SUITABILITY OF OSMAND MOBILE MAPPING APPLICATION FOR RURAL ROADS

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ABSTRACT - For day-to-day work many free and open-source mobile mapping and navigation apps are available for common users. Suitability analysis of these applications in various domains is the need of the hour. The OSMAND mobile mapping and navigation app, was tested during training programmes on eight rural roads in seven States of the country in India in different terrain conditions. During training programmes, under field visits, the participants collected tracks in OSMAND mobile mapping app, of the selected roads, while sitting in a vehicle or walking on the road. Later data of all mobiles for the particular road visited were downloaded and analysed for the proximity to each other, in QGIS software. Data were found within a range of about 2.5 meters to 25 meters in either side from centre line of road tracks, as per travel on foot or in the bus, irrespective of bus width, travel speed, sitting position of participants, terrain conditions, weather condition, time of measurement, internal settings of application and makes and models of mobiles, barring few outliers. It was observed that the data were more in proximity and having less variation in plain terrains. The variation was more in hilly terrains with dense tree covers. The open mobile mapping applications can be a boon for developing countries for day to day uses in road sector for mapping and navigation.

Keywords: OSMAND; Open Source GIS; QGIS; GNSS; mobile mapping

1. INTRODUCTION

"Mobile communications technology has become the world's most common way of transmitting voice, data, and services, and no technology has ever spread faster" [1]. In a study the results showed that mobile data compared reasonably well to manual data for most of the desired variables [2]. In mobile data collection the integration and actual application of data in overall workflow of organisation with supporting other than locational requirements are also the factors for evaluating any mobile application. A systematic approach and research are required for standardising the application of mobile based technologies in low income countries [3].

National Institute of Rural Development and Panchayati Raj, Hyderabad, India is an apex autonomous institute of Government of India which caters for Training, Research and Consultancy in Rural Development and Panchayati Raj. In training programmmes, author initiated testing the free OSMAND mobile mapping app [4] on rural roads constructed under government supported schemes like Pradhan Mantri Gram Sadak Yojana (PMGSY).

In general, the roads are monitored by customised state specific mandatory applications including a dedicated portal and mobile application for submitting the field data. In addition to these applications there is a need always to have solutions for monitoring of road data in public domain or in Government also to have quick monitoring of roads or any length feature or other assets also. As the overall accuracy and application potential is not known to the users of these freely application open source applications, they remain hesitated to use these applications, in day to day and other purposes.

In this article OSMAND mobile application has been tested on various rural roads in the seven states of India under different terrain conditions ranging from plain to hilly and open to dense tree cover. The OSMAND has been used in the study by author for ease of use and easy data handling. Many other applications are also available in Free and Open Source domain for use, to be tested by users for ease of operation and suitability in their domain [5]. Hence the broad purpose of this study is to give a confidence to the users about line data variation along the roads in various terrain conditions, and to provide application potential of the mobile apps for day to day professional use in rural development works in general and rural roads in particular.

2. MATERIALS AND METHODS

The OSMAND mobile mapping application was used in the study during training programmes conducted on geospatial technology applications in rural roads. The tool was tested for variation between the tracks from each other while used on the same road with many participants with different kind of mobile makes and settings. The application had been used for track data collection by the training participants while sitting in the bus or by foot in onwards and return journey on the road. Mode of travel was kept on bus or by foot for convenience and easy availability. The data exported to the desktop were analyzed using Google Earth Pro and Free and Open Source QGIS Software [6].

Training were conducted at State Institute of Rural Development (SIRDs) which functions under administrative control of respective State Governments, and National Institute of Rural Development and Panchayati Raj (NIRDPR) provides off-campus training to these locations in collaborative manner. The training were sponsored by Ministry of Rural Development (MoRD), Government of India.

The roads were studied during the financial year 2018-2020. In all the training programme, one day field visits were held comprised of half day for road data collection and understanding the location data collection in mobiles in practical manner. All the programmes were of five days duration and full time residential in nature. In each programme, one road was covered and mentioned as cases in the table-1.

How to track the line data in OSMAND is explained in YouTube video of author [7]. In this study the main focus was to check suitability of OSMAND mobile app for monitoring of line features, starting with roads in the study. The same may be applicable to any other linear and point features also.

3. RESULTS AND DISCUSSION

The details of all eight cases are provided in Table 1. The field details of case-1 is depicted in Figure-1, describing the type of overview and data pattern in individual cases.

Table 1. Details of Travel, Terrain and Range of Variation at Selected Points under Each Case

Case no. and State	Mode of Travel	Terrain condition	Approximate Travel length (Kms)	Number of sites considered at map for width variation	Width variation of tracks at selected points (Meters)				
					1	2	3	4	5
1	Bus	Plain	3	4	7.02	8.50	7.36	11.34	-
2	Bus	Plain with houses along the roads	6	4	15.68	8.75	22.08	17.41	-
3	Bus	Hilly with tree cover	10	4	28.82	47.91	12.67	30.82	-
4	Walk	Undulated with scattered forest	1	4	7.69	8.05	6.80	10.10	-

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5	Bus	Plain with habitations along the road	5	5	10.47	10.67	12.50	11.72	16.52
6	Bus	Hilly with steep slopes	6	4	16.82	14.66	10.26	22.25	-
7	Walk	Plain with habitations along the road	1	4	5.54	5.79	8.38	5.99	-
8	Walk	Plain	0.1	2	5.64	4.86	-	-	-

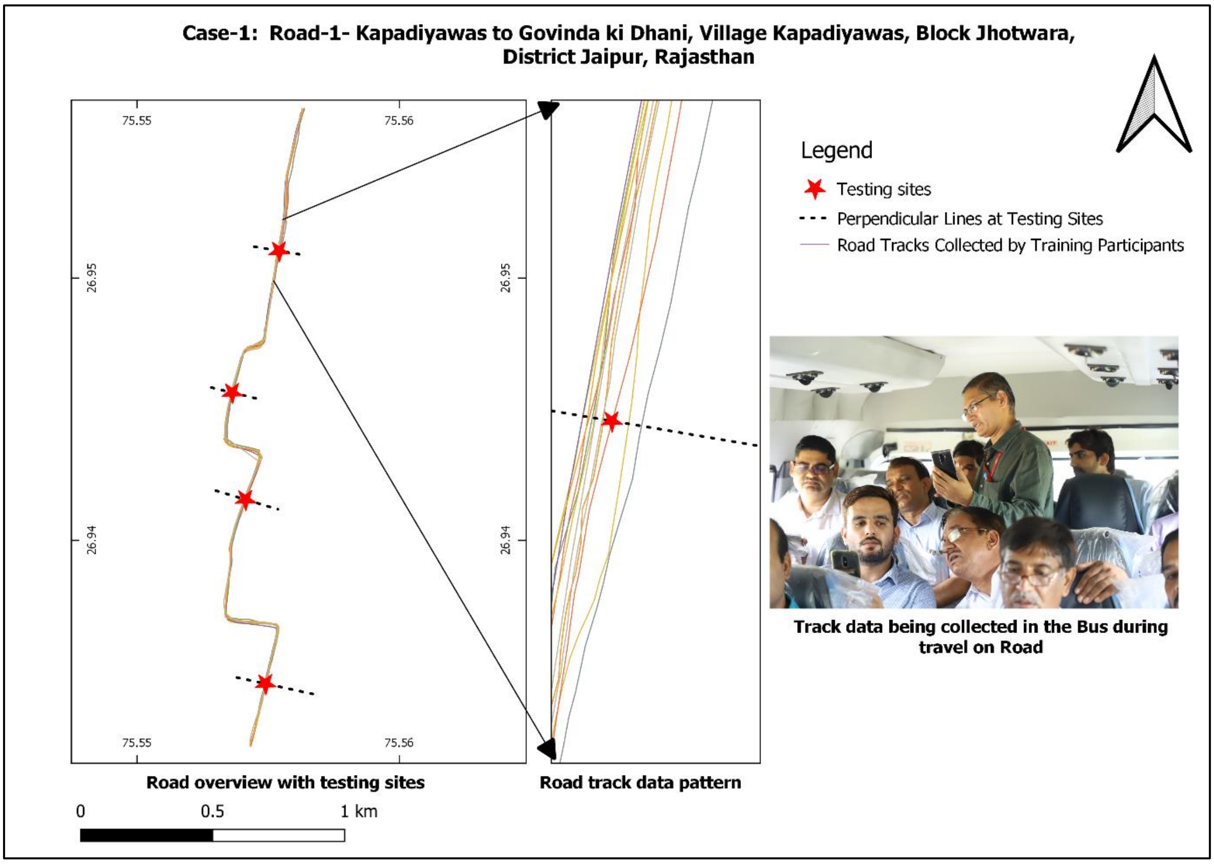

Figure 1. Road Overview and Track Data Pattern for Case-1

3.1. Limitations

The study was conducted irrespective of settings of OSMAND application, mobile settings, make and models of mobiles, and there were shift in sitting position of participants during onward and return travel. Avoiding these effects in a more systematic experiments may give better results. The study was undertaken in different time settings and different areas and weather conditions which is having influence on satellite positions and Dilution of Precision (DOP) and can cause the further variation in accuracy of data among different roads. However for the same road these factors can be considered constant among mobiles. Due to budgetary limitations and limited number of sponsorship of training, the testing could be done on the training locations only. However most of the terrain and geographic conditions are covered.

4. CONCLUSION

Location variation on length of roads were within a range of about 2.5 meters to 25 meters in either side from average center line of width variation of tracks (table-1), irrespective of mode of travel. It was observed that the data were more in proximity and having less variation in plain terrains with fewer trees and buildings along the roads. The variation was more in hilly terrains with dense tree covers. In future with better signals availability in the public domain and availability of more GNSS signals on mobiles can enhance the usability of mobile mapping apps. The use of these tools may be encouraged with proper capacity building of users.

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