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# Where Can I Find a Pharmacy? - Human-Driven Design of a Service Robot's Guidance Behaviour

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## ABSTRACT

This workshop paper describes our human-driven studies for designing the guidance behavior of a shopping centre service robot. The aim is that the robot would be capable of giving guidance to customers in an effective and intuitive way. We conducted two human-human interaction studies, where the persons working at the information desk of a shopping centre worked as a guide, giving guidance to researchers and students conducting pre-defined guidance tasks in the shopping centre. We will use the data for identifying effective ways to give guidance and analysing relevant social signals in the interaction situations.

## Author Keywords

Human-Robot Interaction, Human-Human interaction, Human-Driven Design, Guidance

## ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous; See <http://acm.org/about/class/1998> for the full list of ACM classifiers. This section is required.

## INTRODUCTION

As social service robots are expected to become more common in shopping centers, it is important to integrate them to be a natural part of the shopping centres' services. It is crucial to explore what kind of an assistive and useful role the robots could have to complement and enrich the current customer services of the shopping centres.

In a study exploring the potential of a social robot in customer service at an airport, assisting, informing and guiding customers have been found as valuable roles for a social robot [1]. To provide true usefulness and achieve acceptance among customers, the robot's behavior and gestures need to be designed thoroughly, to be intuitive and effective, for example in guidance situations, which are the focus of this workshop paper.

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The objective of this study is to create real-like guidance situations to observe the behaviour of the professional guide and the people asking guidance, to understand relevant social signals and features of effective ways to give guidance in varying situations. The findings will be utilised in the development of the shopping centre service robot to make its interaction socially appropriate and effective in the real guidance situations, as well as other customer service tasks.

This study is a part of a four-year, EU-funded MuMMER (MultiModal Mall Entertainment Robot) -project [2], which aims at developing a social service robot with an ability to interact autonomously and naturally in a shopping centre, and provide an engaging and entertaining customer experience. The platform in the project is the humanoid service robot Pepper of Softbank Robotics. We involve the potential end-users and other stakeholders in the design activities and experiments in the shopping centre throughout the duration of the project [3].

## METHODS AND PARTICIPANTS

We conducted two human-human interaction studies with preliminary interviews. The preliminary interviews helped us to understand the guidance situations in general and the typical questions asked by the customers. We interviewed and observed three persons working at the information desk of the shopping centre who give guidance to the customers as part of their daily work.

The first human-human interaction study was conducted by two researchers, who asked altogether 15 guidance questions from one guide, and repeated the set-up with another guide. The aim was to demonstrate the instructions given by the guides to different types of questions: typical questions from the customers, places located in different areas of the shopping centre, two locations asked in the same question, and questions covering several locations (e.g. toy shops).

The second study focused on the understandability and effectiveness of guidance and social interaction between the guide and the participants. In addition to the question types of the first study, also situations where two persons asked the guidance together were included in the study tasks. We designed the tasks so that they would be complex enough to raise some confusion or challenge the participants. Altogether 10 students, 4 males and 6 females, 21-41 years, participated in this study, by asking guidance according to a set of pre-defined tasks (7 tasks for each person). After each task to ask guidance, the participants went to the actual

places and took a picture of the entrance with their mobile phones. The participants were shortly interviewed after each task, and they could give free comments after any of the tasks. All participants filled out an informed consent form for taking part in the study. However, to ensure natural human–human interactions, we did not reveal them that the study is related to the development of a service robot, until completion of the whole set of tasks.

We conducted the studies at the assumed future location of the service robot, at the central square of the shopping centre. The guidance situations were videotaped with a top camera and two front cameras diagonally placed towards the guide and the customers. In our setup, the placement of the cameras enabled seeing the movements and faces of both the guide and the participant(s) (Figure 1). We marked the guide's default standing position on the floor and distance tape markers every 0,5 meters to allow measuring distances more accurately later from the top camera view.



**Figure 1: A participant (on the right) asking for guidance; three camera views of the same situation.**

The preliminary interviews have been analysed qualitatively to reveal patterns of effective guidance. The collected video data will be analysed through an observational analysis. Especially social signals, such as proxemics, gaze, hand gestures, and body orientation will be analysed.

### INITIAL FINDINGS

The first human–human interaction study gave us understanding of the guidance giving behavior. The guides made the instructions more concrete for example by using landmarks and pointing the directions. We observed that the instructions typically followed a specific structure, from first stating a general notion of the location asked, (e.g. “*It is pretty close by*” or “*We have several toy shops here.*”) and then proceeding to the exact instructions. One of the guides had a routine to repeat the location of the question to the customer (e.g. Customer: “*Where could I find a pharmacy?*” Guide: “*A pharmacy. Well, it is not far away. You first need to go...*”), which will be useful also for the interaction with the robot, to make the customer sure that the robot has understood the question.

In the second study, the data revealed a range of interactions with some confusion between the guide and the participants. In these situations, the participants or the guide needed to ask more advice, confirm what was said or use gestures for clarification. For us, the tasks with two participants will be of special interest, as the robot should work in a socially appropriate and effective way also in these situations.

Our experiences of the study procedure have been positive. In the second study, we found it important that the study participants visited the actual locations where they were guided to, to ensure that they needed to apply the guidance instructions. For analysing the social signals between the guide and the participants, it was essential that they focus on listening to the instructions of the guide.

### NEXT STEPS

The next step of the research is to repeat the same study set-up, but replace the human guide with our service robot, an adaptive Pepper prototype. We will recruit the same number of participants and use similar tasks to see how the participants perceive the guidance given by the robot and which the key development needs are. In a later phase of the project, we will observe also authentic guidance situations when the robot will be offering its services to the customers. At the end of the project, the robot will be present at the shopping centre for a longer period of time, which will prove whether the customers use it actively and finally, whether they perceive it as an acceptable, useful and engaging part of the customer services.

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