ECE-6483 Final Embedded Challenge 2023
Need for Speed

Group Number: 39
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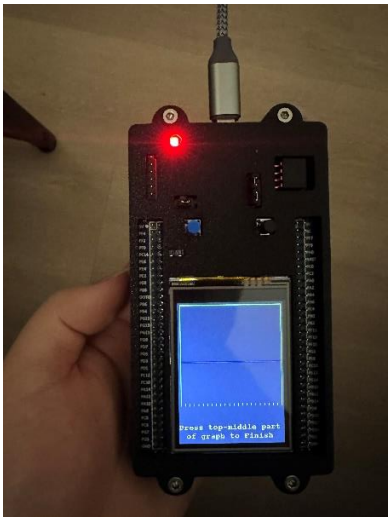
youtube link: https://youtu.be/Oi5I4e3ZiLI

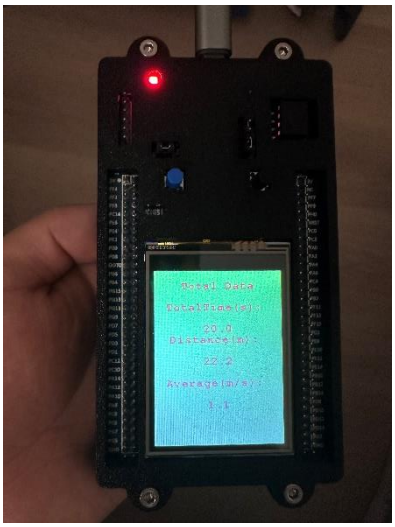
1. Demo Pictures

(1)Start Page

(2)Real Time Data Page



(3) Distance Graph



(4)Fianl Total Data Page

(1) We use a tick to sample from the gyroscope per 0.5s, and we use a flag to tag it.
(2) We use the lcd function to creat wonderful pages and can switch it by tapping on the screen.
(3) Start Page: When tapping the “Start” button we can enter the Real Time Data Page.
(4) Real Time Data Page: The page will displays a real-time data status. We can see the instant velocity every 0.5s, the distance we walked and the time we spent.
(5) Distance Graph: We can see the distance we walked on the graph.
(6) Fianl Total Data Page: After 20s and we can tap the screen to enter the Fianl Total Data Page. We can see the total time, distance and average velocity on it.

2. Core function

```
void compute_walkingtime(){

    //use the queue's size to allocate the tick time and finally compute the time
    all_time_velocity.push(instant_velocity);
    total_velocity += all_time_velocity.back();
    walking_time = all_time_velocity.size()/2;

}

void compute_distance(){

    //Convert those measurements of angular velocities to linear forward velocity
    speed = instant_velocity * Height_Term;

    //Calculate the overall distance traveled during the 20 seconds of measurements.
    Distance += speed * 0.5;

}

void compute_final_average_velocity(){

    //Calculate the overall average speed traveled during the 20 seconds of measurements.
    avg_speed = Distance / 20.0f;

}
```

(1) To calculate the instant velocity(m/s), we use the Formula **v = rw.** We just let **r** be the **Height_Term** which correlates with the height of the man who is using the device. And the **w** is the angular velocities sampled from the one dimension of gyroscope.
(2) To calculate the final walking distance(m), our group utilized the instantaneous velocity of each sampling interval (0.5s) multiplied by the time interval as the walking distance for this sampling interval, and then added up all the interval distances to get the total distance.
(3) The average velocity is Average speed is the final distance traveled in 20s divided by 20s.