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// Sara Falkson Accelerometer Code

#include <Adafruit_MPU6050.h>
#include <Adafruit_Sensor.h>
#include <Wire.h>

Adafruit_MPU6050 mpu;

// Variables to store speed, distance, and time
float speedX = 0, speedY = 0, speedZ = 0;
float distanceX = 0, distanceY = 0, distanceZ = 0;
unsigned long startTime;
unsigned long previousTime = 0;

void setup(void) {
 Serial.begin(115200);
 while (!Serial)
   delay(10); // will pause Zero, Leonardo, etc until serial console opens

 Serial.println("Adafruit MPU6050 Speed, Distance, and Time!");

 Wire.setPins(8, 9);
 Wire.begin();

 if (!mpu.begin()) {
   Serial.println("Failed to find MPU6050 chip");
   while (1) {
     delay(10);
   }
 }

 mpu.setAccelerometerRange(MPU6050_RANGE_8_G);
 mpu.setGyroRange(MPU6050_RANGE_500_DEG);
 mpu.setFilterBandwidth(MPU6050_BAND_5_HZ);

 previousTime = millis();
 startTime = millis(); // Mark the start time
}
```

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void loop() {
 sensors_event_t a, g, temp;
 mpu.getEvent(&a, &g, &temp);

 unsigned long currentTime = millis();
 float deltaTime = (currentTime - previousTime) / 1000.0; // Convert ms to
seconds
 previousTime = currentTime;

 // Calculate speed by integrating acceleration over time
 speedX += a.acceleration.x * deltaTime;
 speedY += a.acceleration.y * deltaTime;
 speedZ += a.acceleration.z * deltaTime;

 // Calculate distance by integrating speed over time
 distanceX += speedX * deltaTime;
 distanceY += speedY * deltaTime;
 distanceZ += speedZ * deltaTime;

 // Calculate total speed and distance
 float totalSpeed = sqrt(speedX * speedX + speedY * speedY + speedZ * speedZ);
 float totalDistance = sqrt(distanceX * distanceX + distanceY * distanceY +
distanceZ * distanceZ);

 // Calculate elapsed time in seconds
 float elapsedTime = (currentTime - startTime) / 1000.0;

 // Print the results
 Serial.print("Time: ");
 Serial.print(elapsedTime);
 Serial.println(" s");

 Serial.print("Speed: ");
 Serial.print(totalSpeed);
 Serial.println(" m/s");

 Serial.print("Distance: ");
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 Serial.print(totalDistance);
 Serial.println(" m");

 Serial.println("");
 delay(200);
}
```