

SodaSense: An Intelligence Platform for Micro-Mobility, Micro-Climate and Agriculture

Paraskevi Raftopoulou, Spiros Skiadopoulos, Christos Tryfonopoulos, and Costas Vassilakis

Dept. Informatics and Telecommunications

University of the Peloponnese

Tripoli, Greece

email: {praftop,spiros,trifon,costas}@uop.gr

Abstract—SODASENSE is an end-to-end big data manipulation platform that focuses on decision and policy making. It concerns the management of big trajectory and spatio-temporal data that is collected from sensors and relates to micro-mobility, micro-climate and agriculture, and aims to the creation of an expert decision making platform with research, social and business orientation.

Keywords—spatial time series, trajectories, big data management and analysis

I. INTRODUCTION

SODASENSE (<https://sodasense.uop.gr>) is an on-going project implemented by the SoDa Lab (<https://soda.uop.gr>). The platform under development that bears the same name (i.e., SODASENSE) offers end-to-end big data manipulation focusing on decision and policy making in the Peloponnese Region, Greece ([https://en.wikipedia.org/wiki/Peloponnese\(region\)](https://en.wikipedia.org/wiki/Peloponnese(region))). Specifically, SODASENSE will manage big trajectory and spatio-temporal data that is collected from sensors and relates to micro-mobility, micro-climate and agriculture. An overview of the layered structure of SODASENSE, which comprises of *Data sources*, *Data management* and *Data analysis and visualization*, is illustrated in Figure 1. The uttermost goal of SODASENSE is to create an expert decision making platform with research, social and business orientation

In more details, the platform’s services combine the collection, storage, analysis, visualization and data mining, to improve the quality of life in urban centers (through city redesign, planning and micro-transportation) and to support basic economic activities (such as tourism and agriculture), especially for small and medium-sized enterprises that make up most of the economic backbone of the Peloponnese. The SODASENSE project is designed to enhance with *specific services* the coordination of public authorities and the relevant policy decisions making in the areas in which it specializes. Through the new services, it will provide its users with information, knowledge and tools on:

- the use of new technologies in micro-mobility, micro-climate and agriculture,
- the collection of relevant data, and
- the utilization of data to improve life in urban centers.

Overall, SODASENSE will offer additional capabilities and services to academia, research, professional associations, private and public companies, infrastructure operators, independent



Figure 1. SODASENSE in a nutshell

authorities and public bodies, to support original research, investment projects and decision making. This will enhance tourism, support agricultural production, and better facilitate decision-making in the Peloponnese area.

The rest of the paper is structure as follows. Sections II and III illustrated the added value and the approach of SODASENSE. Finally Section IV offers conclusions.

II. SODASENSE ADDED VALUE

Greece, due to its geographical position and its history, is a pole of attraction for tourism. Consequently, there is a great demand for micro-movements of both tourists and permanent residents of urban areas. At the same time, it has a long tradition on agriculture and the cultivation of excellent quality agricultural products (e.g., olives and olive oil, grapes, raisins and wine, figs). Until the launch of the SODASENSE infrastructure, no other infrastructure had been created for the systematic research, analysis and dissemination of data related to micro-mobility, micro-climate and agriculture.

The lack of infrastructure to provide information and data on the above subjects entails additional constraints for conducting further research. It also limits the development of strategic plans and policy making at local, regional and national

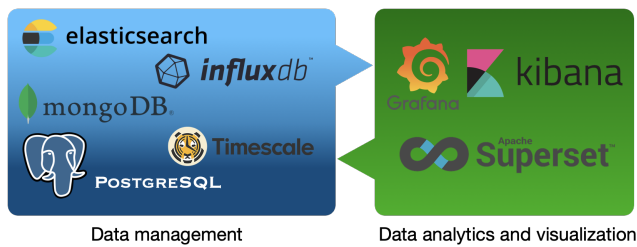


Figure 2. SODASense technologies

level. The SODASense platform responds to the above needs by updating and monitoring data on micro-mobility, micro-climate and agriculture, combining them with data from other stations (where available), as well as identifying and recording trends with a focus on smart specialization in these areas. The specialized knowledge that SODASense provides will also enhance the implementation in Greece of European directives and policies related to the aforementioned areas.

Overall, the main objective of the SODASense infrastructure is to enhance regional excellence in the fields of micro-mobility data management, micro-climate and agriculture, by providing the necessary services (data collection and analysis, modeling, programming, applications to users).

III. THE SODASense APPROACH

SODASense platform will provide an reliable and easy access to data using information technology and communication services. SODASense addresses innovative topics, such as large-scale data management, real-time exchange of scientific data, data processing with advanced artificial intelligence and machine learning methods, the use of cloud computing services, aiming to improve the efficiency and reliability of activities critical for a modern urban environment, such as micro-mobility, micro-climate, smart agriculture, as well as tourism.

More specifically, a Data Center will be designed as an application of the Database as Service (DaaS) model [1]. SODASense's services will be provided under the Software as a Service (SaaS) model [2], while the Services Center will operate under the Internet as a Service (IaaS) [3] and Platform as a Service (PaaS) models [4]. Figure 2 summarizes the technologies and tools employed by SODASense.

In the field of micro-mobility, micro-climate and agriculture, the scientific and technological innovation of the operation lies in the use of digital methods to gain new knowledge about large-scale data, advanced computational models, applications and visualization technologies. Research will be carried out on micro-mobility topics, such as routing, compliance with the new regulations regarding the environmental impact of micro-mobility, intermodality and accessibility to poles of concentration of cultural or educational activities.

Accordingly, urban air quality simulations will be designed and carried out taking into account buildings of different shapes, sizes and layouts. Finally, research will be carried

out on the placement of smart sensors on crops, as well as combining them with data from other stations where available, in order to collect data that will help farmers monitor and optimize crops in line with changing environmental factors. At the academic level, the scientific innovation of practice lies in the use of advanced methodologies and tools with increased reliability, such as simulation, decision-making and policy support models.

SODASense aims to become an innovative e-research infrastructure with significant added value at all levels: regional, national and international. At regional level, it will support smart specialization, assisting regional innovation and economic development of the Peloponnese Region, allowing regional resources to focus on their advantages, including the wealth and smart specialization of small and medium-sized enterprises, and in particular small and medium-sized enterprises engaged in micro-mobility, agriculture and tourism.

IV. CONCLUSIONS

SODASense infrastructure will support in an interdisciplinary way the key axes pertaining to micro-transport, micro-climate, agriculture and tourism. It will create an electronic information system for the systematic information, decision support and research, while the use of standards for the interoperability of the collected data and the provision of open availability of the data will allow the exploitation of datasets and related tools by the research potential and the general public.

Finally, SODASense is expected to have a positive impact on various socio-economic sectors specific to the region in the context of smart specialization (e.g., tourism, micro-mobility, micro-climate, environment, agriculture). At a different level, through SODASense the region will have, for the first time, an integrated tool (and the relevant data) to study and support decision-making of key areas of activity; the platform has the potential to promote green micro-transport, precision agriculture, and sustainable tourism development. From the above, it is understood that there is a wide range of beneficiaries of the operation at both national and regional level, including regional and local authorities, organizations, businesses and bodies in the target sectors.

ACKNOWLEDGMENTS

This research was funded by project SODASense (<https://sodasense.uop.gr>) under grant agreement No. MIS 5060275 (co-financed by Greece and the EU through the European Regional Development Fund).

REFERENCES

- [1] H. Hacigumus, B. Iyer, and S. Mehrotra, "Providing database as a service," in *Proceedings of ICDE*, 2002, pp. 29–38.
- [2] B. Allen et al., "Software as a service for data scientists," *Commun. of ACM*, vol. 55, no. 2, p. 81–88, Feb 2012.
- [3] B. Wang, X. Chang, and J. Liu, "Modeling heterogeneous virtual machines on IAAS data centers," *IEEE Comm. Letters*, vol. 19, no. 4, pp. 537–540, 2015.
- [4] R. Dua, A. R. Raja, and D. Kakadia, "Virtualization vs containerization to support PAAS," in *IEEE Int'l Conf. on Cloud Engineering*, 2014, pp. 610–614.