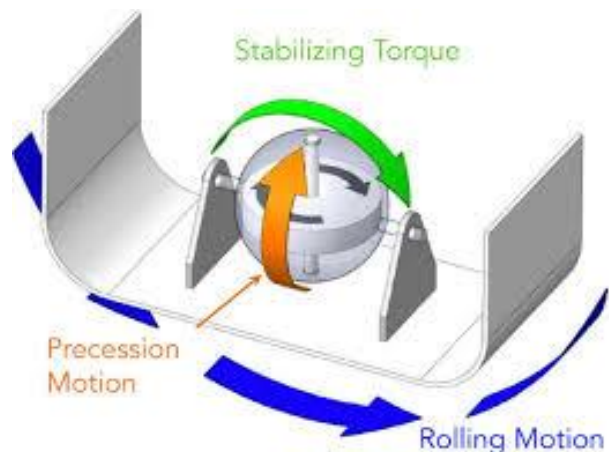
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Overview:



During sea travel, ships and boats are subjected to a lot of forces due to wind and waves which in turn cause a boat to become unstable causing the renowned and dreaded sea-sickness. As a result, marine engineers always looked for solutions to avoid all the unwanted stability-issues due to those external forces. Then, they realized that gyroscopes could be really helpful in stabilizing the ships and preventing this “rolling” phenomenon.

A gyroscope is a device that rotates at really high speeds which generates a high angular momentum. Therefore, the external torque which is generated by the waves of the ocean would be negligible compared to the angular momentum of the gyroscope. Which would cause a more stable trip.



In our project we would attempt to recreate the stabilization effect of a gyroscope and use the gyroscopic precession phenomenon to be able to stabilize a small model of a 3D printed boat, where we would use a motor to spin up a gyroscope which would be mounted on a platform that is attached to a servo which would allow us to control the angle of the gyroscope and thus allowing us to counter and cancel

the external torque that the boat would be subject to. That's where the closed loop control of our project resides where we would take the readings from a gyroscopic sensor to tell us the tilt angle and the error we need to compensate for, which would be calculated using a PID controller which would be programmed on an ATMEGA328P. And as an external input we would add a button to be able to switch on and off our PID controller. And as our output we would use an LCD to show the output of the tilt angle and the values of the error that we need to compensate.

Components:

- Output Display
 - **LCD** Displays tilt angle
- Data Input
 - **Switch** Toggles control system
- Sensor
 - **Accelerometer** Measures angular velocity (tilt)
- Actuators
 - **Servo Motor** Rotates the gyroscope for stabilization
 - **DC Motor** Spins the gyroscope
- Logic, Processing and Control
 - **Control** Closed-Loop Feedback Control
 - **Microprocessor** ATmega328P

