



Robot assisted Play - PlayROB

Type of Project

Finished research project

Summary

The aim of this project is to explore how children with physical disabilities could use a toy robot system for autonomous playing. Children with physical disabilities have difficulties interacting with the material environment and they have fewer possibilities for autonomous play. In this project a robot system was developed and first user trials with this system and the target group - physically disabled children. Working with this toy robot system allows children with physical disabilities to independently manipulate the real objects in a play situation.

Low-tech, high-tech products, services and contexts for play

The main idea was to build a toyrobot for children with physical disabilities. The chosen setup – and this is also the main difference to other known approaches in the field - is to use the robot as an assistance system which allows interaction to standard toy –namely bricks and not as a toy itself. In order to make it available to a larger group of users one of the main criteria for the robot system was low-cost configuration. Special attention also was given to operation stability and especially to an appropriate human-machine interface. A prototype of the robot is available since summer 2003 and could be evaluated in several user trials.

Functionality and technical specification

Based on our previous work and a related study, the question arose whether a remote controlled robot system could be able to assist severe physically disabled children when playing with toys. The robot should serve as an assistant – the way of playing is defined by the user in order to ensure a maximum on autonomy. Not the robot is the toy – but the robot helps to use the toy. Using the functionality of the robot system, the user is now in the position to manipulate real objects (toys) in the real world, despite of her/his disability.

In a first feasibility study, a dedicated custom-made robot system has been designed for manipulation of small bricks by AIT Austrian Institute of Technology. The system consists of the following components :

- Special designed “low-cost” robot system with three degrees-of-freedom;
 - Storing system for different types of bricks;
- current system setup: two stacks for 2x2 bricks and one stack for 4x2 bricks (each stack has a capacity of 18 bricks) plus one additional magazine for four special bricks
- Dedicated gripper device ;
 - Control system including user-adapted input devices;
- at the current state, the system can be operated by means of a single switch (in scanning mode), a mouth-mouse (also developed by AIT), and a standard 5-key input device – all the devices can be adapted to the particular needs of each user

The context of use

School, rehab center,

Type of play in this play system

Cognitive

Constructive

Social

Solitary

Objectives related to play according to ICF-CY

Play for the sake of play: Major life areas - d880 engagement in play

d8800 solitary play
d8809 engagement in play, unspecified

Community social and civic life - d920 recreation and leisure time

d9200 play

Play-like activities: Therapeutic and educational objectives

b1 Mental functions
d2 General tasks and demands

Number of participants

1-5

Chronological Age

6-12 years

LUDI Categories of disabilities

Communication disorders (speech and language disorders):
Physical impairments:
Severe
Multiple disabilities:

Explanation on the use of low-tech, high-tech devices, services or contexts

Explanation

No instruction, self-discovery of the participant/subject
Guided discovery: therapist/researcher coaches the participant so s/he discovers how to use the assistive technology

Involvement

Adult: therapist/educator/researcher
Parent or significant others

Role

Providing instruction
After the instruction, providing supervision during play

Evaluation of objectives and outcome measures

Description of outcome measure(s)

Observation by professional/researcher providing the play experience
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Feedback from client/parents/professionals

Summary of achieved effects

The user tests revealed that robot systems can be attractive toys for children with physical handicaps. The children enjoyed playing with that system and the goal to make autonomous play for children with physical handicaps possible has been achieved. The users all made new experiences – most of them were in an active player role for the first time. To have fun with the toy robot should be in the foreground - but it also can be assumed that playing with the toy robot system implicate some learning effects of the development of spatial sense and perception. A continuative research question now will be to investigate these learning effects by means of a multi-centre study. The challenge would be how to quantify the learning effects by this target group mainly because of the difficulties to evaluate the starting level of development of the users and the progress they made after using this toy robot system. Children with multiple impairments have difficulties to understand this system as the user-tests showed. For this target group an easier handling of the toy robot is under development.

References to the intervention or research project

Barbara Prazak-Aram

Contact Person

Barbara Prazak-Aram

Keywords

Robots, assisted play, physically disabled children