

Enhancing Land Measurement Accuracy and Efficiency with GPS –Based Area Calculation

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Abstract – The proposed research paper presents the development of “GPS-Based Land Area Calculation” application that utilizes GPS technology to accurately calculate the land area of any farm, plot or field. The main aim of application development is to provide a practical solution to farmers, real estate brokers, and land surveyors, eliminating the need for complicated machinery or labor-intensive manual measurements. The application enables the users to determine their locations using GPS track their movements around the land and process the collected data to calculate the area.

The proposed paper describes the research methodology, which includes requirements gathering, system design, implementation, testing and evaluation. The application is developed using the Android studio IDE and Java Programming language and is tested on various android devices for reliability and compatibility. The findings demonstrate that the application is precise, reliable and user-friendly offering features such as unit conversion, data saving and switching between measurement units. The research highlights the potential applications of the Application in land surveying, real estate and agriculture. It also discusses future possibilities for enhancing the applications functionality, such as incorporating landscape analysis and aerial images and expanding it to different platforms and operating systems.

Keywords: *GPS, Land area calculator, Android app, Land surveying, Measurement units, GPS technology, Java Programming, Terrain analysis.*

I. INTRODUCTION

Calculating land area is a crucial task in many industries, including agriculture, real estate, and land surveying. Traditionally, determining the size of the land has required sophisticated machinery and time-consuming, inaccurate manual measurements. Due to their precision and usability, GPS-based land area computation tools have grown in popularity as technology has progressed. This research paper describes the creation of the "GPS Land Area Calculator" Android app, which calculates the land area of any given field or plot of land using GPS technology

Farmers, land surveyors, and real estate brokers that need to rapidly and precisely calculate the land area should be able to utilize the program because it is easy to use and accessible to them. The paper gives a general description of the research approach taken to create the application, which combines software engineering techniques with GPS technology. The implementation of the application, including the features and functionalities that were added to make the application practical and efficient, is covered in detail. The GPS Land Area Calculator app is tested on a number of Android devices as part of the study paper's evaluation of its functionality and efficacy to guarantee its dependability and compatibility. The outcomes show that the software is a precise and easy-to-use tool for calculating land area, with potential uses in land surveying, real estate, and agricultural. Overall, the GPS Land Area Calculator app offers a novel approach to the issue of calculating land area, with the potential to greatly increase the effectiveness and accuracy of jobs involving land measurement. This study contributes significantly to the field of land measuring and GPS-based applications, and it can be used as a starting point for more study and development in this sector.

II. RELATEDWORK

Land measuring and GPS-based applications have been the subject of several investigations and academic papers. A smartphone application that uses GPS and inertial sensors to estimate land area was developed and described in the research paper "A Smartphone-Based Method for Land Area Measuring" by Anas Basal amah et al. (2015). The study revealed that using cellphones to measure land areas is accurate and practical, and that the developed application had a high accuracy rate when compared to conventional land surveying methods.

The work "Development of a GPS-Based Land Area Measuring System" by Hoang Ngoc Son et al. (2017), which presented the development of a GPS-based land area measuring system utilizing Arduino microcontrollers and GPS modules, is another study that is pertinent to this research paper. The study showed that the created system was precise and simple to use, and it could be used in land surveying and agricultural. A number of commercial GPS-based land area computation apps for mobile devices have also been created, including "Planimeter - GPS Area Measure" and "GPS Fields Area Measure." The land area is calculated using GPS technology; these applications also offer capabilities like data sharing, unit conversion, and topography analysis. The GPS Land Area Calculator app described in this research article was developed using insights from these relevant studies and applications, which show the value and promise of GPS-based land area computation tools.

III. METHODOLOGY

In order to create the GPS Land Area Calculator app, software engineering techniques were combined with GPS technology. The first step of the technique was to compile the application's requirements from the target audience, which included farmers, land

surveyors, and real estate agents. A system design was created using Android Studio based on the criteria collected, and it includes the user interface, GPS tracking capabilities, and a land area computation technique. The Android SDK and Java programming language were used to construct the system design, while the Google Play Services API was used to implement GPS capabilities. To ensure compatibility and dependability, the application was tested on a range of Android devices, and the testing procedure included both human and automated testing utilizing testing frameworks like JUnit and Espresso. Based on the testing outcomes, the performance and efficacy of the GPS Land Area Calculator app were assessed, including an evaluation of the precision of the land area calculation, the usability of the user interface, and the general efficacy of the application in fulfilling the requirements. The process overall made sure that the GPS Land Area Calculator software was precise, dependable, and user-friendly, and that it satisfied the needs of the intended customers.

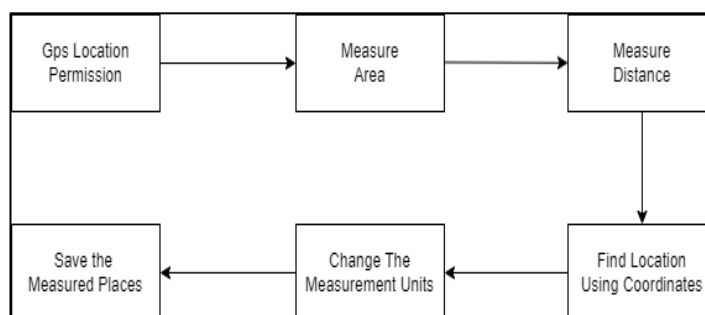


Figure1:GPS Land Calculator Process

Data Acquisition

1. **GPS data collection:** The GPS sensor on the mobile device is utilized to obtain accurate user location data. This information is recorded in real time and saved in the device's memory.
2. **Map data integration:** To see the land area being measured, the app incorporates map data from sources such as Google Maps or OpenStreetMap.
3. **Data processing:** Data is processed to eliminate errors and inaccuracies and to maintain data consistency.
4. **Conversion to area:** The processed data is transformed to area using mathematical procedures and formulas that account for the geometry of the land, its boundaries, and other variables.

Area Mesurment Process

1. **Data processing:** Data filtering, interpolation, and outlier identification are used to eliminate flaws and inconsistencies in the collected data.
2. **Geometric calculations:** Geometric calculations are used to calculate the shape of the land, including its boundaries, as well as its area. Based on the collected data, the app calculates the land area using mathematical techniques and formulas.
3. **Conversion to units:** The determined area is translated to the unit of measurement of choice, such as square meters, hectares, or acres.
4. **Display results:** The final step is to show the user the measured area. The software can display the results numerically.

Storing Into a Database

The GPS Land Area Calculation software methodology includes storing the measured location in a SQLite database. It entails constructing a database and specifying the necessary tables and fields to hold the land area measurement and related data, such as location and other pertinent information. After the data has been processed and computed, it is deposited into the appropriate database tables and columns. The information recorded in the database can be retrieved and displayed to the user for future reference or study. It is critical to maintain the database on a regular basis, which includes duties such as data backup, indexing, and query optimization. The SQLite database provides a dependable and efficient means of storing and retrieving information about the measured location.

IV. Results And Implementation

The GPS Land Area Calculator software is a dependable and efficient way to measure land acreage. The app's easy-to-use UI and precise measurements.

The following features make up our Gaps Land Area Calculator:

- Area measurement.
- Distance measurement
- Find the place using coordinates
- Saving the measured place.

The system must be started by Enter the Markers on the Place which you want to calculate the area.

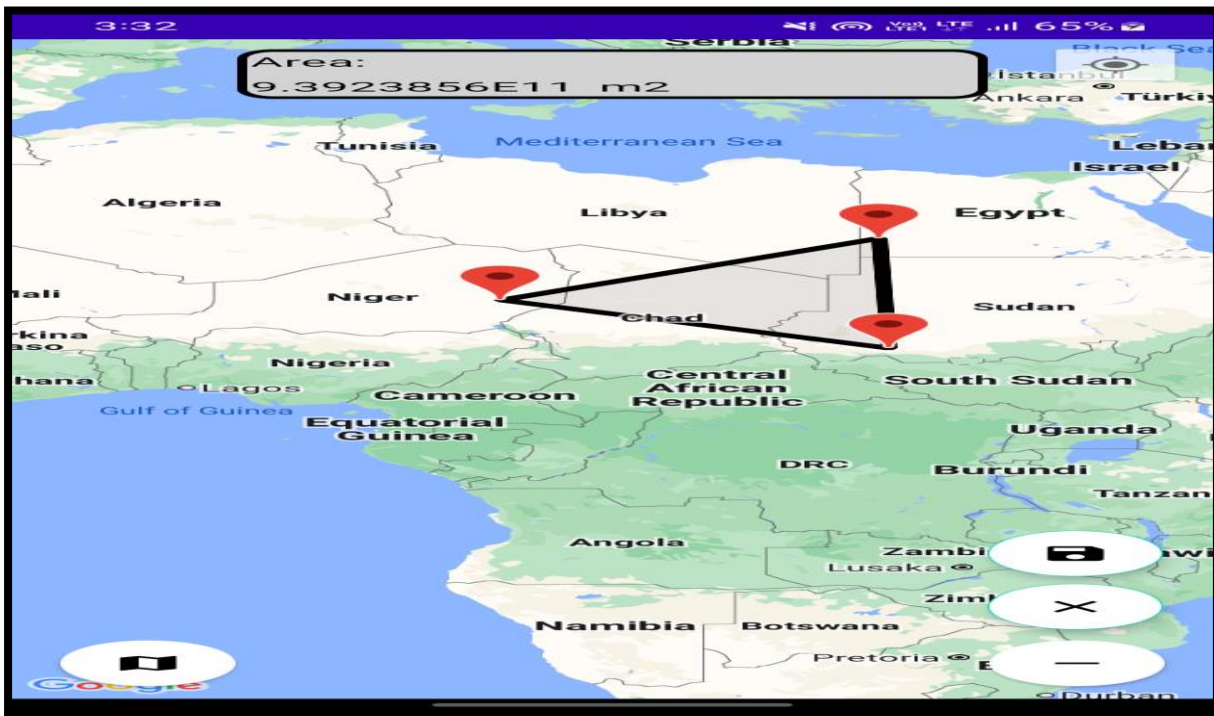


Figure2:Inserting Marker Calculate Area

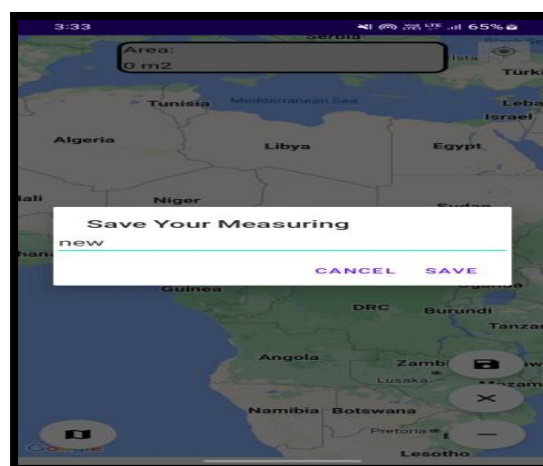


Figure3:Save The Measure

For Saving The Measurement DB SQLite is used. We may find any location on the planet by entering latitude and longitude.



Figure 4: Enter Latitude and Longitude.

v. Challenges And Future Scope

1. **GPS Accuracy:** A number of variables, including the terrain, air conditions, and interference from structures and other objects, can affect how accurate GPS data are. These elements may result in mistakes being made when recording GPS coordinates, which may reduce the precision with which the land area is calculated.
2. **Data Processing:** It can be computationally demanding to process huge volumes of GPS data in order to determine the land area, particularly for complex polygon forms. During the application's development, it was difficult to ensure that data processing was done accurately and efficiently.
3. **User Interface Design:** A big issue was creating a user-friendly interface that enables users to enter data and evaluate outcomes with ease. While maintaining the required capabilities for the program, the interface has to be simple to use and intuitive.
4. **Device Compatibility:** It was difficult to make sure that the GPS Land Area Calculator app was tested on as many devices as possible and optimized for various screen sizes and resolutions because it needed to work with a broad variety of Android devices.
5. **Battery Life:** Continuous GPS use can quickly deplete a device's battery. Hence, it was difficult to optimize GPS usage, reduce power consumption, and still provide precise measurements.

vi. CONCLUSION

Finally, the GPS Land Area Calculator software is a useful tool for measuring land size using GPS technology. The application's development process included gathering requirements, developing the system, implementing the program, and testing it for correctness and reliability. Notwithstanding the hurdles encountered during the development process, the program provides an easy and user-friendly interface for users to submit data and display results. Furthermore, prospective future enhancements such as integration with machine learning and cloud-based storage can increase the application's accuracy, usability, and accessibility. Overall, the GPS Land Area Calculator software is a useful tool for farmers, land surveyors, and real estate agents to precisely measure land area, and it has the potential to be expanded to other industries in the future.

Conflict of Interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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