E-BIKE GPS AND SPEED MONITORING WITH LCD DISPLAY

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ABSTRACT

Increase in popularity of electric bicycles (e-bikes) has raised the demand for creative solutions that improve user enjoyment and safety. Using an Arduino Uno and the Neo-6M GPS module, this project provides an integrated system for GPS tracking and real-time speed monitoring on an e-bike. To create a user-friendly interface for riders, the Arduino Uno microcontroller uses this data and connects with a Liquid Crystal Display (LCD). The LCD displays critical information such as current speed, date, and accurate GPS positions in latitude and longitude.

1. INTRODUCTION

The combination of an Arduino Uno, a Neo-6M GPS module, and an LCD display provides an affordable and adaptable option for e-bike enthusiasts looking for a comprehensive monitoring system. This project seeks to develop e-bike technology by offering a user-friendly and accessible platform for tracking and speed monitoring, hence improving overall riding experience and safety.

2. LITERATURE REVIEW

The query ((“LCD DISPLAY” AND “ARDUINO”) OR (“NEO 6M” AND “ARDUINO”)) was used to scope out 44 results from the Web of Science published papers, which was then rigorously reviewed by citations to select relevant articles that helped in creating a code structure.

3. METHODOLOGY

Following an agile methodology, the project planning was divided into the simulation phase and the software implementation phase.

3.1. Simulation

The TinkerCAD simulation illustrates integrating the Arduino UNO with the LCD display. Outcome of the task is demonstrated in the schematic diagram of the Arduino breadboard project.

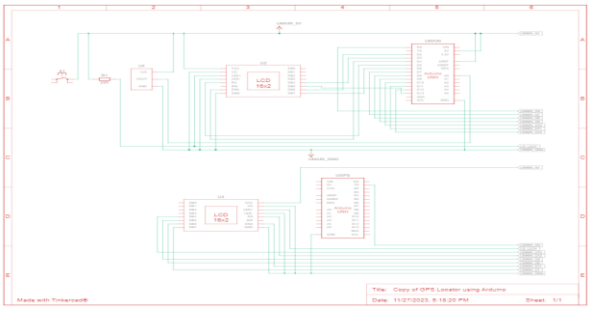

Figure 1: Schematic diagram

3.2. Software Implementation

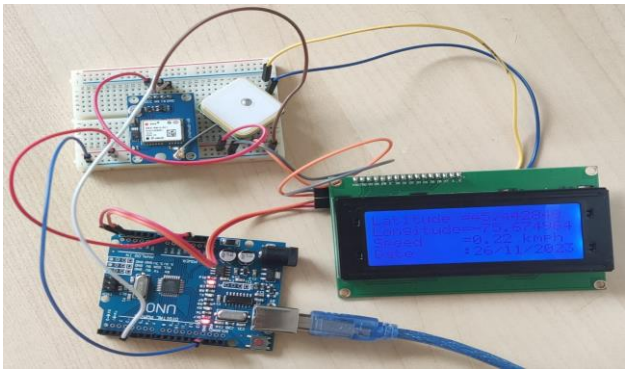

Figure 2: Components Used

1. Arduino IDE: Arduino UNO is open-source electronics prototyping platform that enables users to develop interactive electronic objects. They produce single-board microcontrollers and microcontroller kits [2]. The program contains the setup function that gets executed only once when the program starts or board gets reset while the loop function gets executed indefinitely (till power off) [1]

2. NEO-6M GPS module: The Neo 6m is a GPS receiver that uses a 2.7 - 3.6V power supply. It consists of four interfaces namely- UART, USB, SPI, DDC and an antenna supply and supervisor when provided with the necessary external components and integration on the application processor [2]

3. TinyGPS++ Library: TinyGPS++ is an Arduino library, which is supplied by the GPS modules and is used for parsing NMEA data streams. It is an Immediate inheritor of TinyGPS. [2]

4. SoftwareSerial Library: This multi-instance software serial library for Arduino wiring is used for multiple serial ports. It allows serial communication on other digital pins of the Arduino, using software to replicate the functionality. [2]

5. LiquidCrystal I2C library: A library for I2C LCD displays. The library allows to control I2C displays with functions extremely similar to LiquidCrystal library.

3.3. Code

```
// Interfacing Arduino with NEO-6M GPS module
#include <TinyGPS++.h> // Include TinyGPS++ library
#include <SoftwareSerial.h> //Include software serial library
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 20, 4);
TinyGPSPlus gps;
#define S_RX    4 // Define software serial RX pin
#define S_TX    3 // Define software serial TX pin
SoftwareSerial SoftSerial(S_RX, S_TX); // Configure SoftSerial library
void setup(void) {
  Serial.begin(9600);
  SoftSerial.begin(9600);
  lcd.init(); // Initialize the LCD
  lcd.backlight(); // Turn on the backlight }
void loop() {
  while (SoftSerial.available() > 0) {
    if (gps.encode(SoftSerial.read())) {
      if (gps.location.isValid()) {
        // Print a message to the LCD
        lcd.setCursor(0, 0); // First line
        lcd.print("Latitude =");
        lcd.print(gps.location.lat(), 6);
        lcd.setCursor(0, 1); // second line
        lcd.print("Longitude=");
        lcd.print(gps.location.lng(), 6);}
      else
        Serial.println("Location Invalid");
      if (gps.speed.isValid()) {
        lcd.setCursor(0, 2); // third line
        lcd.print("Speed    =");
        lcd.print(gps.speed.kmph());
        lcd.print(" kmph");}
      else
        Serial.println("Speed Invalid");
      if (gps.date.isValid()) {
        lcd.setCursor(0, 3); // fourth line
        lcd.print("Date     :");
        if(gps.date.day() < 10)
        lcd.print(gps.date.day());
        lcd.print("/");
        if(gps.date.month() < 10)
        lcd.print(gps.date.month());
        lcd.print("/");
        lcd.print(gps.date.year());}
      else
        Serial.println("Date Invalid"); }}
}
```

4. CONTRIBUTION

Goal: The primary goal of my task was procurement of components and the subsequent implementation of code on these components in the project. Additionally, the task involved effectively coordinating information among team members and various departments.

Approach: This involved collaborative project planning and creating a timeline to ensure the smooth execution of the project, including direct communication with the CEED manager. This also required a thorough research about various Arduino sketches particularly on liquid crystal display and GPS modules.

Challenges: The main challenges encountered revolved around time management, particularly during the building and integration phases of the Neo 6M GPS modules with the LCD display. Despite these challenges, modifications were made to the circuit design to keep the project on track.

5. CONCLUSION

The code was successfully compiled and executed from the simulations onto the hardware components**.** This enhanced proficiency in project planning, effective communication with team members, as well as hands-on experience with integrating GPS modules and LCD displays onto micro-controllers. Coordinating information across teams, procuring components, and implementing solutions garnered a multifaceted approach by providing a holistic view of project management, involving both technical aspects and effective communication.

6. REFERENCES

[1] A. Yadav, A. Gaur, Sm. Jain, Dk. Chaturvedi, and R. Sharma, “Development Navigation, Guidance & Control Program for GPS based Autonomous Ground Vehicle (AGV) using Soft Computing Techniques,” *Mater. Today Proc.*, vol. 29, pp. 530–535, 2020, doi: 10.1016/j.matpr.2020.07.309.

[2] P. Kanani and M. Padole, “Real-time Location Tracker for Critical Health Patient using Arduino, GPS Neo6m and GSM Sim800L in Health Care,” in *2020 4th International Conference on Intelligent Computing and Control Systems (ICICCS)*, Madurai, India: IEEE, May 2020, pp. 242–249. doi: 10.1109/ICICCS48265.2020.9121128.