INSTITUTI "HARRY FULTZ"
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Subject:	Matje elektronike
Teacher:	Jurgen Metalla

Group	1	Class	4-6	Date	06/11/2023	Academic Year	22-23

Document		GPS Distance Meter: A portable solution for accurate distance measurement	Supervising teacher: Jurgen METALLA
	Lab	Module used: Distance meter (GPS)	
	Information		
X	Project		
	Random Topic		

Work group	Student	Project (0-3)	Document (0-6)	Submission (0-1)
Student 1	**Albion Spaho**	3	6	1
Student 2	**Darti Lila**	3	6	1
Objectives		No.	Realised (YES/No)	
Research for the creation of the instrument		1	**YES**	
Physical construction of the instrument		2	**YES**	
Analyzing the instrument		3	**YES**	

Key Words	Measuring instrument, Geographical distance measuring, GPS
References	https://datasheetspdf.com/pdf-file/866235/u-blox/NEO-6M/1
Software	Arduino.io
Literature	
Source 1	https://spaceplace.nasa.gov/gps/en/
Source 2	https://www.iso.org/home.html
Source 3	https://www.gpsworld.com/what-exactly-is-gps-nmea-data/

Content:

1. Key Words:

GPS (Global Positioning System),
Arduino,
Geographical Distance Measuring,
Measuring Distance.

2. References:

https://www.iso.org/home.html
https://spaceplace.nasa.gov/gps/en/
https://www.gim-international.com/content/article/gps-position-time-and-distance\
https://education.nationalgeographic.org/resource/gps/

3. Abstract:

This project presents an open-source GPS device developed for the accurate measurement of geographic distances. Using GPS technology, the device uses satellite signals and advanced algorithms to accurately determine its location on the Earth's surface. Through the principles of triangulation, the device calculates the distances between it and different satellites, allowing accurate estimation of distances between different geographical points.

The open source nature of this tool promotes collaboration and allows developers to adapt and improve its features according to specific requirements. The design of the device, both physical and software, is publicly available, encouraging innovation and facilitating knowledge sharing within the community.

The device offers durability, precision and versatility, making it suitable for a wide range of applications. It can withstand different environmental conditions, ensuring reliable performance in different geographical regions. The accuracy of the device's distance measurements enables applications in the field of geodetic enterprise, geolocation services, outdoor sports tracking and environmental monitoring.

Embracing open source development, this GPS device aims to facilitate the advancement of geospatial measurement technology. It empowers individuals and organizations to take advantage of its capabilities, contributing to the development of accurate and accessible distance measurement in outdoor environments.

4. Introduction:

Measuring geographic distances is one of the oldest engineering challenges that man has encountered. Starting with the palms of the hands of the Egyptians, to internationally standardized units of measurement, the engineering odyssey has pushed forward the limits of human creative capacity. Magnificent monuments, buildings with stable structures and various designs of the surface of the planet Earth require precise geographic measurements to create safe and standardized floor plans.

These measurements are performed with different measuring instruments that use unique working principles. One of the most efficient ways of measuring geographical distances on earth is with GPS. For the first time this method was used by the US Navy in 1960, which, using five coordinated satellites, managed to help the Navy navigate the waters of the Pacific. Today GPS technology is open to the public and most widely used in navigation and measuring geographic distances. Examples of services that use GPS as a working principle in their instruments are: Google Maps, Google Earth, Apple Find My, Flightradar24, etc.

The GPS Distance Meter project aims to develop a portable and easy-to-use device that uses Global Positioning System (GPS) technology to accurately measure the distance between two geographic points. The project aims to address the need for a reliable and efficient distance measurement solution in various fields, including sports, geodetic surveys, navigation and outdoor activities.

The key contents of the GPS Distance Meter include a GPS receiver module, an LCD screen for real-time data visualization, a microcontroller unit for data processing, and a user interface for input and configuration. The device integrates advanced positioning algorithms to improve accuracy and reliability, taking into account factors such as signal strength, atmospheric conditions and satellite geometry.

The project focuses on developing an intuitive user interface that allows users to easily set start and end points for distance measurement. The LCD display provides clear and easy-to-understand distance readings, providing quick access to accurate measurements. In addition, the device includes features such as data logging, unit conversion and statistical analysis to enhance its versatility and functionality.

Extensive testing and validation procedures will be performed to ensure the accuracy and reliability of the GPS Distance Meter. Field tests will include comparing measurements taken by the device to known reference distances, validating its performance in different terrains, environmental conditions and user scenarios.

Our group with this project seeks to use the concept of GPS to create a longitude measuring instrument. This instrument will allow the measurement of distances without the need to use conventional tools such as meters or LASER technology, approaches which are the most frequent in the field of geographic distance measurements. The goal of the project is the realization of an easy-to-use GPS measuring instrument with a narrow error range and high speed in data reading and processing.

5. **Group Work Assignment:**
   5.1. **Albion Spaho:** Research on the theory of work and physical design of the project.
   5.2. **Darti Lila:** Research on the theory of work, its documentation and construction of the scheme by means of simulation programs and physically.

6. **Theoretical Part**
   6.1. Clarification regarding the theoretical part, construction in the simulator of the model. Clarifications on the operation and expectations of the scheme.

The global positioning system (GPS) is a network of satellites and receiving devices used to determine the location of something on Earth. GPS receivers provide location in latitude, longitude and altitude. They also give the exact time. GPS includes 24 satellites that circle the Earth in precise orbits. Each satellite makes a complete orbit of the Earth every 12 hours. These satellites are constantly sending radio signals.

GPS receivers are programmed to receive information about where each satellite is located at any given moment. A GPS receiver determines its location by measuring the time it takes for a signal to reach its location from at least four satellites. Because radio waves travel at a constant speed, the receiver can use time measurements to calculate its distance from each satellite.

Using multiple satellites makes GPS data more accurate. If a GPS receiver calculates its distance from only one satellite, it can be the exact distance from that satellite in any direction. *Think of the satellite as a flashlight. When you shine it on the ground, you get a circle of light. With a satellite, the GPS receiver can be anywhere in that circle of light. With two more satellites, there are two more circles. These three circles intersect, or intersect, in only one place. This is the location of the GPS receiver. This method of locating is called trilateration.*

The distance meter will be based entirely on the GPS system and the data provided by this system. The instrument contains the GPS module (NEO 6M) which will be connected to the arduino nano microcontroller. The measured value will be displayed on an LCD display with a resolution of 2x16 bits. The display will be refreshed by a button and the instrument will be polarized by a lithium battery to make it portable. The radio waves received from the satellites will enable the data, which according to the algorithm implemented in the microcontroller, will perform certain calculations to find the correct distance.

6.2. Clarifications for the model of the instrument being built.

GPS distance measuring tools work by using Global Positioning System (GPS) technology to calculate distances between different points on the Earth's surface. This is how they work today:

Signal reception from satellites: The GPS distance measuring tool receives signals from several satellites orbiting the Earth. These satellites continuously transmit precisely timed signals along with their location information.

Trilateration: GPS distance measuring tool measures the time it takes to receive the signal from the satellites. By knowing the speed of light, the device can calculate the distance between it and each satellite.

Position calculation: Using signals from at least four satellites, the GPS rangefinder determines its position by performing a process called trilateration. Trilateration involves cutting spheres around each satellite with radii equal to the measured distances. The points where these spheres intersect represent the position of the device.

Distance calculation: Once the GPS distance measurement tool has determined the start and end point positions, it can calculate the distance between them using mathematical formulas such as Haversine's formula or Vincenty's formula. These formulas take into account the longitude of the Earth's spherical surface to give more accurate distance calculations.

Display and output: The calculated distance is displayed on the device screen or output in a desired format, such as meters, kilometers or miles. Some GPS distance measuring tools may also offer additional features such as waypoint storage, route tracking or navigation guidance.

The instrument is based on a Noyafa NF-198 GPS Land Measuring Instrument which is used for measuring geographic areas on Earth. The rangefinder uses two coordinates in the air plane to find the distance between them without accounting for obstacles that may be encountered between them. The instrument is designed to perform measurements at long distances in the field, guaranteeing simple implementation methodology and accuracy.

6.3. Analysis of expected errors and determination of the measurement range.

Signal Interference: GPS signals can be affected by various factors such as tall buildings, dense vegetation or electromagnetic interference. These interferences can lead to inaccurate positioning and erroneous distance measurements. Protection techniques and signal filtering algorithms must be implemented to reduce these errors.

Atmospheric Conditions: Changes in atmospheric conditions, especially during severe weather conditions or in areas with heavy cloud cover, can affect the strength and accuracy of GPS signals. These conditions can introduce errors in distance measurements. Applying error correction algorithms and taking weather conditions into account during data analysis can help reduce these errors.

Multipath Effects: Multipath is the phenomenon when GPS signals are reflected off surfaces such as buildings or mountains before reaching the GPS receiver. This can result in signal delays and distortions, causing errors in distance measurement. Advanced signal processing techniques, such as multipath reduction algorithms, can reduce the impact of multipath effects.

Satellite Geometry: GPS positioning accuracy depends on the geometric arrangement of satellites in the sky. In some scenarios, such as when there are significant satellites in a region or when there are limitations in viewing satellites, the accuracy of distance measurement may be compromised. Implementations of algorithms that take into account satellite geometry and the inclusion of additional satellite constellations (eg, GPS and GLONASS) can help improve accuracy.

User Errors: Incorrect user inputs, such as choosing the wrong start or end points, or not calibrating the device properly, can introduce errors into distance measurements. Providing clear instructions, user-friendly interfaces, and implementing validation controls can help reduce user-induced errors.

Systematic Errors: Systematic errors can arise from inaccuracy in the GPS receiver, clock error, or bias in the measurement algorithms. Regular calibration, periodic firmware updates and careful testing can help identify and correct systematic errors, ensuring more accurate distance measurements.

Data Processing and Integration: Errors may occur during data processing and integration phases, including data transmission, algorithm implementation, or data recording. Detailed testing, validation and error control procedures should be performed at each stage of data processing to reduce these errors.

The NEO-6M GPS module provides a range of latitude and longitude measurement of geographic position. Measurement accuracy and defined range vary depending on various factors, such as GPS signal quality, atmospheric conditions, and module performance level.

Latitude: The NEO-6M module can measure latitude from -90° (south) to +90° (north). This represents the entire latitude spectrum, including all locations from the equator south and north.

Longitude: The NEO-6M module can measure longitude from -180° (west) to +180° (east). This range represents the entire longitude spectrum, including all locations from the Greenwich meridian west and east.

It is worth noting that measurement accuracy may vary depending on many factors, including GPS signal quality, environmental interference (such as tall buildings or dense trees), atmospheric conditions (such as clouds or fog), and the accuracy calibration of the module. To achieve greater accuracy of geographic position measurement, it is recommended to perform measurements in open spaces and receive a sufficient amount of GPS signals from satellites to improve the performance of the module.

6.4 Normativa dhe standartet

ISO 14253-1:1998, Geometric product specifications (GPS) - Measuring inspection of workpieces and measuring devices - Part 1: Decision rules for the verification of conformity or non-conformity with specifications.

https://www.iso.org/obp/ui/#iso:std:iso:14253:-1:ed-3:v1:en

SO 14253-5:2015, Geometric product specifications (GPS) - Measurement inspection of workpieces and measuring devices - Part 5: Uncertainty in verification testing of indicating measuring instruments.

https://www.iso.org/obp/ui/#iso:std:iso:14253:-5:ed-1:v1:en

ISO/TR 14253-6, Geometric product specifications (GPS) - Inspection by measurement of workpieces and measuring devices - Part 6: General decision rules for acceptance and rejection of instruments and workpieces.

https://www.iso.org/obp/ui/#iso:std:iso:tr:14253:-6:ed-1:v1:en

ISO 21747:2006, Statistical methods — Process performance and capability statistics for measured quality characteristics.

https://www.iso.org/obp/ui/#iso:std:iso:21747:ed-1:v1:en

ISO/IEC Guide 98-3, Uncertainty of measurement - Part 3: Guidelines for the expression of uncertainty in measurement (GUM:1995).

https://www.iso.org/obp/ui/#iso:std:iso-iec:guide:98:-3:ed-1:v2:en

ISO/IEC Guide 98-4:2012, Uncertainty of measurement — Part 4: The role of uncertainty of measurement in conformity assessment.

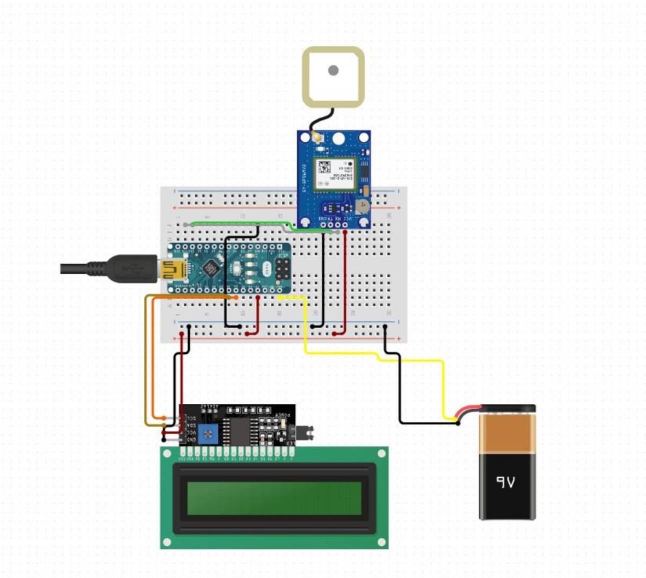
https://www.iso.org/obp/ui/#iso:std:iso-iec:guide:98:-4:ed-1:v1:en

6.5 Metoda e matjes

The measurement method will be straightforward and direct. The user of the instrument will wait for the device to self-calibrate until the GPS module has acquired at least 4 satellites. The user will then have the option to press the "START" button to enter their first geographic coordinate. After locking, the user is free to move towards his destination. When the user is at the destination, he presses the "STOP" button to perform the measurement. The measured distance will be displayed on the LCD screen.

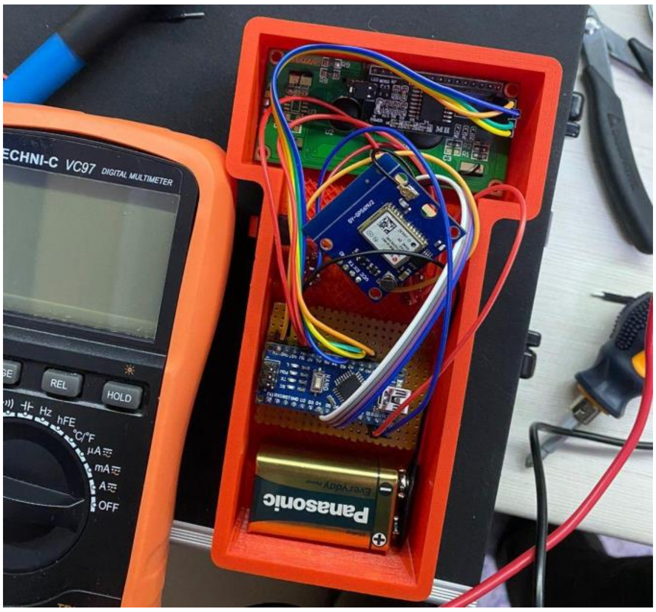
7. Pjesa praktike:

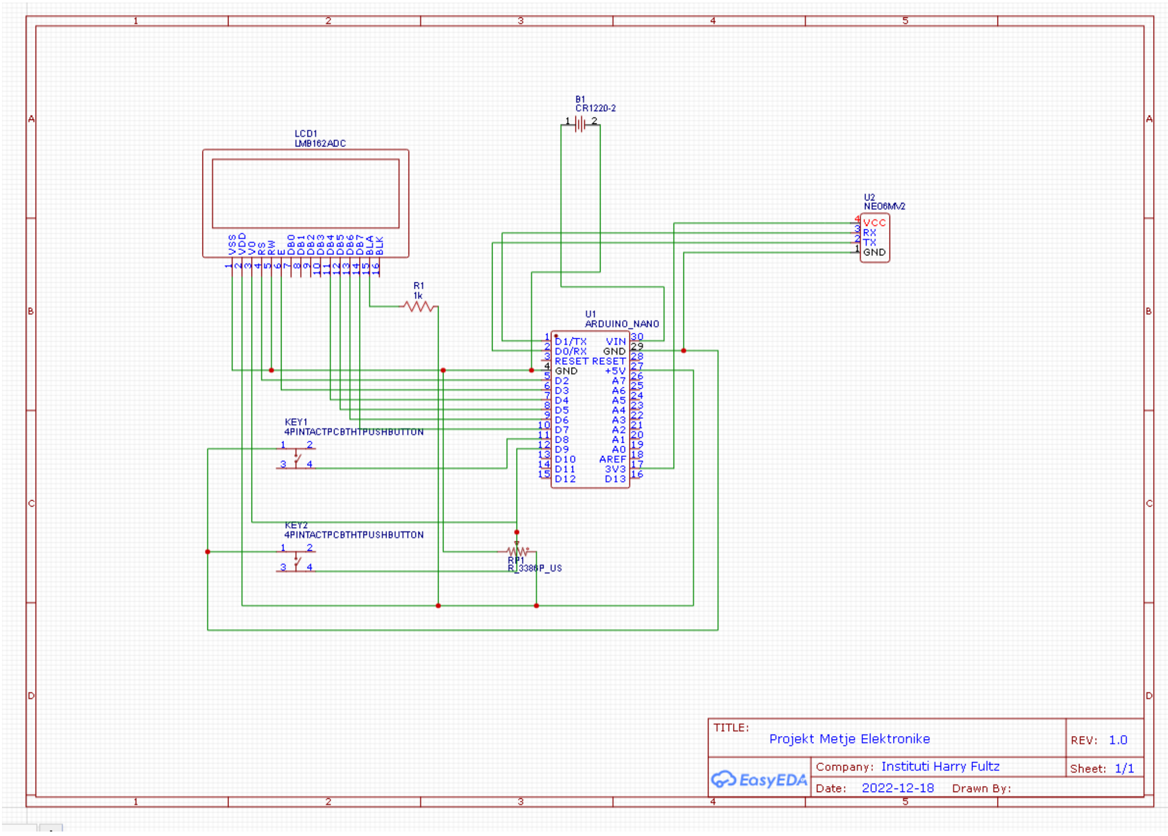
7.1. Clarification for the practical part, realization, circuit, measurement and comparisons with the simulated model.



The project built with Arduino Nano, I2C LCD, NEO-6M GPS module and two buttons to mark start and end position aims to build a device that can read and display geographic distance data from GPS satellites on an LCD screen . Here is a description of the circuit and functionality of each part:

- **Arduino Nano:** The Arduino Nano is a microcontroller based on the Arduino platform. It has an ATmega328P processor and provides a simple development environment for programming the functionalities of electronic devices. The Arduino Nano controls and coordinates all parts of the design, receiving and processing data from the GPS module and controlling the LCD screen, as well as processing the actions from the buttons.
- **NEO-6M GPS Module:** The NEO-6M GPS module is a low-power GPS module capable of receiving and interpreting signals from GPS satellites to determine geographic position. The module communicates with the Arduino Nano via UART (Universal Asynchronous Receiver/Transmitter) to transmit position data.
- **I2C LCD:** The I2C LCD is a character display that uses the I2C (Inter-Integrated Circuit) protocol to communicate with the Arduino Nano. This technology facilitates connection and communication between the Arduino Nano and the LCD display, using only two pins for data transmission and other pins for display control.
- **Buttons:** The design includes two additional buttons to mark the start and end position. The user can push the first button to record the starting position, while the second button marks the final position. The Arduino Nano reads the button actions and stores the data for the start and end position.





The functionality of the project is built in this way:

- The Arduino Nano is initialized to receive and interpret data from the NEO-6M GPS module. The Arduino Nano reads GPS signals from the module and processes the data to determine geographic position and geographic distance.

- The geographic position data received by the GPS module is displayed on the I2C LCD screen. The Arduino Nano sends the necessary commands to the LCD screen to write and display position data, such as geographic coordinates.

- User can mark the starting position by pressing the first button. The Arduino Nano records the current position coordinates and stores them for later use.

- User can mark the final position by pressing the second button. The Arduino Nano records the current position coordinates and stores them for later use and to show geographic distance.

The code writen in arduino:

```
#include <Wire.h>

#include <LiquidCrystal_I2C.h>

#include <TinyGPS++.h>

#include <SoftwareSerial.h>

const int start = 2, stop = 3, RXPin = 4, TXPin = 5;

LiquidCrystal_I2C lcd(0x27, 16, 2);
```

```
byte liti[] = {
  B00000,
  B01110,
  B11111,
  B01110,
  B00100,
  B01110,
  B10101,
  B00000
};

const uint32_t GPSBaud = 9600;
SoftwareSerial ss(RXPin, TXPin);
TinyGPSPlus gps;

void setup()
{
  pinMode(start, INPUT);
  pinMode(stop, INPUT);

  Serial.begin(115200);
  ss.begin(GPSBaud);

  lcd.init();
  lcd.backlight();
  lcd.write(3);
  delay(4000);
```

```
}

void loop()
{
  while (ss.available() > 0) {

    Serial.print(ss.read());

    if (gps.encode(ss.read())) {

      if (gps.location.isValid()) {

        lcd.clear();
        lcd.setCursor(0, 0);
        lcd.print("Lat: ");
        lcd.print(gps.location.lat(), 3);
        lcd.setCursor(0, 1);
        lcd.print("Lon: ");
        lcd.print(gps.location.lng(), 3);
        Serial.println(gps.satellites.value());
        double initLat = 0;
        double initLon = 0;
        double initAlt = 0;
```

```
        double finalLat = 0;

        double finalLon = 0;

        double finalAlt = 0;

        double distanceTraveled = 0;


           if(start == HIGH){


              initLat = gps.location.lat();

              initLon = gps.location.lng();

              initAlt = gps.altitude.meters();


              lcd.clear();

              lcd.setCursor(0, 0);

              lcd.print("Start Saved");


              delay(3000);


              }
            if(stop == HIGH){

              finalLat = gps.location.lat();

              finalLon = gps.location.lng();

              finalAlt = gps.altitude.meters();


              distanceTraveled = sqrt(pow((abs(acos(sin(initLat) *
sin(finalLat) + cos(initLat) * cos(finalLat) *
```

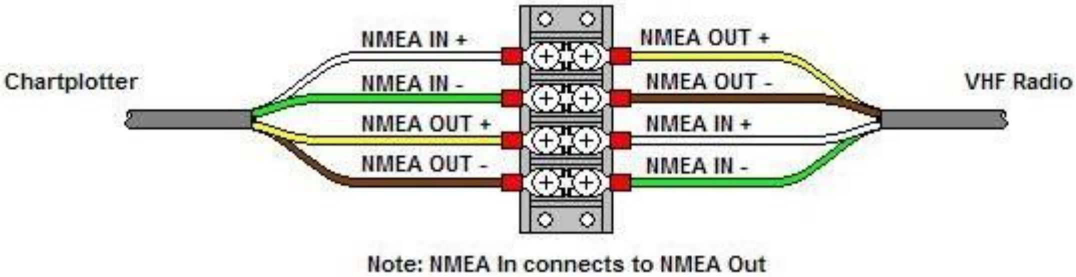
```
cos(finalLon-initLon))*6371)),2) + pow((finalAlt-initAlt),2)); //6371
is earth's radius in KM)


              lcd.clear();

              lcd.setCursor(0, 0);

              lcd.print("Distance Traveled: ");

              lcd.setCursor(0, 1);

              lcd.print(distanceTraveled);

            }

              else{

                lcd.clear();

                lcd.setCursor(0, 0);

                lcd.print("Distance: ");

                lcd.setCursor(0, 1);

                lcd.print(distanceTraveled);

              }

                delay(3000);

            }

        }

      else{

        lcd.clear();

        lcd.setCursor(0,0);

        lcd.print("Waiting for: ");

        lcd.setCursor(0,1);

        if(gps.satellites.value() >= 0 ){

        //Serial.print(gps.satellites.value());
```

```
        lcd.print("Satellites = " + String(gps.satellites.value()));


        delay(5000);


        }

      }

    }

  }
```

7.2. Real Photos.

7.3. Diagram of the measured signals.

GPS NMEA (National Marine Electronics Association) is a communication standard used to exchange data between GPS devices and other electronic devices. This standard uses a structured format to transmit various information such as geographic position, time, speed, orientation, and other important data.



The operation of GPS NMEA is based on the transmission of data packets in ASCII (American Standard Code for Information Interchange) format. Each data packet, known as a NMEA message, consists of a series of structured data, separated by separate commas.

For example, a typical NMEA message might be GGA (Global Positioning System Fix Data), which contains geographic position information. The format of a GGA message may be as follows:

$GPGGA,123519,4807.038,N,01131.000,E,1,08,0.9,545.4,M,46.9,M,,*47

In this example, $GPGGA is the message type identifier. After the identification code, the values separated by commas follow. For example, time is 123519 (12:35:19), latitude is 4807.038N, longitude is 01131.000E, etc. The last value, *47, is a checksum which verifies the integrity of the data.

7.4. Analysis and evaluation of errors for the created instrument.

The purpose of instrument error analysis and evaluation is to identify and understand errors that may occur while using the GPS Distance Meter instrument. This process allows an accurate estimate to be developed and effectively adjusted to reduce errors and improve the accuracy of distance measurements. By performing a step-by-step analysis of our instrument, we have built a structure as follows:

Error identification: We identify the types of errors that can occur in the GPS Distance Meter instrument. This includes the errors discussed above in the abstract and section 5.3, including signal interference errors, atmospheric conditions, multipath effects, systematic errors, user errors, data processing errors, and data integration errors. data.

Error measurement: Use methods and techniques to measure and estimate instrument errors. For example, we compare instrument measurements to the two main measurement sources we have, eTREX Garmin and Google Maps. We carry out measurements in different conditions, including terrain, different atmospheric conditions and different users to identify and evaluate errors in real conditions.

Fault Cause Analysis: We identify potential causes of instrument faults. For each type of error, we determine the possible reasons that cause them, such as the quality of the GPS device, signal interference, atmospheric conditions, or user error. Understanding the causes of errors helps in developing strategies to reduce them. In our case, the quality of the GPS device constitutes one of the main problems in the measurement errors encountered.

Estimating the impact of errors: We determine the impact of errors on distance measurement results. We investigate how errors affect the accuracy and reliability of distance measurement results. We determine which bugs are most important and can have the greatest impact on applications and instrument usage.

Developing error reduction strategies: We make recommendations to reduce instrument errors. We identify methods and strategies to minimize the impact of errors. These may include the use of advanced signal filtering algorithms, the application of atmospheric corrections, the use of multipath reduction technologies, regular instrument calibration, and the provision of appropriate user training.

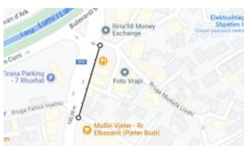
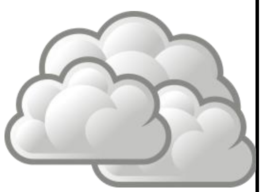
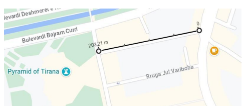
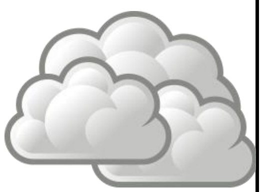
Testing and Validation: We perform additional testing to verify the effectiveness of the strategies undertaken to reduce errors. We perform regular verifications and validations to evaluate the accuracy and performance of the GPS Distance Meter instrument after the implementation of the changes and improvements made.

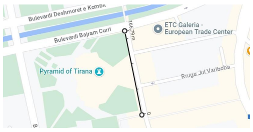
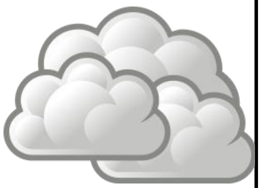
7.5. The measuring range of the built-in instrument.

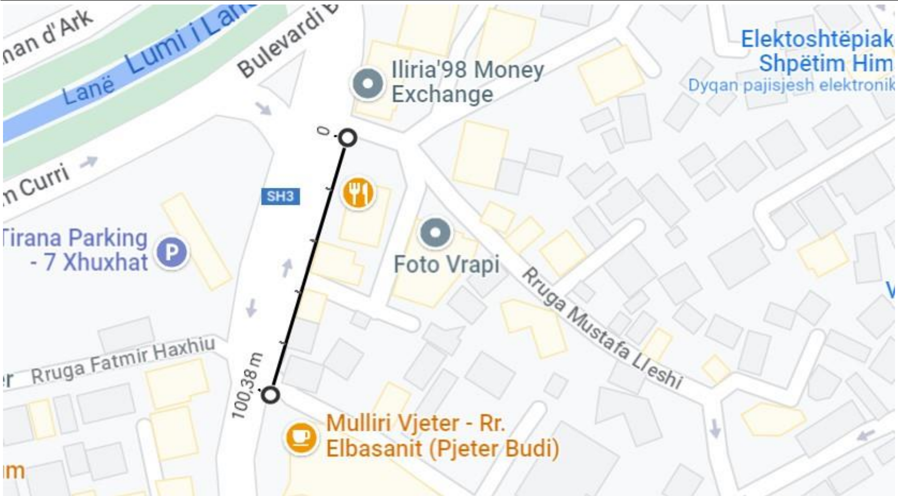
- **Latitude:** The GPS Distance Meter instrument can measure latitude from -90° (south) to +90° (north). This range contains all locations from the equator south and north.
- **Longitude:** The GPS Distance Meter instrument can measure longitude from -180° (west) to +180° (east). This includes the entire spectrum of longitude from the Greenwich meridian west to east.

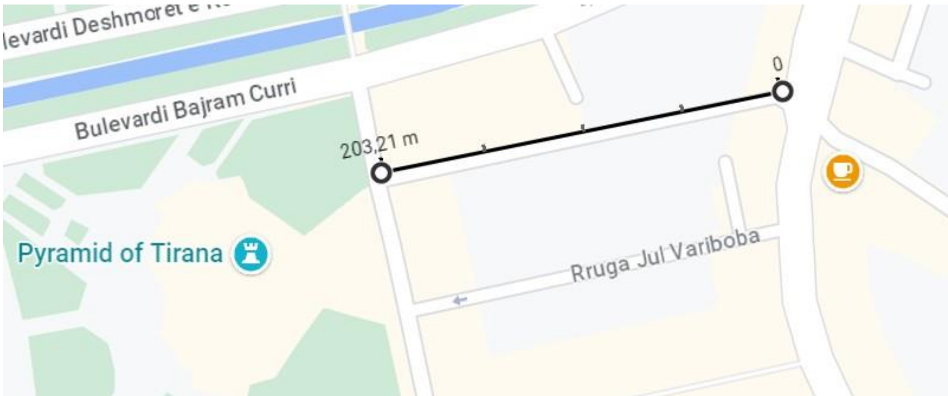
7.6. Measurement method implemented in practice and measurement documentation.

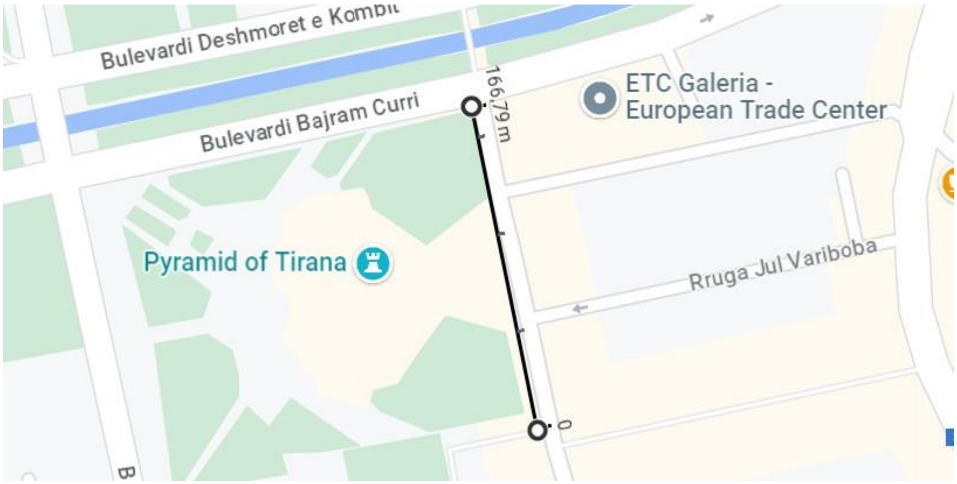
In order to perform a more accurate and interesting test, we tested our instrument in 6 different situations as follows:

Map	Distance	Cloudy	Sunny
	Elbasani Street; Fast Food Gonis-Mulliri ivjetër		
	Elbasani Street; Ish Parku Shtat Xhuxat - ETC		

	Papa Gjon Pali II Street; From one corner of the Pyramyd to the other.		







7.7. Resultus of the measurements, report.

Measurement	Measuring Instrument	eTREX Garmin	Google Maps(Phone GPS)	GPS Distance Meter (Our Instrument)
Elbasani Street; Fast Food Gonis-Mulliri ivjetër (Sunny)		100.25m	100.12m	100.18m
Elbasani Street; Fast Food Gonis-Mulliri ivjetër (Cloudy)		100.23m	100.12m	100.12m
Elbasani Street; Ish Parku Shtat Xhuxat - ETC (Sunny)		203.68m	204.82m	203.15m
Elbasanit Street; Ish Parku Shtat Xhuxat - ETC (Cloudy)		203.70m	204.82m	203.20m
Papa Gjon Pali II Street; From one corner of the Pyramyd to the other. (Sunny)		166.34m	165.48m	166.04m
Papa Gjon Pali II Street; From one corner of the Pyramyd to the other. (Cloudy)		166.36m	165.48m	166.06m

*** The above results are the average of 4 measurements made for each instrument and situation.**

**** Human error plays an important role in measurement fluctuation.**

7.8. Conclusions.

In conclusion, the development of an open source GPS device for measuring geographic distances presents significant advantages and opportunities. The use of GPS technology, combined with an open source framework, provides a cost-effective and accessible solution for accurately measuring distances in outdoor environments. The device's ability to determine precise locations through satellite signals and triangulation principles enables various applications in the field of geodesy, geolocation services, outdoor sports tracking and environmental monitoring.

However, there are some areas where the project could be improved. First, improving the power efficiency of the device and optimizing battery life would be beneficial, especially for extended use in the field. Adding real-time data processing capabilities and integration with other sensors or other technologies will expand its functionality and applications.

Also, improving the device's resistance to extreme weather conditions, such as rain or intense heat, would ensure reliable performance in different geographic regions. Improving the user interface and providing easy-to-use tools or applications would contribute to an engaging user experience.

Finally, fostering a strong and active community around the project through forums, documentation, and collaborative platforms would help knowledge sharing, problem solving, and continuous improvement of the device's features and capabilities.

By addressing these areas of improvement, the open source GPS device has the potential to become an indispensable tool for accurate measurement of geographic distances, contributing to progress in various fields and benefiting a wide range of users and applications.

8. List of materials, cost and time spent.

8.1. List of used materials.

- Arduino Nano
- GPS Module NEO6M
- LCD I2C Screen
- Buttons
- 3D printed Case
- 9V Batery
- Jumper Wires

8.2. Cost.

Element	Cost
Arduino Nano	$26.50
GPS Module NEO6M	$9.99
LCD I2C Screen	$9.99
Buttons	$1.40
3D printed Case	$15.00
9V Battery	$3.00
Jumper Wires	$5.00
Total	**$70.9**

8.3. Time spent for the project.

The time spent to complete the task is 16 hours.

9. Improvements for the future:

9.1. Possible improvements related to the project/assignment.

- Cost reduction by creating a board that includes all materials (Removes the need for jumper wires).
- Using a more accurate and faster GPS module to reduce calibration time and increase measurement accuracy.
- Adding the functionality of saving measurements to SD card,
- Adding the functionality of calculating surfaces knowing the shape and distances of distances.
- Using a larger and more convenient screen.

10. Selfevaluation.

How hard was this project?	Show where you faced difficulties during the project	What knowledge have you obtained	In your judgement, what improvements should be considered for the future
This project was difficult enough for a subject yearly project. It had its own difficulties, but during the project you could learn different facts and skills.	**The problems encountered were with the calibration of the instrument, taking a long time to detect the satellites.**	Knowledge of GPS and how it works.	I think there is no need for any improvements to the project, apart from the possible improvements I can make to the task itself.
Selfevaluation from 1 (little/bad) to 10 (very good)			
How do you evaluate your work?		Bad / Good / **Very Good**	Mark: 10