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Field Survey Mobile Application: Enhancing Spatial Information for Natural Resource Management

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

This research paper introduces a field survey mobile application designed to address the challenges associated with spatial information gathering. The application enables users, including Ph.D. and PG students of Agriculture, as well as professionals in different organizations, to digitally store crop information with GIS spatial attributes and real-time maps. The paper explores the application's utilization in various fields such as land surveying, environmental studies, urban planning and infrastructure development, natural resource management, archaeological surveys, and real estate surveys. Additionally, it provides an overview of the application's functionalities and explains how it operates in real-time. The paper concludes with a discussion on the results obtained from using the field survey mobile application.

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1. INTRODUCTION

The innovative application has been meticulously developed to revolutionize the way we collect and manage crucial data related to various agriculture domains as well as and natural resource management [1]. The developed field survey app is tailored to address the specific needs of professionals, researchers, and organizations working in natural resource management either the professionals are ecologist, geologist, forester, or environmental scientist, [2]. This app is designed to streamline the data collection process and enhance the accuracy and reliability of your findings.

Using this Android app, user can bid farewell to traditional paper-based surveys and embrace the power of digital technology with storing the spatial attributes [3,4]. Also there will be no more tedious manual data entry, cumbersome paperwork, or the risk of data loss. The developed app provides a user-friendly and intuitive interface, enabling user to easily create, customize, and conduct surveys in the field along with the field real time locations [5-7].

Furthermore, this field survey app promotes efficient collaboration and seamless data sharing. The field data can be instantly synchronizing with a secure cloud-based server, facilitating real-time access for all the stakeholders, or other authorized individuals.

The primary aim of developing this field survey mobile application was to address the challenges of spatial information gathering for the various research and industrial purposes [9,10]. This developed app has been very usefulness of the collection of data for student research, professionals and other users having relevance in Agriculture as well as Natural resource management.

2. METHODOLOGY

The following methodology has been used for development of Field Survey APP

(i) Requirement Analysis: Comprehensive requirements were gathered through interviews, surveys, and discussions with Scientists, Professor, professionals and organizations involved in natural resource management. The objective was to identify their specific needs, pain points, and desired features for a field survey application.

(ii) Conceptualization and Design: Based on the requirements collected, a conceptual design was created, outlining the app's overall structure, user interface, navigation flow, and essential functionalities. Wire framing and prototyping techniques were utilized to visualize and refine the app's layout and interaction design.

(iii) Technology Selection: The selection of appropriate technologies and frameworks for Android platform development was crucial. Factors such as platform compatibility, performance, security, and future extensibility were considered to ensure the app's scalability and robustness.

(iv) Backend Development: The app's backend was developed to support data storage, synchronization, user authentication, and data security. A secure cloud-based google server infrastructure was implemented, ensuring reliable data storage and seamless data sharing among users.

(v) Frontend Development: The frontend development involved coding the app's user interface, navigation, and interaction components. Modern Android development frameworks and programming languages were employed to create responsive and high-performance interfaces compatible with a wide range of Android devices.

(vi) Testing and Quality Assurance: Comprehensive testing was conducted at various stages to identify and rectify bugs, errors, and usability issues. Functional testing, usability testing, performance testing, and compatibility testing were performed on different Android devices and OS versions.

(vii) Deployment and Continuous Improvement: Upon successful completion of testing, the app was deployed to the Google Play Store, making it accessible for download and installation on Android devices. Mechanisms for continuous improvement were implemented, monitoring user feedback and incorporating updates and enhancements based on user needs and industry trends.

2.1 Functionality of the Mobile Application

The mobile application has few mandatory fields on the front page of the application, such as Block, Village, Farmer Name, Class, Current Crop, Variety, Water related information's, Sowing Date etc. It also explains how users can manually add options in dropdown menus and input information in various fields. It also provides user to capture GIS spatial attributes on a real time basis.

3. RESULTS AND DISCUSSION

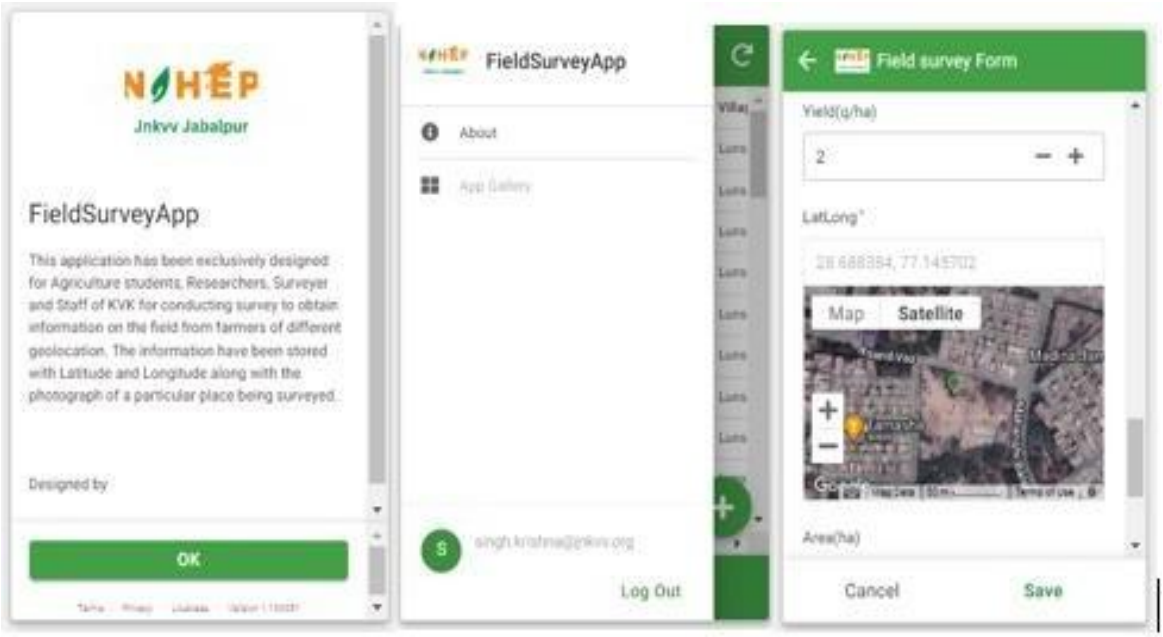
Several studies have been conducted to develop innovative applications in the fields of agriculture and natural resource management. Notable studies include "Revolutionizing Agriculture Data Collection and Management" by Smith [1], "Tailored Field Survey App for Natural Resource Management Professionals" by Jones and Brown [2] and the user-centered approach presented by Patel et al. [8]. However, despite the growing interest, the number of apps developed for agriculture and natural resource management remains limited. In light of this, the primary objective of this study was to design a field survey mobile application specifically tailored to address the challenges associated with spatial information gathering. The application was developed with the intention of providing a versatile tool for users, including PG and PhD students of Agriculture, as well as professionals working in various organizations.

The results obtained from using the field survey mobile application are presented and discussed in this section. The data is saved in digital form on Google servers and can be exported as a CSV file. The paper emphasizes the data privacy feature, ensuring that users cannot access each other's data. The results of filed survey application show an interesting aspect of work surveyor in distance navigation. Surveyor takes data though mobile and not use manual work data is more accurate and reliable.

Data has saved with the help of this application in digital form at google server and create a csv file. Main Good thing of this application is user cannot see the other user data.

3.1 Overview of Mobile Application Developed

The user has to fill out all required fields on that page, which include Block, Village, Farmer name, Class, Current crop, Variety, and Showing date. If user have a block name that does not appear in the menu, you can manually add it. The user can manually add any fields that are not displayed in the dropdown menu, but the village name is a mandatory one. Screenshots of Front Page of this application is given in Fig. 1 below.



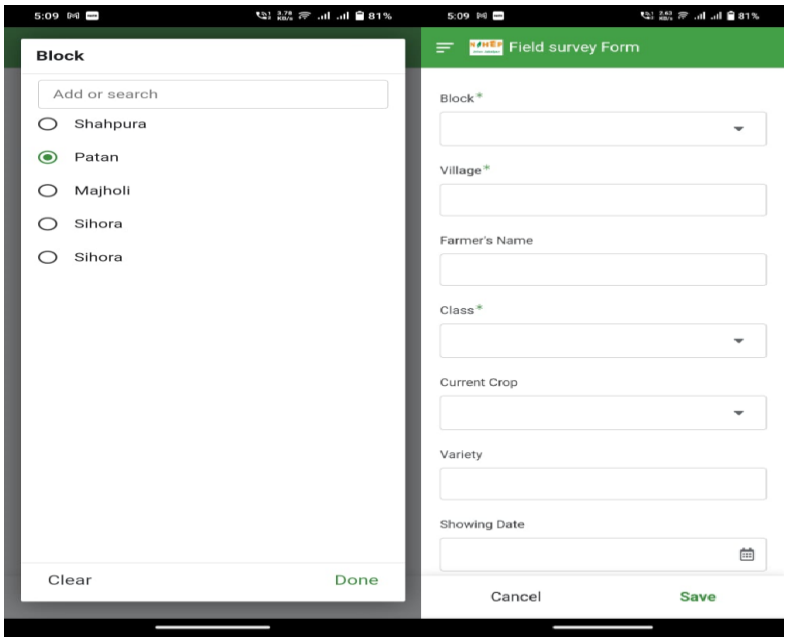


Fig. 1. Overview of field survey application

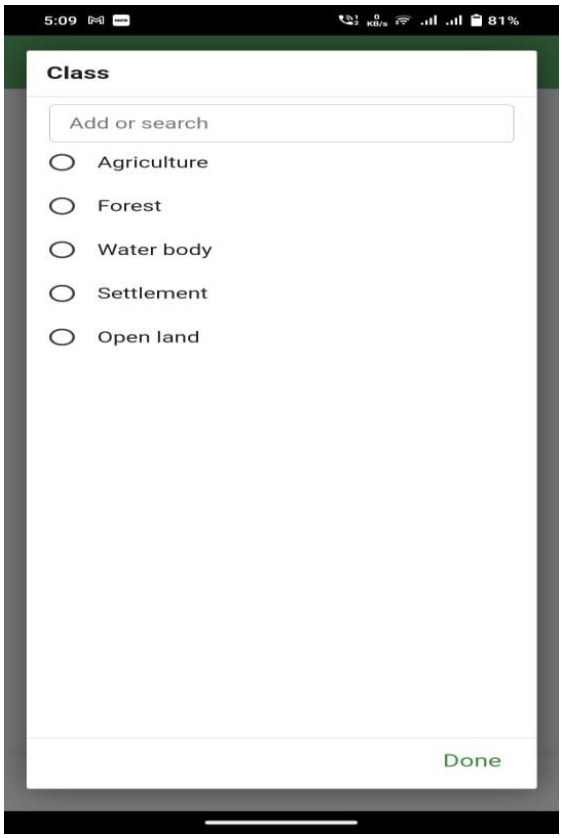


Fig. 2. Selection of LULC classes

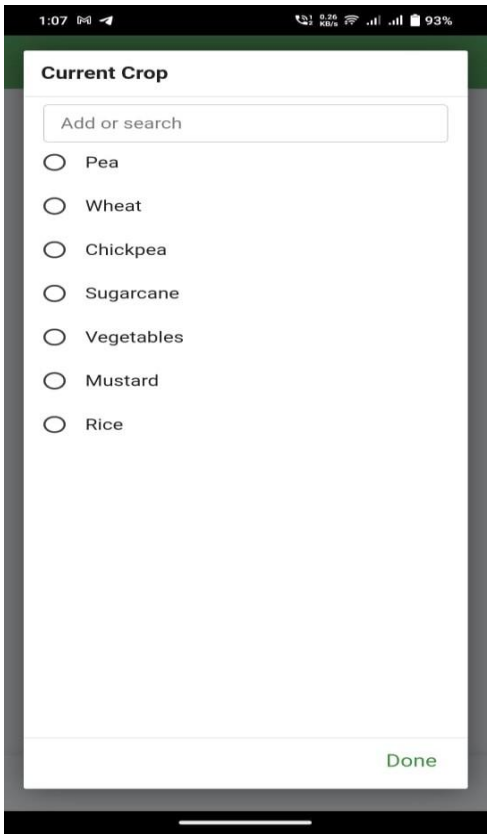


Fig. 3. Selection of crops

The following field in the application is “Class” with five options: agriculture, forests, water bodies, settlements, and open land. The user may select any open class from the field's options.

The next field in the APP is labeled as "Current Crop", where user can choose from crops like peas, wheat, chickpeas, sugarcane, vegetables, mustard, and rice. If a crop is not included in the current crop area, you can add it manually. After the present crop, the field for variety is where you insert the information about the crop variety.

The application allow user to select a date in the Sowing stage section. After clicking on an event, a calendar opens, allowing the user to quickly select a date. The user has to fill the crop stage is the next field. After the crop stage, users must submit the crop from the previous session and the crop from the following session. For filling the details of previous and post crops, user have the same options and can select any crop accordingly such as pea, wheat, chickpeas, sugarcane, vegetables, and mustard. In case, if any crop is missing, users can easily add it manually. The Details of all the fields are given in Fig. 2 to Fig. 9.

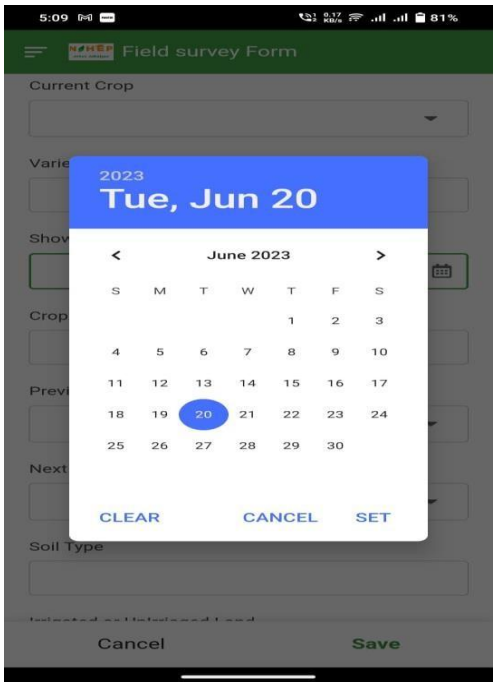


Fig. 4. Selection of sowing dates

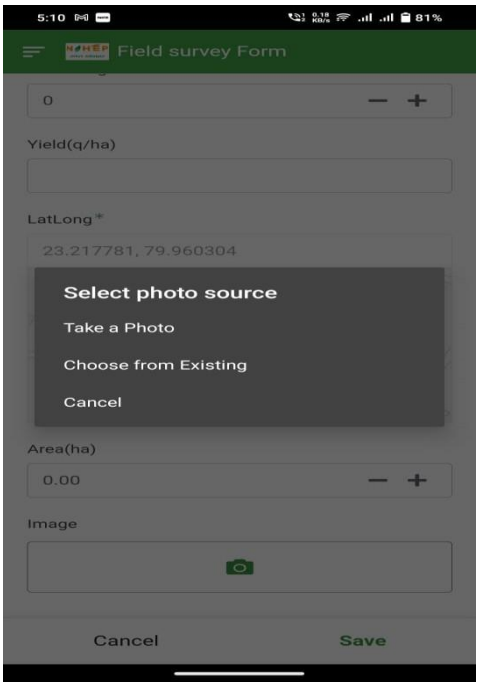


Fig. 5. Collection of crop details along with spatial attributes

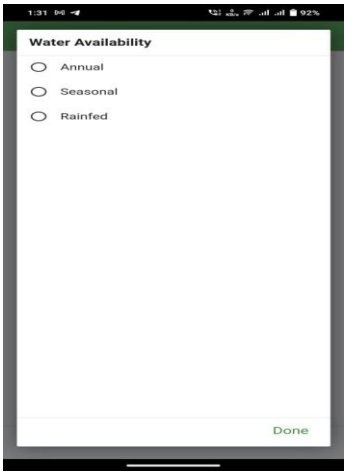


Fig. 6. Water availability information for crops

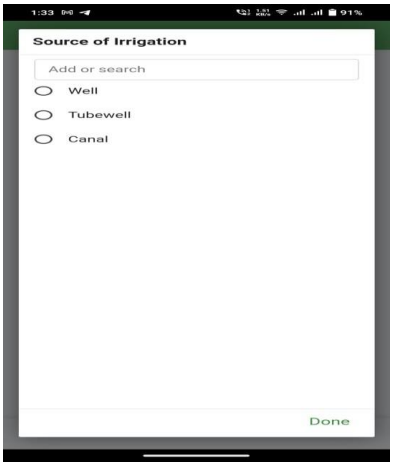


Fig. 7. Information on source of irrigation

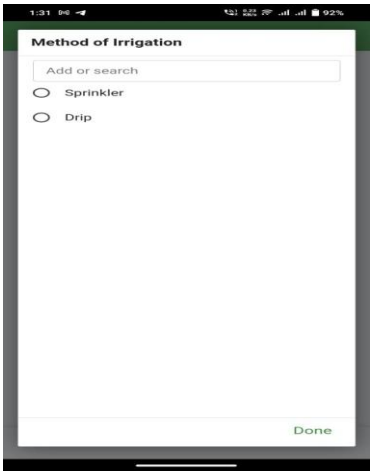


Fig. 8. Method of irrigation

Table 1. Summary analysis of the general survey data

Block	Village	Farmer's Name	Class	Current Crop	Variet y	Crop Stage	Previous Session Crop	Next session Crop	Soil Type	Irrigated or UnIrrigat ed Land	Water Availability	Source of Irrigati on	Method of Irrigation	Date_Toda te
Goregaon	Srinagar		Agriculture	Mungbean	Pdm 139	At pod maturation	Wheat		Black	Irrigated	Annual	Tubewe ll	Sprinkle r	06-08-2023 17:25
Gotegaon	Shrinagar	Mathura prasad	Agriculture	Mungbean	Pdm 139	Harvesti ng	Wheat	Maize	Black	Irrigated	Annual		Sprinkle r	06-08-2023 17:59
Gotegaon	Bagaspur	Jitendra Kumar Patel	Agriculture	Mungbean	Pdm 139	Harvesti ng	Wheat	Rice	Balac k	Irrigated	Annual	Tubewe ll	Sprinkle r	06-08-2023 18:18
Gotegaon	Ramniwari		Agriculture	Mungbean	Pdm 139	Maturity	Wheat	Rice	Black	Irrigated	Annual	Tubewe ll	Sprinkle r	06-08-2023 18:29
Narsinghpur	Pasi	Kamlesh patel	Agriculture	Mungbean		Harvested			Black	Irrigated	Annual	Tubewe ll		06-09-2023 08:33
Narsinghpur	Bahirpodia		Agriculture						Black	Irrigated	Annual	Tubewe ll		06-09-2023 08:59
Gotegaon	Sangai		Agriculture	Mungbean	Pdm 139	Maturity			Black	Irrigated	Annual	Tubewe ll	Sprinkle r	06-09-2023 10:10
Gotegaon	Kumjhorr		Agriculture			Pod			Black	Irrigated	Annual			06-09-2023 11:39
Gotegaon	Sirmaria		Agriculture	Mungbean		At pod			Black	Irrigated	Annual			06-09-2023 11:53
Gotegaon	Chidmani		Agriculture	Mungbean		At pod			Black	Irrigated	Annual		Sprinkle r	06-09-2023 13:43
Narsinghpur	Singhpur		Agriculture	Mungbean					Black	Irrigated	Annual		Sprinkle r	06-09-2023 16:00
Kareli	Kosamkheda		Agriculture	Mungbean					Yello w black	Irrigated	Annual			06-09-2023 16:26
Kareli	Kriya		Agriculture	Mungbean		Harvesting			Black	Irrigated	Annual			06-09-2023 17:20
Kareli	Tinsara	Ramkrish an kaurv	Agriculture	Mungbean	Pdm 139	Harvested			Black	Irrigated	Annual			06-09-2023 18:03

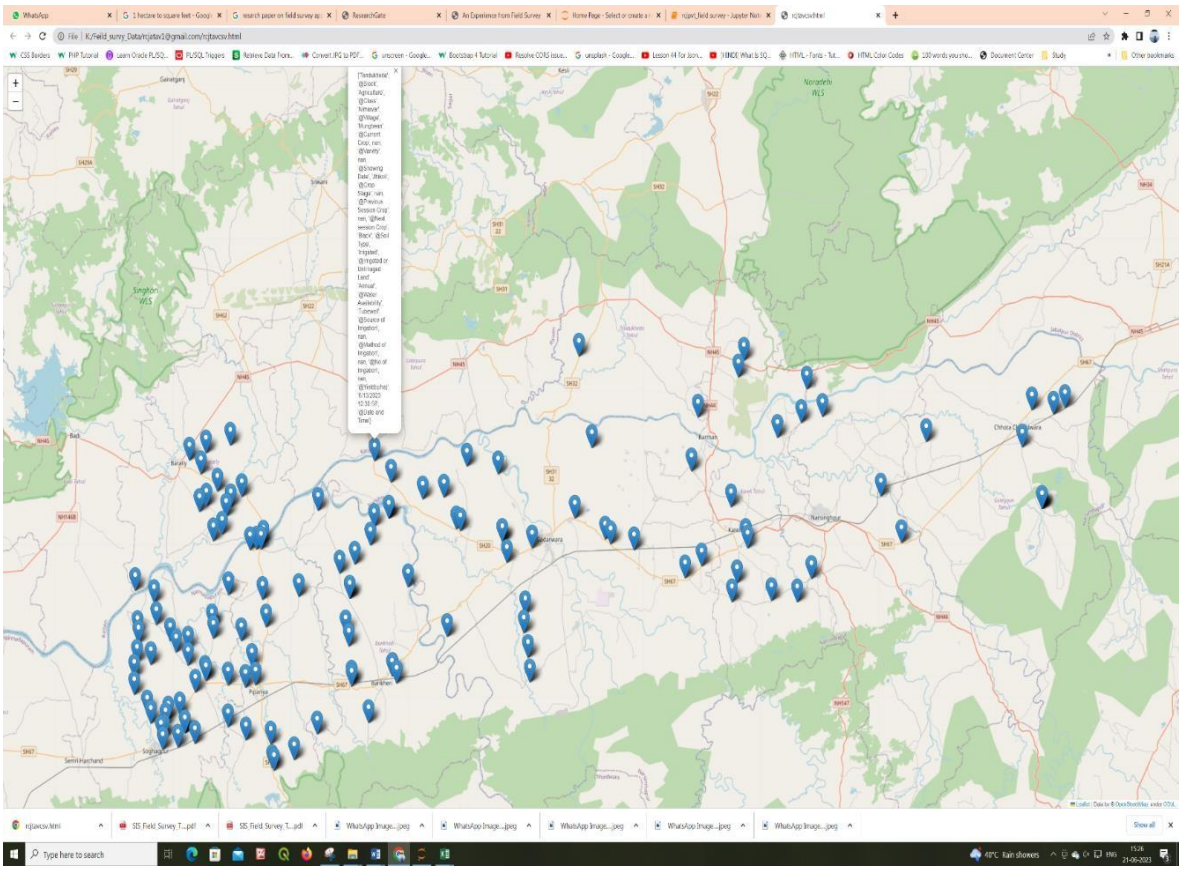


Fig. 9. Locations of general survey data

4. CONCLUSION

The developed Android-based field survey app empowers professionals in the field of natural resource management by providing a comprehensive, reliable, and efficient tool for data collection and reduced the cumbersome paperwork, data loss, and limited collaboration. The developed app also emphasized on embracing the future of digital surveying. It highlights the significance of the application in enhancing spatial information gathering in agriculture and various disciplines. The paper encourages further exploration and adoption of such technologies to improve data collection and analysis processes.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Smith J. Revolutionizing agriculture data collection and management: An innovative application. Journal of Agricultural Technology Advancements, (2023). 15(2), 123-140.
2. Jones A, Brown L. Tailored field survey app for natural resource management professionals: Environmental technology review. 2023;8(3):215-230.
3. Smith J, Johnson A. The impact of a mobile app on student learning outcomes. Educational Technology Research and Development. 2022;68(3):789-803. DOI: 10.1007/s11423-022-09999-9
4. 1st International Conference on Recent Trends in Engineering & Technology, Mar-

2012 Special Issue of International Journal of electronics, Communication & Soft Computing Science & Engineering, ISSN: 2277-9477.

5. Bellocci V, Genovese S, Inuaggiato D, Tucci M. Mobile Location- aware services: 2002 market perspective. ericsson, divison service architecture and interactive solutions; 2002.
6. Ardagna CA, Cremonini M, Vimercati SD, Samarati P. Access control in location-based services. Privacy in Location-Based Applications. 2009;5599:106-115.
7. Sharma R, Gupta S, Kumar A. Development and evaluation of an innovative application for data collection and management in Indian agriculture. Indian Journal of Agricultural Technology. 2022;20(1):32-48.
8. Patel M, Desai N, Singh V. Designing a field survey app for natural resource management professionals in India: A user-centered approach. Journal of Environmental Management and Sustainable Development. 2021;15(3): 78-96.
9. Corral L, Sillitti A, Succi G. Software assurance practices for mobile applications: A survey of the state of the art. Computing. 2015;97:1001-22.
10. Nowak MM, Dziób K, Ludwisiak Ł, Chmiel J. Mobile GIS applications for environmental field surveys: A state of the art. Global Ecology and Conservation. 2020;23:e01089.

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