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## User friendly interaction with natural objects in web map applications based on object recognition

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### Abstract

The maps become a common tool for many users. We can find a wide range of solutions from simple search applications to advanced location intelligence tools. In most cases, aerial or satellite images are used as a background. Above this background, other map layers are presented and used for the actual interaction. Our approach is focused on the mentioned background. Aerial and satellite images comprise a huge amount of objects, but it is virtually impossible to interact with them. This paper proposes a new kind of user interface that allows to interact with these natural objects.

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### 1. Introduction

In the last decade, we can see substantial arise of different mobile and web mapping applications. The well known leader in this area is the Google corporation with their Google Maps service. The Google Maps and other similar solutions such as Mapy.cz, Bing Maps etc. share the basic concept. They provide satellite/aerial imagery, topographical or thematic maps that serves as a background for data presentation. These base layers are both from technical and the user point-of-view just raster images. We can see them, but there is no possibility of some advanced interaction.

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Above this base layer, a set of vector map layers is usually presented. As an example can be taken the road network, selected points-of-interest etc. Particularly, the Google, Seznam.cz and similar companies frequently present the search results as a point layer that allows the user to click on specific points and see related details. On the Fig. 1 (a), we can see the search results for restaurants in Brno. We can say that particularly these vector layers are designed for interaction. There is a wide range of solutions based on the same principle. Many towns, cities and organizations present overview of their properties through the web map applications. For instance, we can find geospatial information systems that present city infrastructure. The users (usually particular technical department and/or city council) can see electrical lines, pipes, roads conditions, public lights etc. On the Fig. 1 (b), is a web based geospatial information system Wegas developed by Envipartner company. Its purpose is to provide an information about maintained public properties. The users can interact with different layers that contains the description of the related infrastructure.

The last, nonetheless important, category comprises different solutions for business intelligence that incorporate maps and generally work with the spatial information. They are usually called location intelligence (Wolfe, D. & Moon G., 2008). From the technical point-of-view, they have the same architecture as previously mentioned solutions. Analytical layers are presented above some base layer with the satellite imagery, topographical maps, etc. These analytical layers are computed on the basis of complex data and provide information about the company sales and many other details necessary for the decision making process. Different services provided by CleverAnalytics<sup>†</sup> company can be taken as an example.

As been presented above, virtually all these applications are based on the same architecture. The users interact with selected (usually vector) map layers. They can see the details of presented object, search within them, even modify them. On the background is frequently a base map layer in a raster form. This layer can be usually changed or disabled, nonetheless, there is practically no possibility of an other interaction. Although there is such need as is described further. Therefore, we focused on this issue and developed a method that allows to decompose this raster layer on the separate objects and allows to present information related to these objects.

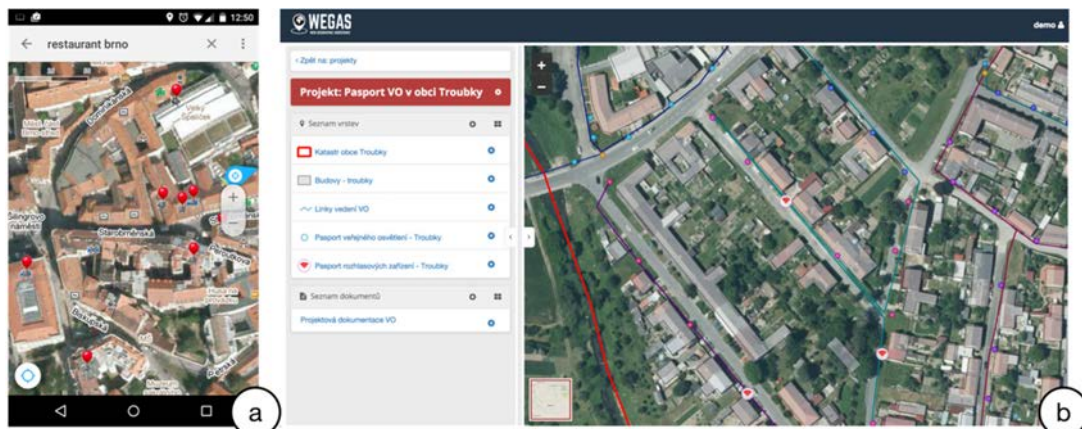


Fig. 1. Vector map layers above aerial image base map (a) Seznam.cz mobile maps application with search results; (b) Wegas application with inventory of public infrastructure (<http://wegas.cz>).

### 1.1. Structure of the article

The article is organized as follows: On the beginning, we provide a brief review of user interfaces that are currently used for interaction with different raster map layers. Further, we overview applications of the object

<sup>†</sup> <http://www.cleveranalytics.cz/>

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