Smartphone Application for Tourist Assistance Based on OpenStreetMaps Data

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***Abstract*—This paper describes the smartphone application which provides a tourist assistance based on information from the OpenStreetMaps servers. The Android-based application allows users to view nearby attractions in selected region, find an attraction detailed information and build route to it. An attraction information is taken from the OpenStreetMaps servers and matched with data from open and crowd-sourced information resources such as Wikipedia project.**

I. System reference model

The proposed approach can be described as Android-based application and service-oriented system which processes user requests. This system provides content to an user and consists of a set of interacting services. The system reference model is presented on fig. 1. The user can start working with application by using an Android-based smartphone. This application can provide the current region map with attraction on it, show the nearest attractions around the tourist and image gallery about them and show detailed information about selected point of interest. The application tries to gather specific information from own side (sensors data or tourist information) and from the other services(attraction data or route information). The tourist can get information about attraction from *content delivery service*, which was gathered by *information aggregation service*. It is possible to get current weather for the tourist city by using *weather service* and build the route to the desired attraction with help of the *route service*.

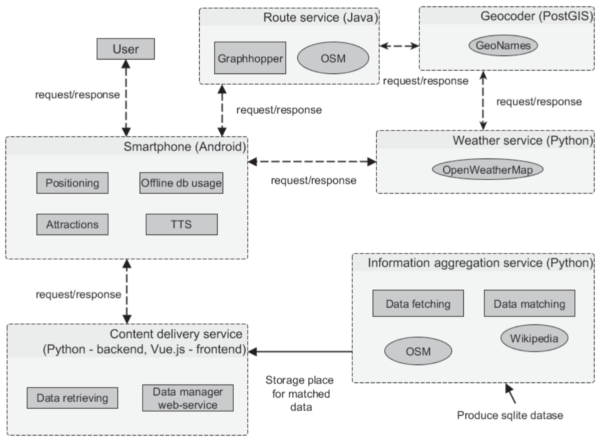


Fig. 1. Reference model

The set of services are processed information after the tourist request. The *information aggregation service* uses OpenStreetMaps and Wikipedia data for gathering geo-information about selected region and its attractions. This service need to be launched first before any other services. The user can provide a JSON-based settings file with set of desired regions to be parsed. The OpenStreetMaps servers are used as geo-data source for fetching information about attractions in the region. This information includes attraction name, position (latitude and longitude) and tag (attraction category such as museums, parks, etc.). The attraction name, coordinates, tags are gathered. After gathering a general information from OpenStreetMaps the *information aggregation service* tries to match information with open crowdsource information resources such as Wikipedia. The attraction description and images are usually searched by the service. After the information matching the service pack the data into the sqlite database which can be opened from the tourist smartphone. This action allows users to work with the application in offline mode without accessing the Internet. This service is written in the Python programming language. More details about the *information aggregation service* can be found on the paper [1].

The *content delivery service* stores all data about cities and related attractions. This service takes all created sqlite-databases from the *information aggregation service* and delivers them to the tourist on request. This service also includes web-based interface for interacting and managing offline databases. The administrator can creates the region page with some basic information and makes it available for downloading. In this web-interface administrator can view attractions from each region and modify them by by editing description and providing audio and video media files. It is also possible to create new attractions with description, coordinates and images which was not include in the provided sqlite-database. The service backend part is written by using the Python programming language and Flask micro-framework. The frontend part is written by using the Javascript programming language and Vue.js framework.

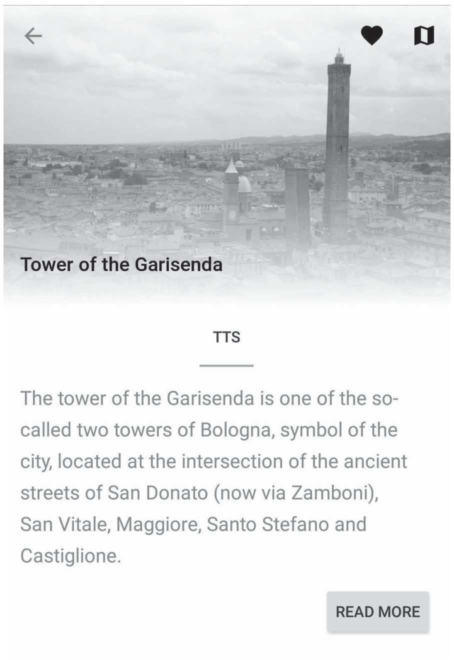
The *weather service* is designed to fetch information about weather in the tourist location. The main information about weather is gathered from the OpenWeatherMap services. In general, the *weather service* fetches the temperature, wind strength and position, humidity and pressure. For reducing the number of service calling, the caching of the obtained results is applied for each region for a certain amount of time. This service is written in the Python programming language.

The *route service* constructs the route for the specific attractions within the tourist city. The Graphhopper library is used for graph construction from OpenStreetMap data and route creation based on the tourist location and attractions coordinates. At the current stage of development, the default algorithm of route construction is used without any modification, but it is possible to change weights in a constructed city graph to improve overall quality of route building. The Java programming language was used for this service. Both *weather* and *route* services uses a *geocoder* for tourist location determination based on his/her coordinates. The cities and coordinates are used for reverse geocoding from Geonames project and the PostGIS database is choosen as information storage for fast searching in geo-based data.

II. Implementation

The Android-base implementation of application is based on Tourist Assistant — TAIS mobile application [2], [3]. The developed application can determine the tourist location by using inner sensors/GPS data and search information for nearby attractions. This result can be achieved in two ways: by performing online searching through geo-based systems or by local searching via previously downloaded databases with text and media information for selected region. This offline databases is constructed by *information aggregation service* and can be downloaded from *content delivery service*. By using offline databases the tourist can gather information in places without Internet accessibility which improves the overall experience of using the application. Each attraction has own detailed description (fig. 2) with images and link to attraction page on Wikipedia or another information resource. Description of attraction is voiced by using Android TTS module.

For the current tourist position the application provides an image gallery and list of nearby attraction. With a certain periodicity the Android application updates the tourist location and displays of nearby attractions and also offers



The tower of the Garisenda is one of the so-called two towers of Bologna, symbol of the city, located at the intersection of the ancient streets of San Donato (now via Zamboni), San Vitale, Maggiore, Santo Stefano and Castiglione.

Fig. 2. Attraction description

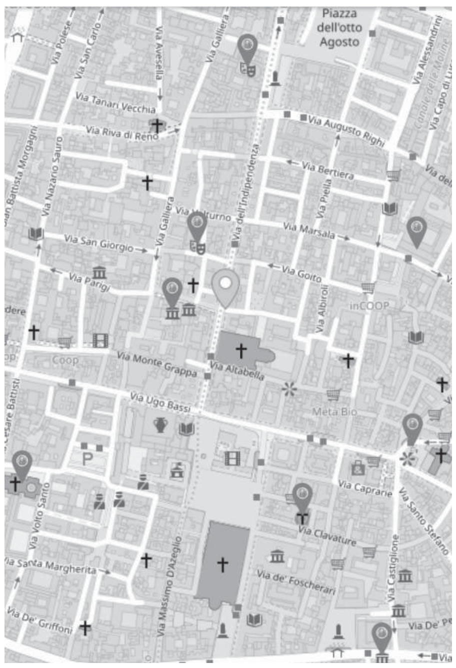


Fig. 3. Bologna attraction map

proactive recommendations. The proactive recommendations allows tourist to construct route through the selected city or region. The tourist can open the global map (fig 3) with all featured attraction and build a route to the selected point of interest with the help of the *route service*.

III. Conclusion

The Android-based smartphone application which provides a tourist assistance based on information from the OpenStreetMaps servers was presented. The general reference model of application and service is given. The offline usage of merged OpenStreetMaps and Wikipedia data can improve the overall usage of application and enable application usage without the Internet access.

Acknowledgement

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References

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