Searching in the Smart City?

An Information Access Challenge

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Abstract

How can users use search to make sense of Smart City offers? On the one hand, of course much information is available on the Web and is supposedly easily accessible to search. On the other hand, Smart Cities aim for data-driven urban transformation, and build a variety of new systems and data sources. Yet it is not yet fully clear which (new) approaches are needed to make these accessible to search. In the attempt to break up silos and make information more open, new types of silos or inaccessible systems can come up. It is of course rather easy to find restaurants or the list of city services. But that cannot be all we want from our cities. We need support in dealing with the higher complexity of information and services, and ideally more integrated ways of accessing them.

Keywords

Smart Cities, IR, Information Retrieval, Search, Urban Information Access, Location-based Search, Data Integration

1. Challenge

There is no search engine for Smart Cities. Why is that? Is it not necessary, too complex, too specific, or something else? While we don't have a complete answer yet, we argue that it is a bit of all. It may not be necessary to have that many separate (new) systems if we can handle the complexity through integration. Integration could also be a good way to go from a user view, as universal search shows in common Web search engines. There are few searches that would only apply to one specific smart city, so tackling them specifically for integration can help to make sense of them. This aligns with the idea and ambition of Smart City as an integration and combination of systems and silos. Of course there will be specific search systems for specific datasets, systems, or applications, but for broad user appeal, it needs easy findability and access; and subsequent integration into general search.

From a user or citizen perspective, a Smart City should be a city that makes life easier, removes barriers, focuses on sustainability and quality of life, and provides access to existing and new services and systems, well integrated, and data-driven. As we argued before, "the Smart City concept can be understood as a convergence of digital information and physical environment along with social factors within a city. The 'smartness' from the ICT view is usually provided by information systems and concerns certain key areas: governance, people, living, mobility, economy, environment." [1] For a search perspective, it means that data should be readily available, accessible, findable, searchable, composable and useable both by humans and other services.

A Smart City is not a monolithic block run only centrally by the city (administration) itself. It rather means an overall ecosystem of various (external) systems and services and stakeholders, of access, and of running the city. As an example, to a user, the city feels smart if it has good mobility options. The public transport should be efficient and cover the city well, and this should be combined with information about it being readily available; for example by having clear maps and route information available on the Web, on apps, and at the bus stops, but also having it machine-readable so that it can be included in other services and for example integrated into the commercial mapping and routing engines. Having the bus tables only in a pdf or worse, only at the bus stops, would break that integration flow and the sensation of 'smart'.

Online city services improve a lot if it is not behind a login screen, but the main parts are available freely on the Web, so they can be found through any search engine, and not just by knowing the right entry point and navigating a semi-public system from there.

So, to transfer the vision of smartness to the users, data and information needs to be easily available and findable, and it needs to support integration across different systems. This of course opens up many opportunities to develop the approaches and systems that do the individual parts well, and then do the same for the integration, which will make all parts even more valuable to the inhabitants.

More complex use cases and information needs could be stated and fulfilled. As an example, a more integrated

search may not only ask for a bar, but allow users to find a bar that is accessible by public transport at night, after hiking, with a view to the fjord or the river. That would combine location-based search, mapping and understanding routing tables, spatial relations, and semantic web retrieval, as well as integration across silos.

Many similar scenarios exist and would move further away from single-page or single-result queries. These real-life cases are often not covered by existing evaluation scenarios such as TREC. They may also be much more context-dependent, and their answer depends to a high degree on local information available. There may be only noisy or lacking data sources. With the slow opening of silos, there is still a massive amount of information that is not yet accessible on the broad Web. Information may also not be findable in the big location search engines (or simply be not widely sourced and grounded enough to actually show up). The best result may be a combination, for example, of crowdsourced locations in OpenStreetMap and an obscure event on social media. So also location search is still far from solved. And while commercial engines are very good at a wide range types of queries, the complex integrated queries often only are found to be addressed in research prototypes.

We have previously argued a similar case for recommender systems [1]. There we focused more on the different scenarios and use cases, while there is a lot of overlap in the challenges. The needs of scenario-based search, data and service integration, cross-domain complex search, and evaluation do provide many challenges to further research into the topic of Smart City Search.

Acknowledgements

References

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