

Making Ambient Spaces into Playgrounds

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Introduction

Ambient spaces are characterized by sensors, which allow detailed observation of visitors and inhabitants, and by displays and actuators that allow the system to react to the observed behavior. Starting from a general ambient space, we are working towards an interactive environment that invites and seduces people to interaction with each other and with the environment. We aim at “play” rather than at “game”; the visitor has no obligation to interact with the system, nor is there any specific goal to reach or task to complete.

Background and motivation

The development of our interactive playground (see Figure 1) is inspired by children’s play, combining the rich interaction possibilities of computer games with the physical and open-ended aspects of traditional playground play [1,2]. The “open-ended play” afforded by such a playground may benefit children in many aspects of their development [3, 4].

Offering specific toys, play objects, or mechanisms on a playground does not necessarily mean they will be used as intended. Children appropriate the things that are present in playgrounds, such as swings and seesaws, and repurpose them for their own play and games. The boundaries between play and game are blurred, the two types of activity merge seamlessly. While they play a game, playful activity occurs within, besides and around the specific rules and goals. “Dramatic performance in play” (bodily acts, a special jump or shout, etc.) occurs, and “in fact it often becomes the most important activity of the play in itself, and it becomes the one admired and imitated by others.” [5]. In the pilot tests with the first prototype of our interactive playground, for example, one pair of children decided to designate the playground to be an environment for expressive dancing. On the other hand, during open play, *ad hoc* rules are continually being defined, adapted and discarded, and spontaneous “gamelets” emerge continually. Many such temporary rule introductions were observed during the pilot tests. For example, one of the children shouted at some point: “We must all run away from the yellow shapes that are



Figure 1. Children playing with the HMI Interactive Playground

following you!” (interestingly, in the thematic concept underlying this playground, the shapes that are following you were actually envisioned to be “your shapes”, and not hostile at all). At another point, a child said: “come on everybody, we must all get off the play area for a moment, come on...”. This little “rule” was introduced with an ulterior motive: this child was the first person to run onto the field again and claim one of the colored shapes that was previously “caught” by one of the others.

Measuring and influencing social and affective behavior in the interactive playground

Intelligent interactive playgrounds offer possibilities beyond those of a seesaw or a swing, which just sit there, waiting to be used in play. An intelligent playground is more like another person, responding to what you do, but also proactively contributing things to the play that occurs. By well-placed interventions in the interactive play, an intelligent playground can influence many social and physical properties of the play that emerges [6]. To this end, the playground needs to observe and interpret the social and affective behavior of the players, and determine appropriate (re)actions to change the interaction between visitors [7].

For example, the amount of nonverbal coordination (“motion synchrony”) between visitors may be measured to yield insight into their social relation [8], but might also be manipulated through coordinated interaction between the system and the individual visitors, in order to change their relation [9]. The playground may contain sensors for the detection of engagement and group forming, and when a person is observed to be uninvolved in the play, the interactive elements of the playground may explicitly link this person to the others in an attempt to draw them into the play. The system may respond to motion and sound in such a way that the children are encouraged to jump around wildly and scream at the top of their voices, or, conversely, to be very quiet and careful. Through designing such interactive interventions, we aim at increasing the engagement of people with the system and with each other.

Pilot evaluation of the first prototype

The first prototype of the playground was evaluated in a series of user tests with 19 children, in groups of 2-4, playing for approximately 30 minutes inside the playground. The first 10 minutes they were allowed to play without any instruction at all. After that, they were asked to tell about the interaction patterns that they had discovered in the system, and they received a 5 minute explanation of some of the patterns that they had not yet discovered. The goal of these tests was twofold. Firstly, we wanted to know whether the children would display the mix of play and game typical of children’s activity on a playground, and whether we would observe them “telling stories” about the possible interaction patterns and changing these stories throughout the session. As can partially be seen from the examples above, this was the case. Secondly, we attempted to introduce a set of interaction patterns in the system that specifically targeted the social dimension of *cooperation* and *collaboration*, hoping to increase the presence of either of these aspects in the play of the children. However, the amount data that we collected was too small to draw clear conclusions about that.

Future work

We are currently involved in developing an annotation scheme and an inventory of relevant dimensions of play behavior, concerning both physical and social dimensions. This annotation scheme is based upon recordings made of the evaluations of the first prototype playground and upon observations of children’s play at a number of primary school playgrounds. This should lead to the development of algorithms for automatic detection of relevant social and affective behavior, and the development of a series of new interactive playground prototypes. Future experiments will focus more on the elicitation and influencing of various types of social and physical behavior in the children’s play.

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