Geovisualization and processing of mobility data to identify impact factors on mobility patterns

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Geovisualization represents the emerging technique to visualize the geographic data/information interactively. Through the integration of mobility data and geovisualization techniques, this thesis aims to develop the user interactive platform as a part of aCar Mobility project to facilitate the processing of raw data gathered in underdeveloped areas in Africa and visualize it.

OBJECTIVES

For the development of the user interactive platform the main objective is sub divided into three objectives.

1. Identifying different (raw) data-sources & -contributors that could take part in the platform.

2. To develop or find the existing methods to process (structure & categorize) the data-sources,

3. The visualization of the mobility indicators on a map.

METHODOLOGY

The research was carried out in three major phases. The first phase included identifying the data sources, data structuring techniques and geovisualization methods. In the second phase the prototype development was done. Then the application was tested with real-time data and these results led to conclusion and improvements.
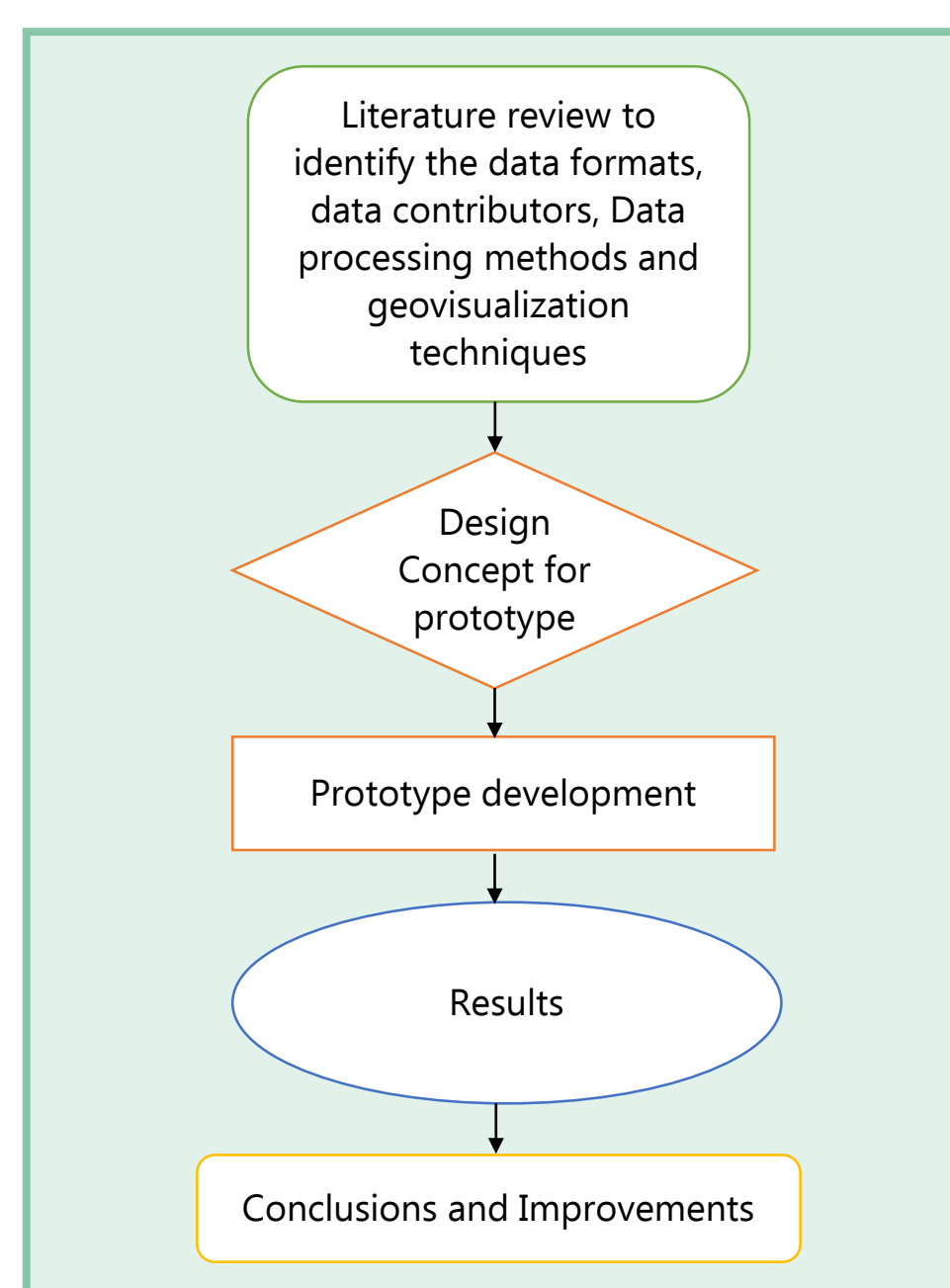

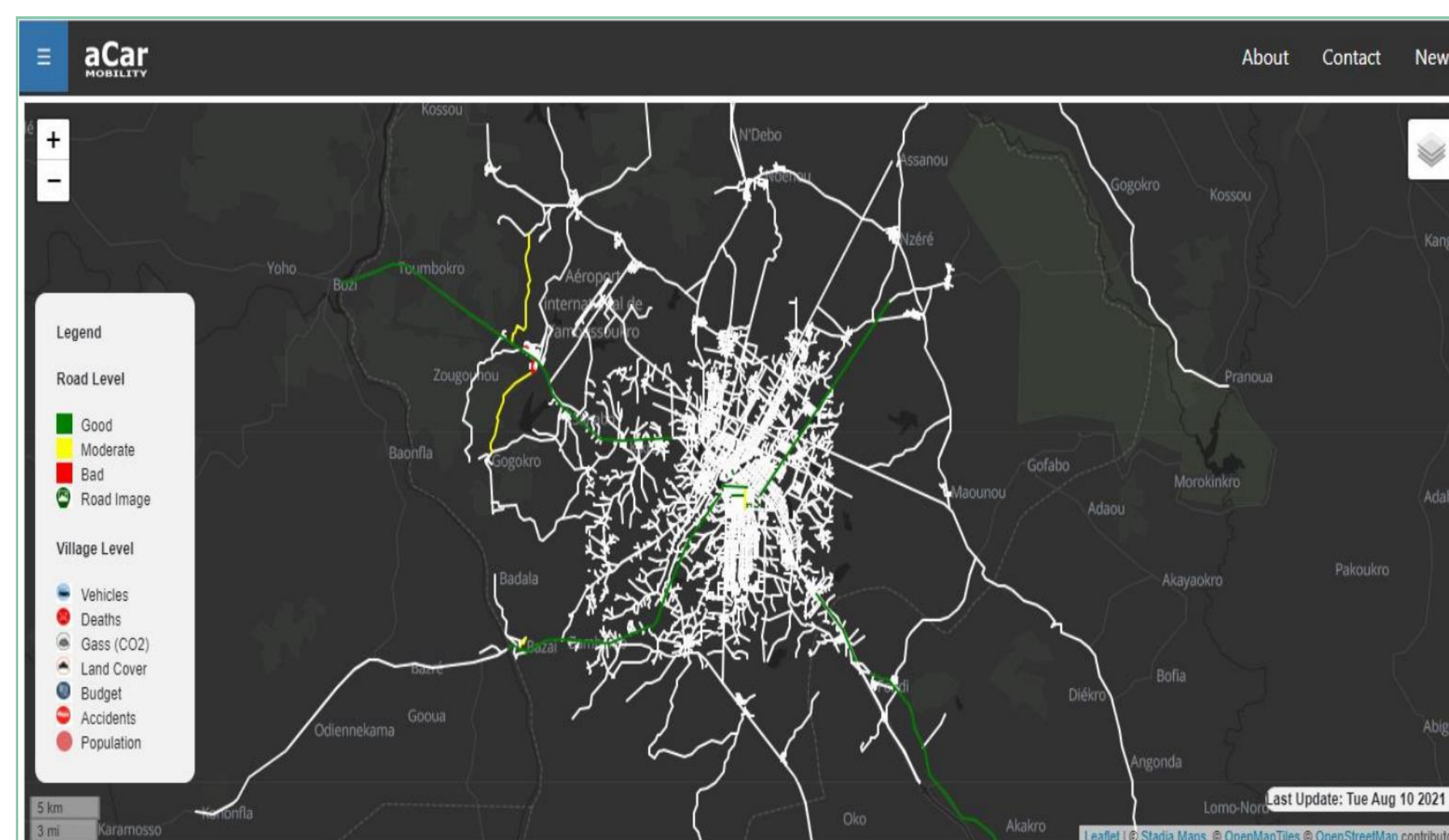Figure 1: Methodology flowchart showing each phase in a different color.

Figure 2. The prototype showing the road condition visualization on the map.

STUDY AREA

The target region for this research is Ethiopia and Côte d'Ivoire.

RESULTS

At the end, the visualization of mobility indicators on the map gave the insight about comparison among the target places. The major goal of uploading the data on field is fulfilled by this application. All involved institutes have access to the data uploaded by the surveyors and have the capability to structure the raw data. The visualization of indicators enabled the researchers to see the impact factors so that they can use them for the mobility pattern analysis.
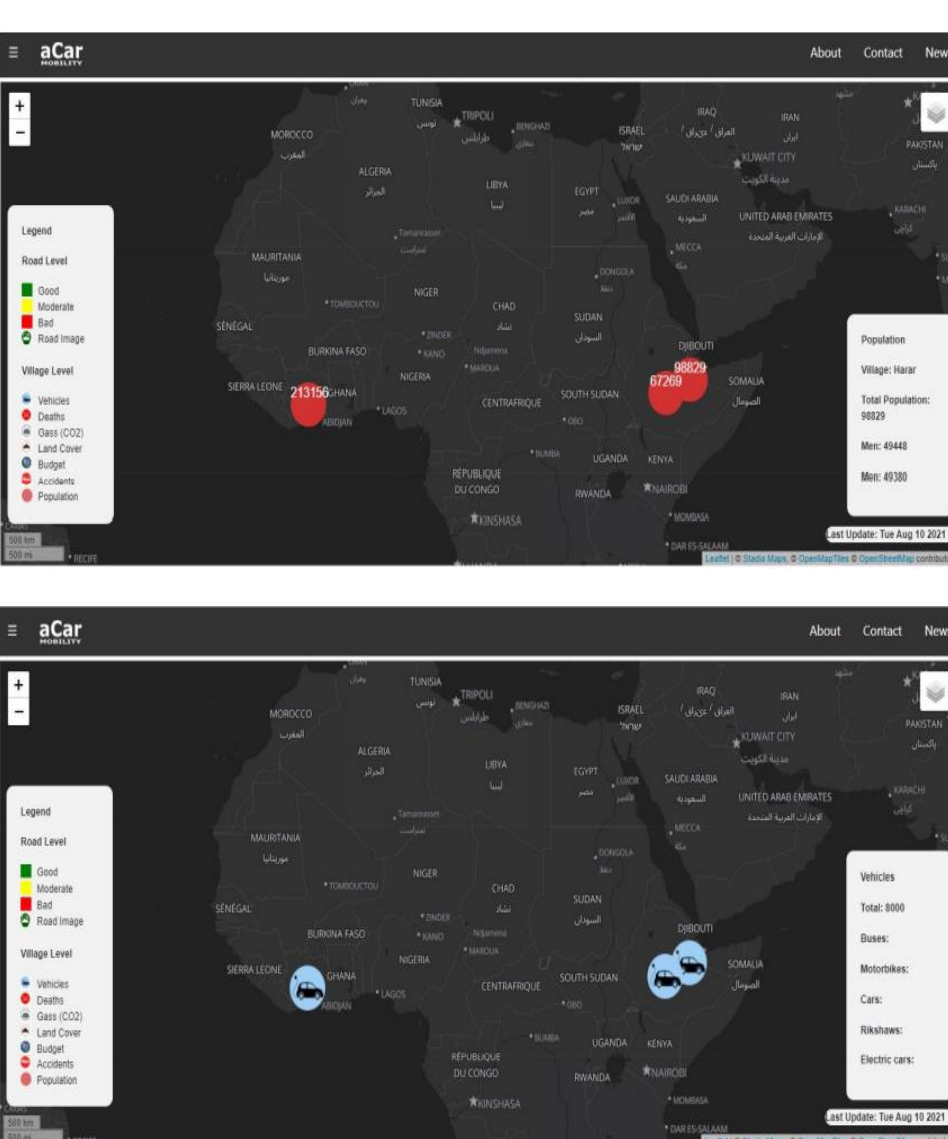

Figure 3: The visualization of two mobility indicators on map.

CONCLUSION

The goal of this thesis was achieved by successfully developing the user interactive platform/GUI where users can visualize the mobility indicators. The functionality of GUI (e.g. features) was tested by the open source and survey data. The results achieved after testing were satisfying. The functionality of the application depends on the data provided. The GUI can handle the large amount of data and can be used by multiple users at a same time. This GUI is tested on different devices such as laptops, mobile phones & tablets and it's compatible with these devices.

IMPROVEMENTS

1. More data should be collected via surveys.

2. The platform can be extended by introducing more mobility indicators.

3. The HTML form to organize and structure the data can be filled automatically upon uploading the raw data in a pdf file.

4. More features can be added such as the automatic report generation in the end of geovisualization.

5. Machine learning techniques can be used to calculate some of the indicators by browser itself.

6. Overall statistics of particular region can be displayed.

REFERENCES

[1] Geisa Bugs, Carlos Granell, Oscar Fonts, Joaquín Huerta, Marco Painho (2010). An assessment of Public Participation GIS and Web 2.0 technologies in urban planning practice in Canela, Brazil. 27(3). 172-181.

[2] Maria Antonia Brovelli, Marco Minghini, Giorgio Zamboni(2016). Public participation in GIS via mobile applications. ISPRS Journal of Photogrammetry and Remote Sensing, 114, 306-315.

[3] Poorazizi, Ebrahim & Alesheikh, Ali & Behzadi, Saeed. (2008). Developing a Mobile GIS for Field Geospatial Data Acquisition. Journal of Applied Sciences. 8. 10.3923/jas.2008.3279.3283.

[4] Jing, Changfeng, Mingyi Du, Songnian Li, and Siyuan Liu. (2019). Geospatial Dashboards for Monitoring Smart City Performance. Sustainability 11, no. 20: 5648.

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