Testing Interactive Products with the Robot Intervention Method

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Abstract
This paper introduces robot intervention, a novel approach to usability testing with children. A social robot is used as a proxy for a test administrator who conducts an active intervention session remotely in a Wizard of Oz fashion. The motivation of the technique is that children will feel at ease and enjoy interacting with the social robot, and thus produce more frequent and informative verbalizations regarding their interaction with the product under test. First experiences regarding this method are positive with regards to the feasibility of the method and with regards to how well it is received by children.

Keywords
Evaluation, Children, Usability Test, Active Intervention, Think-Aloud, Wizard of Oz, Social Robot.

ACM Classification Keywords
H. 5. 2 User Interfaces, Evaluation methodology.

Introduction
It can be challenging to apply or adapt existing evaluation methodology to account for the involvement of children in testing interactive products. One major challenge is obtaining verbalization data from children during a test [5].

Verbalization data refers to things children say while they interact with a product during a test-session. Think-aloud aims to capture the thinking processes of test-participants as they discover how to use a new product; it is a relatively cumbersome process, where the evaluator remains distant and avoids engaging in a dialogue with the participant, but just encourages them to keep talking. This can be disconcerting for a child who might need reassurance during the test or who might be uncomfortable with the behavior of the evaluator. In practice a more relaxed approach is often followed even for adult testers (see [1]).

Recognizing the difficulties related to think-aloud modifications of this technique have been proposed that involve a more dialogical demeanor of the test administrator, e.g., [6]. Such methods that are broadly referred to here as active intervention method attempt to survey the test-participants' opinions and thoughts intermittently through interaction using different degrees of intervention, from simply waiting for a task to finish before questions are asked to guiding the test-participant, and asking probing questions regarding their thoughts and experiences during the interaction [1]. While addressing some of the problems of think-aloud some problems can surface in practice:

- Children may hesitate to try things out in the presence of an adult, not wanting to make mistakes, asking for approval or help instead.

- Children may be influenced by the questions or suggestions of the adult, or may even attempt to double-guess the evaluator to please him/her with their answers.

To address such problems, we introduce a variation of the active intervention method, in which the child interacts with the test administrator through a social robot.

Social Robots

By the term Social Robot we mean a robot that can interact and communicate with humans while following the behavioral norms expected by the people with whom it is intended to interact [3].

Achieving this ideal in full is in several ways beyond the current state of the art, but some current robots manage to emulate human social behaviors to some extent. An example used in this study is the Philips iCat [4]. For the purposes of the robot intervention technique we content with a robot that can exhibit a small range of human behaviors that can be triggered remotely by a human operator.

Robot intervention Method

The robot intervention method bears a lot of resemblance to active intervention, with the test administrator asking questions and explanations from the child regarding the interaction and the interface and even probing with potential courses of action that the child should explore. The administrator withdraws out of sight from the child and operates the robot remotely. The motivation for doing this is that the child can relate easier to a playful and toy-like robot than an adult administrator and can be more uninhibited to talk to it. The robot is used as a proxy for the administrator who operates it from the observation room.

Through a purpose made graphical control panel the administrator can invoke simple pre-programmed

human-like behaviors (facial expressions, orienting its head-pose towards the child, etc.). The interviewer's voice is transformed so that is not recognizable and can be attributed to the robot.

Broadly, the procedure for the evaluation is as follows:

- The administrator introduces the set up and explains that the robot is there to offer help when the child gets stuck and to ask questions about what the child is thinking or trying to do.
- The child is allowed to familiarize with surroundings.
- The administrator withdraws to the observation room from where all interaction of the child is observed through cameras and through one-way mirrors.
- The evaluation session proceeds as in standard evaluation sessions.
- The administrator observes the child through observation equipment and one-way mirrors, and observes remotely the content of the child's screen.
- The administrator applies an active intervention protocol and a help protocol through the robot when this is necessary.
- At appropriate moments in the session, the administrator evokes emotive reactions by the iCat or small comments, to remind the child to talk, to encourage the child or to guide it in accordance to the test-protocol applied.
- The administrator returns to the room for debriefing the child.

Experiences with the Robot intervention method

The method is being developed iteratively together with the technology that supports it. The first trials involved children aged 6-8 and concerned the evaluation of a PC based game appropriate for their age.

Initially, 4 trials were executed simulating the core elements of the method using low-tech solutions. More specifically, a speaker connected to a PC was inserted inside a fluffy animal allowing for the basic test and help protocols to be executed (without the display of social behaviors by the toy).

When the observer's interface for the iCat was ready a further set of trials involving 10 children was carried out. The first experiences with this method have been positive:

- The children are very comfortable and enjoy the interaction with the robot.
- With the current implementation, the administrator of the test has a heavy workload (there was only one person managing the robot and interacting through it with the child in these trials). More autonomy is required for the robot and a higher level set of controls are needed for the observer.
- The children provided limited spontaneous verbalizations to the robot, but felt very comfortable to answer its questions.
- The robot seems to resolve the problem of other verbalization methods that children are hesitant to try things out, turning for help to the administrator. It seems they will only ask help when they are truly stuck.

Figure 1. The administrator explaining the set-up prior to the test session (top) and the administrator operating the robot from the observation room (bottom)

Conclusions

We have introduced the robot intervention method, a variant of active intervention that is conducted through a robot that is able to display human-like emotions, child throughout a test-session.

With this method the child interacts with the product under test and with the robot which offers help when the child is stuck and which poses questions for the child.

The method has been found to be feasible even for a single test-administrator to execute, though it is very taxing using the current interface to the robot. Expectations regarding the method have been met partially. The method was not so successful in evoking many verbalizations; it was though very good useful for making the children feel comfortable and helping them njoy the session. Future work should focus on exploring more autonomous social reactions for the robot towards the child and on making a richer set of pre-programmed behaviors and reactions available through the test-administrator's interface.

Work towards validating the method should extend also to different kinds of products that are not inherently fun for the child. In such cases, the robot could be used to make testing a less dull experience for the child-tester.

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