RT Embedded Challenge Spring 2024
Term Project
The Tremor Challenge

Objective:

Over a million people in the USA and more than 10 million people worldwide suffer from Parkinson's disease. The key challenge in improving treatment outcomes for Parkinson's patients lies in the clinically accurate detection of symptoms to enable therapy optimization. More than 70% of patients experience a symptom called resting tremor.

Resting tremors are visible at rest and occur when a body part (usually the hand or wrist) is completely supported. Resting tremors are minimal or absent during activity. Classical parkinsonian tremor (the most common resting tremor) is 3 to 6 cycles/seconds (hertz [Hz]).

The objective of this semester's embedded challenge is to build a wearable Parkinsonian tremor detector using only your STM32 F429 Discovery board with it's embedded gyroscope. The discovery board can calculate real time rotation by measuring angular velocities available from our built-in gyroscope (L3GD20). The idea is to capture time segments from the gyro, analyze the data, and provide a visual indication for the presence of resting tremor and it's intensity (using any board resources such as LEDs or the screen etc…). No additional hardware may be used.

Required Parts:

1. STM32F429 Discovery Board with built in gyroscope
2. Power supply/USB power bank

Restrictions:

- This is either a 2/3 -student project OR an individual project to be done independently by each student or student group.
- No other components may be used other than those specified above.
- The PlatformIO programming environment must be used.
- You will be allowed to use any drivers/HAL functions available through the IDE

Grading Criteria:

- 20% - Ability to successfully and continuously measure gyro values from the angular velocity sensor
- 30% - Ability to analyze the frequency spectrum of the data captured
- 20% - Ability to determine if a tremor is present and it's intensity
- 15% - Creativity
- 15% - Well written and organized code

Deliverable:

- A zipped folder containing the entire PlatformIO directory such that it could be simply imported and tested. THE PROJECT MUST CLEARLY IDENTIFY THE MEMBERS OF THE TEAM IN A COMMENT AT THE BEGINNING OF YOUR MAIN.CPP.
- A demo video (any format) that is less than 1 minute demoing your submission. You should introduce yourself, the objective, your approach, and a short demonstration of how it works.
- Only one submission for each project is required.