Paving the WAI: Defining Web-Augmented Interactions.

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ABSTRACT

We define and provide real cases of "Web-Augmented Interactions" (WAI) with the world, a new family of interactions designed to exploit resources from the Web to improve the users' experience with the devices surrounding them.

CCS CONCEPTS

• **Human-centered computing** → **Web-based interaction**; *Interaction design theory, concepts and paradigms*; • **Information systems** → *World Wide Web*; *Web interfaces*;

KEYWORDS

Web, Interaction, Augmentation

1 WEB-AUGMENTED INTERACTIONS (W.A.I.) A NEW CLASS OF INTERACTIONS

As the access to the Web spreads through the world, it also becomes a ubiquitous resource available for almost any application i.e. the Web is a part of the commons on which we can build new systems. In particular, by providing a growing number of services and data sources in almost any domain it has an impact on how we perceive our world (e.g. augmented reality), on how we move into it (e.g. enriched GPS) or how we act on it (e.g. Web APIs). The Web is deeply modifying our interaction means with the world to the point it creates new classes of interactions. Our experience in designing and implementing Social Semantic Web applications [10] led us to see the emerging of a new class of interactions we call Web-Augmented Interactions (WAI).

Definition 1.1. A Web-Augmented Interaction (WAI) is a user's interaction with a system that is improved by allowing the system to access Web resources in the background in order to analyze, specify or enrich the user's requests or the system's responses, for the benefit of the user (matching her goals, tasks and interaction context).

For instance the access to the Web for a robot can improve the interactions it can offer by providing it with additional knowledge about its environment to take decisions and initiatives. In a WAI, systems are using resources from the Web to simplify the interaction or enrich the user experience in a variety of ways: contextualizing the interaction, improving natural language processing, accessing pragmatic aspects, acquiring and using background knowledge, fueling dialogues with new material, proposing more hypermedia links and paths, etc. In this short paper, (1) we provide real cases of WAI from our research projects [10], and (2) we compare WAIs with related notions. So doing we complement the characterization of what is a WAI. Characterizing the WAI class of interactions is for us a first step in the elaboration of an approach to designing WAIs that will include guidelines and standards.

2 REAL CASES OF WEB-AUGMENTED INTERACTIONS

The idea of defining a new family of interactions emerged from a number of very different projects conducted in our team [10]. We selected a sample of these projects stressing the way they use the Web to improve interactions. This shows at the same time the diversity of cases and the transverse nature of WAIs. For each case we identify the kind of interaction, the provided augmentation, the Web resources allowing the augmentation, and the user's interaction goal.

- In the ALOOF project the goal is to interact with a robot more naturally by allowing it to learn missing knowledge about objects [15]. In order to better answer the request of the users, the robot accesses data on Web and even reads texts from the Web for instance to guess which room in the house is the most likely to have an object it was asked to fetch.
- In AZKAR [4] a robot supports remote visits of museums. To go beyond joystick-based navigation, the system combines cultural knowledge about the collections with data about the museum setup and from the Web to support abstract goals such as a topic based visit (e.g. all clothes in display). By accessing to Semantic Web resources such as ontology-based descriptions of museum objects and scenes, the AZKAR robot helps a remote visitor improve her interaction with the objects and scenes as she moves in the museum.
- The QAKIS search engines performs question-answering over linked data [6]. To improve its robustness to linguistic variations of questions it learns these variations from Web pages by looking at the different ways the same data is expressed across the pages.
- The OCKTOPUS project focused on analyzing on-line epistemic communities to detect them, their experts and the topics which bind them [11]. To interact with the results and in particular to label the detected communities in meaningful ways the system relied on Web resources (StackOverflow

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tags and DBpedia) to find labels that made the results understandable.
- The WASABI project is interested in improving the analysis and access means to music collections. The project uses resources from the Web to augment the interactions of the users with a piece of music he is listening or creating. Adding information, suggestions and links by using the Web (natural language analysis of lyrics sites, linked data, APIs) it provides new routes and interaction means with the musics [3, 5].
- The SeaLife Browser [14] was an early experiment to automatically link Web resources (data, references) to the Web content a user was browsing and augment its experience with additional content and links.
- The myCampus project [9] relied on a Web based e-Wallet to represent personal knowledge about the user that was then used to simplify the interactions with on-line services in a context-aware way.

This non exhaustive list serves the purpose of showing diverse and real cases of WAIs. It also shows that this idea is transverse to application domains being used in robotics, connected objects (e.g. Amazon echo), augmented reality (e.g. Google glasses), tourism applications, e-book reader (e.g. translations), building automation, etc. But in every case we have a system that accesses Web resources (data, texts, services, etc.) to augment its knowledge about the users and the context of the interaction or to improve its analysis of the requests (disambiguate, variations, expand, narrow, etc.) and the quality of its reactions (additional knowledge, representations, suggestions, etc.).

3 WAI V.S. RELATED NOTIONS

Other kinds of augmented interactions have been identified. In *Instrumental interaction* [1], interactions between users and domain objects are mediated by software instruments. In a WAI the Web is used to provide domain objects or additional resources to the instruments of the interactions. *Knowledge-based augmented reality* (e.g. [8]) concentrates on the special case of local knowledge bases used to support a specific type of interaction namely augmented reality. *Ontology-driven document enrichment* (e.g. [12]) focuses on improving information retrieval and document access services using ontologies i.e. a very specific kind of resource and not necessarily on the Web. *Augmented browsing* (e.g. [13, 14]) targets the specific task of browsing and uses specific sources to automatically add definitions, links and additional resources. Finally, *Web Augmentation* [2] focuses on augmenting the functionality of the Web itself.

What distinguishes WAIs from other kinds of augmented interactions? (a) the interaction is augmented through the access or analysis of Web resources related to the user, the context or the task; (b) the augmentation is mainly performed by the system during the interaction although it can benefit from preprocessing; (c) this processing is intended to be transparent to the user, the goal being to simplify the user's task and support a partnership between the user and the system [7]; (c) the resulting interaction is improved in terms of user experience compared to the same interaction without using Web resources.

4 CONCLUSIONS

We proposed a definition of Web-Augmented Interaction (WAI) in what could be called a Web-Wide World. We provided real cases of this new type of interactions in very different contexts. We believe this domain requires the extension of current interaction design methodologies and places additional constraints on the Web architecture in terms of security, quality and real-time access.

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