TheraPlay’ – Toy system for children with motor learning disorders

Nony Kamm

Strategic and Product Design department, University of Art and Design, UIAH, Helsinki, Finland.
nonykamm@yahoo.com

Abstract. ‘TheraPlay’ is a developmental toy system for home environment that motivate children with motor learning disorders to confront their disabilities through playing games, used as a tool for therapists to direct children play activities into guided, therapeutic activities.

1 Introduction

People with disabilities benefit from new technological developments, as more and better systems are designed to improve their quality of life. Making use of planned assistive technology combined with physical therapy may provide better therapeutic achievements.

This project demonstrates a technological environment that supports a multiple number of individual rehabilitation goals. It does so by offering meaningful, adjusted-to-fit content, represented in the form of games, and, by guiding and directing these games according to the therapists’ instructions. While doing so, this environment stimulates the child’s senses and trains his movement patterns, functions, perceptual and social skills. This project followed the notion that the quality of play, as a joyful experience, is a sufficient and the correct motivation for children.

‘TheraPlay’ system tries to show that in creating a tool for the therapists to direct joyful experience for children and making it comfortable for the adults caring for them, rehabilitation goals will be positively served.

2 Design problem and context: Motor development delay and Rehabilitation

Disorders of motor development are caused by damage to different parts of the immature brain, before, during and soon after birth. Brain damage may be responsible for special sense defects of vision and hearing, disorders of movement and posture, abnormalities of speech and language, perception difficulties, different learning and communication problems and various behavioral problems.
Motor learning disorder classifications are not a clear-cut. This group is of infinite variety and severity, which at one end merges into the field of severe or profound learning disability and at the other end into that of a ’minimal brain dysfunction’-clumsy children with specific learning problems. The goal of treatment is to maximize independence. Treatment is guided by the symptoms exhibited and may include physiotherapy, speech therapy, occupational therapy, psychotherapy, water therapy, music therapy, art therapy, horse riding and more.

The overall intention of rehabilitation processes is to get a disabled child reach a degree of independence, from feeding, dressing and bathing to merging in society later on in his life.

Therapy support rehabilitation goals by training the child to perform active learning in the form of small tasks, fractions of movements and parts of functions. This is done in order to eventually allow the child to perform functions, familiar and new, by himself.

The potential for function depends on the disability, but also on the emotional and social adjustment of the child, his personality and ‘drive’ as well as his capacity to learn. When a child wants to perform an action and gives his attention to performing it, he is actively learning it. Each area of development interacts with others, as well as having its own pattern of development. Speech may reinforce movement; words and movement assist the training of perception, etc.

3 ‘TheraPlay’ Developmental Toy System

‘TheraPlay’ toy system is constructed of hardware and server-based software. The hardware is a flexible mat with a grid of illuminated pressure-sensitive switches. The grid for activities is pre-adjusted for the child by the therapists for each game or set of exercises. These adjustments take place at therapy sessions and are saved in the system. When the game is switches-on, the mat, following signals from the system, displays the relevant grid, indicating in red lights where to position the child. These lights turn into green when pressure is applied, providing clear feedback for both

![Figure 1. Light indications on top of pressure switches marking position and activity buttons locations](image)
TheraPlay – Toy system for children with motor learning disorders

Activity points (the game control buttons) are marked in yellow. Game directions are represented in audio or both audio and visual forms.

‘TheraPlay’ offer two game configurations: integral speakers for audio feedback play, and Television connectivity, for visual-audio feedback play. Setting-up is quick: just plug the mat into the phone and the system is on-line, getting games from the server into the child’s environment. The product appearance supports the creation of a more ‘normal’ and ‘sporty’ image, rather than ‘specially-adjusted aiding devices’.

Following the games and the feedback from the games the system direct and motivates the child through interactions, adjusted to his levels and of his interest, to perform movement patterns ordered by the therapists. Parents and caretakers help and guiding is done together with the system instruction. Children are given the possibility to choose the games and mode of interaction, while the games themselves are designed to direct the interactions and promote the children motivation for activities.

Interactive game examples:

− ‘Electric Twister’: following a combination of light and sound signals, pressing the correct switches with different, ordered body parts, remembering and following the correct order.

− Movement initiation: listening-to/watching a story, advancing and navigating by pressing marked switches to ‘turn the page’ or run another event in the game.

− Holding positions: while watching a story and interacting with the characters holding positions can be directed by the system. The reward may be developments in the story, more possibilities for exploration, new characters, animation clips, etc.

‘TheraPlay’ system allows the therapists to attach directions and instructions for exercise to the games in the server. Using visual and audio representations they communicate their instructions to the children and parents, complementing activities.
and directions given earlier in therapy sessions. Through the child’s specifications in
the server the therapists can make immediate changes to the games and determine the
range, direction, order of movements, intervals lengths and frequency, type of
position to hold, repetition required, amount of rewarding feedback, etc.

In the context of this project, servers have three main advantages:
− All the data exists in one place so users do not have to run the application from
  local stations.
− Any changes to the database reflect immediately in all remote stations connected to
  it.
− Any action in remote stations is written to the server’s log.

Using server-based software, therapists work directly onto the child’s file, so
children would choose the games they like and the system would calculate and adjust
TheraPlay – Toy system for children with motor learning disorders

the specifications on every log-in. Therapists can retrieve information about the child’s performance and progress at any stage of the treatment. Specifications defined may control the game’s path, number and location of obstacles, child’s movements (left/right), game difficulty levels, behavior adjustments such as repetition and attention span, etc.

‘TheraPlay’ provides a platform for different social play and on-line plays configurations:
The mat offers room for more than one child, and, combined with the software, children can play together while each is still playing according to his own therapy goals. Once the system recognized the user, it ‘knows’ the therapists’ instructions for him, translating them to the games he plays.

Playing on-line, therapists can play with the children, using their keyboards, directing their game and through the games directing their movements in real time.

A number of users can play on-line; parents can play with their children using their keyboards at the office and children can play with other children without leaving their environment. This system opens possibilities for the formation of on-line communities, offering on-line activities, games and other social interactions.

4 Validation

Validation of the concept and introducing the prototypes to therapists and families got reassuring reactions to the product functionality and semantics and to the system’s design. Carefully prepared user tests, that exceeded the scope of this project, are needed at this point.

5 Acknowledgements

All therapists and families that took part in this project both in Israel and in Finland; my tutors Katja Battarbee and Tuuli Mattelmaki, the Smart Products research Group, UIAH, Helsinki, Finland.

Figure 6. Server configuration that allows remote therapists monitoring, multi-user play and on-line games
6 Reference (partial)

Allison Durin and Cynthia Solomon, (1996), Designing multimedia environments for children, John Wiely & sons, Inc, Canada
Hugh Beyer and Karen Holtzblatt, Contextual design, designing customer-centered systems, Academic Press, 1998, USA
Our world 2000, children’s thoughts about the millennium, Macmillan children’s books, 1999
Leveling the playing field, computer games for blind children, http://www.rdg.ac.uk
Connecting the inner with the outer world, using multimedia software in art therapy, Henrike Gappa, GMD-German National research Center for Information Technology, Germany, http://www.gmd.de
Classroom collaborations in the design of tangible interfaces for storytelling, Dana Stanton, Victor Bayon, Helen Neale, Ahmad Ghali, Steve Benford, Sue cobb, Rob Ingram, Claire O’Malley, johna Wilson and Tony primore, Mixed Reality Laboratories, University of Nottingham, UK.
Mrl@cs,nott.ac.uk
New nomads, an exploration of wearable electronics by Philips, 010 publishers, Rotterdam 2000, Philips research NL, resinfo@philips.com