**Brio Train Challenge**

Challenge: use a microcontroller to remotely detect the layout of a brio train track that has no branches and no crossovers (ie, is one continuous loop). Describe the track by capturing IMU data.

Rules:

1. Each track layout is made up of straight and curved sections only and will not cross over, under, or through itself.

2. The train is a battery-powered locomotive pulling a single car, on which the microcontroller is mounted.

3. For actual trial runs, the train will complete at least three full circuits of the track.

4. Trials are conducted with the microcontroller transmitting in the blind via wifi… the track will not be visible. Detect the layout.

5. Bonus points awarded for hacking the locomotive to be controlled remotely by the microcontroller.
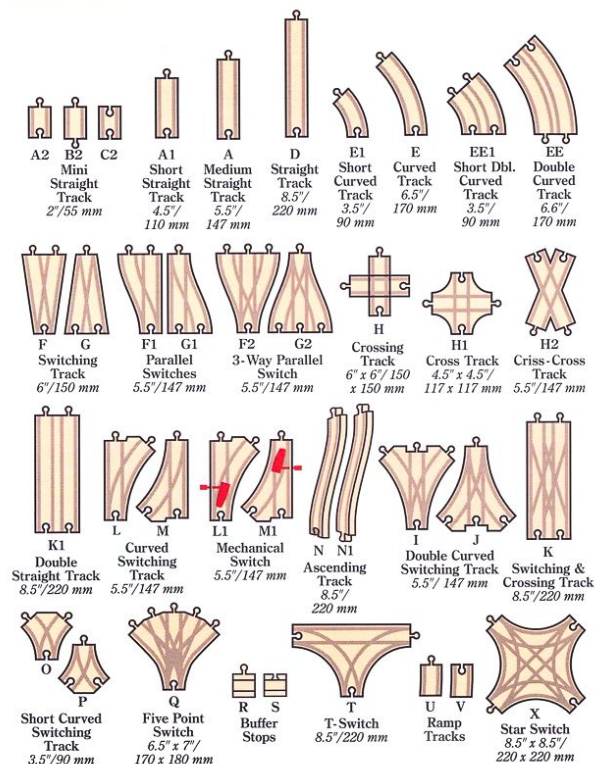
Understanding the 9-axis IMU: make sure you can fill in these blanks!

	Accelerometer	Gyroscope	Magnetometer
Measures… what, exactly?			
Which axis provides the most useful feedback?			
What is the most common source of error?			
What is a simple form of error correction?			
Can this sensor alone detect the layout?			

Understanding sensor fusion

- Some IMUs can provide fused Tait Bryan angles… what are those?
- In general: how does the IMU produce those values?
- Can those values be used to detect the layout?
- What is a critical limitation on the use of those values?