Early Concept Validation
through Provocative Experience Prototyping

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Abstract

This essay reports on a research project aiming at validation of a concept for an AI-driven speech interface for smart services in public spaces. The research team created a simple experience prototype that simulated the envisioned functionality and was used to experiment with subjects in dialogues. The interaction with the prototype invoked a provocative experience that allowed test subjects to better imagine the impact that such a concept for smart services would have in their neighbourhood.

Keywords: Provocative prototype, Smart city, Conversational agent

Introduction

The research was prompted by plans of the municipality of The Hague to create a Smart City Infrastructure using lamp-posts as multi-functional hubs, starting with a pilot in one neighbourhood. These smart lamp-posts will have various sensors and offer Wi-Fi to the public. Large developments like this, technically complex and involving large investments, are often developed and implemented from a technology-push viewpoint. To complement this, the present research project explicitly focused on the viewpoint of citizens (van Leeuwen et al. 2018).

From conversations with residents in the pilot neighbourhood, a number of user stories were collected and a recurring theme was chosen that reflected a common need – better informed communication in and about the neighbourhood. Residents were concerned about the solidarity in the neighbourhood between the various groups of residents, about the preservation of cultural and historic values, and about the alignment of municipal policy with the wishes of residents. Communication between residents and with local government appeared to be an issue. According to some residents, the municipal government is only moderately informed about what is at stake in the neighbourhood.

Research method

The project explored smart services in outdoor public spaces that can enrich urban life, by first investigating explicit and latent needs of citizens and then evaluating conceptual scenarios through a makeshift prototype and a Wizard of Oz technique (Dahlbäck et al. 1993).

The design question became twofold: (1) How can local information, about what's going on in the neighbourhood's public space, be registered and shared? (2) How can an interactive channel be realised that citizens can use to communicate about their local environment, so that they feel heard?

Concept

Creative sessions led to the concept of a 'Conversational lamp-post' – an AI-based point of contact in the neighbourhood, built into a lamp-post. These conversational lamp-posts form a super-local social network for citizens and are a communication channel to the municipality. A speech interface is used to conduct conversations between passers-by and the lamp-post. Conversational lamp-posts remember what is being said by passers-by and also have sensors to listen, smell, feel and look around, building up an information repository of their direct environment: they always have an interesting story to tell and one can query the information they have stored about its environment.

Conversational agents using speech interfaces are getting commonplace in domestic environments (Porcheron 2018). The use of speech in public outdoor settings is less developed and needs research (Clark et al. 2018).

Experience prototype

To evaluate the concept, an experience prototype was created that test subjects could interact with. The experience prototype consisted of a loudspeaker positioned on a tripod and connected to a laptop computer. A document was prepared containing envisioned flows of dialogues, questions and answers that would be used to simulate the conversation between the AI-agent and the user. The researcher conducting the experiment selected sentences in response to the participant's utterances and had the computer pronounce these using its standard speech functionality. The participant was asked to imagine the prototype as a lamp-post in a public outdoor space.

After the interaction with the prototype, participants were interviewed regarding their experience, the concept's usability, its desirability, and topics such as privacy, social preconditions, and ownership of collected data. Of particular interest was the participants' willingness to engage with a conversational lamp-post in their own neighbourhood and under what circumstances different aspects of its functionality would be considered acceptable.
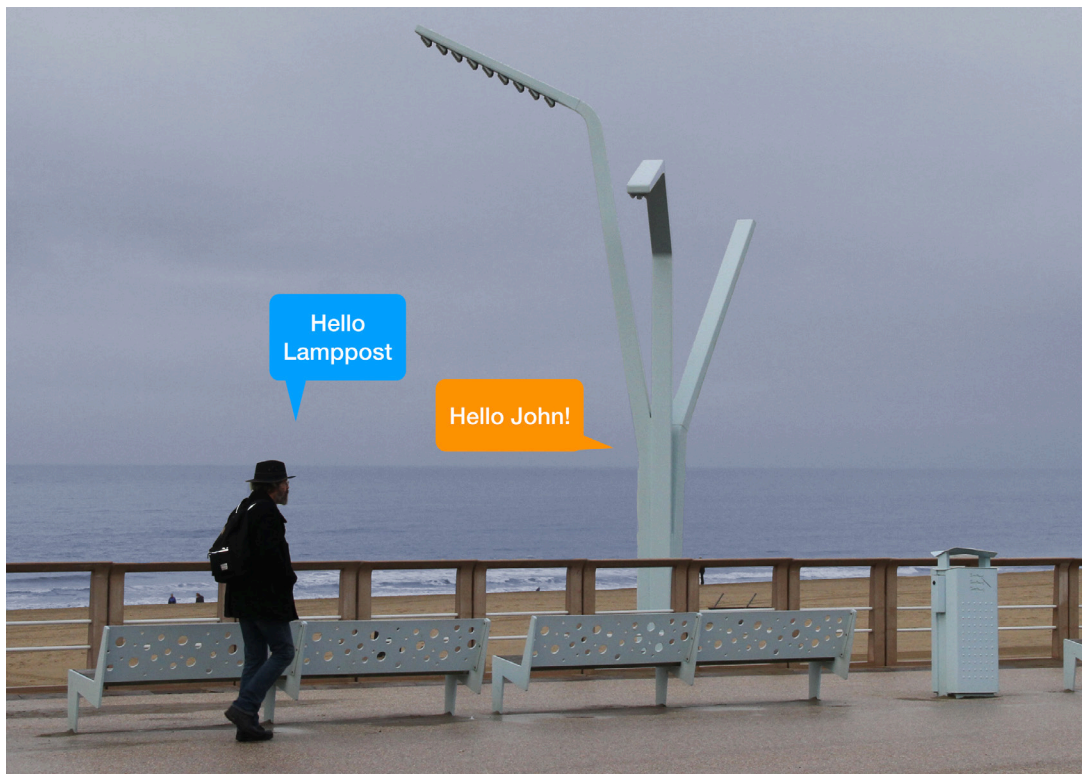

Fig.1 Concept of the conversational lamp-post

Fig.2 Crude prototype of the conversational lamp-post - loudspeaker on a tripod

Scenarios

Questions and answers of the dialogue were prepared for various possible scenarios, anticipating the responses of test subjects and different directions the conversation could take. Three topics were prepared: finding a runaway cat; nuisance by youngsters on scooters; and litter on the street.

Results and Discussion

The provocative experience prototype in this project was created with the simplest possible means, aiming to provide a sufficiently convincing experience for test subjects and stimulating an in-depth discussion afterwards regarding this experience and possible future scenarios. The prototype served to evaluate, in this very early stage, the usability, usefulness, and desirability of the interaction, but also to explore, in subsequent interviews, the boundaries of acceptability of the concept of a conversational agent in public spaces. Through the use of the experience prototype, participants of the session were inspired to imagine the workings of the concept and stimulated to consider its usability, usefulness, and acceptability in their neighbourhood.

The research team experienced this form of low-key experience prototyping as very efficient: participants engaged effortlessly in the dialogue, which proceeded fluently. Experiencing the interaction helped them envision potential use cases and reflect on privacy issues: the dialogues revealed subjective limits of what kind of personal information people were willing to share with the lamp-post. For example, some showed much interest in opportunities to find new relationships in the neighbourhood. Others stated they would feel uncomfortable if the lamp-post would initiate the discussion, particularly when using their name, unless it would clearly represent the municipality – trust as a key-factor (Begany et al. 2015).

Fig.3 Test subject interacting with the experience prototype

Working with the provocative experience prototype has revealed sufficient insights to take the project to its next iteration: a working prototype for experiments in a semi-public space. These experiments will provide further insights into the use of speech interfaces in public, with factors such as the presence of other people nearby and the effects of environmental noise on the user experience. Further iterations of the project include experiments with additional sensors and the use of big data to enhance the conversational lamp-post with relevant and local information.

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