

# Designing Floor-based Games for Young Children

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## ABSTRACT

This paper describes the design of floor-based games for children aged between three and six years. We outline the key design criteria that were used to guide development of these games. The resultant game experiences are discussed briefly.

## Author Keywords

Game-based learning; young children; game design.

## ACM Classification Keywords

K.8.0. [Personal Computing] General: Games.

## General Terms

Design.

## INTRODUCTION

Stomp is a floor-based system that allows users to interact with digital environments. The Stomp platform effectively turns the floor into a 2m x 3m multi-touch computer screen. Stomp can be used by a single participant, pairs and larger groups. Users interact with experiences through stepping, stomping, pressing, jumping and sliding. Initially developed for adults with intellectual disability [5], the technology has recently been adapted for use by very young children. Our floor-based games are designed around the premise that all experiences must be developmentally appropriate [1]. Our aim is to create experiences that naturally engage children in physical, cognitive and social activity.

## DESIGNING FLOOR-BASED GAMES FOR YOUNG CHILDREN

Child autonomy and the creation of an environment where entry level knowledge and experience is kept to a minimum were also high priorities during design. We endeavored to ensure that provision was made for children's varied skill and ability level. We looked to create experiences that do not rely on the acquisition of specific kinds of competencies before interaction and engagement can occur. Importantly, the physical form of the Stomp mat suggests a certain way of interacting. It affords actions like standing, walking, jumping and stomping.

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The Stomp system can be considered in terms of whole body interaction [4] and as an example of reality-based interaction [3]. The system is designed so that stomping, stepping and sliding in Stomp are like stomping, stepping and sliding in the real world.

Design criteria used throughout the development process recognise that young children draw on direct physical and social experiences to construct their own understandings of the world around and that they construct knowledge in environments that allow opportunities to explore and play [2]. Our designs also acknowledge that at this age children are largely sensory dependent, with learning occurring best when they have something to see, touch and hear [1].

The games we've developed build on the knowledge that there is a complex interplay between physical, social and cognitive development during the preschool years and that development and learning are integrated across domains [1]. All games incorporate elements to encourage a combination of physical, cognitive and social activity. The games fluidly become more and less complex and challenging to match the abilities demonstrated by the children.

## STOMP GAMES FOR YOUNG CHILDREN

With the Stomp platform we have made over 18 games for young children, carefully designed to support whole child development and learning. The following examples demonstrate how we achieve this objective.

### Trap-a-Turtle

Turtles appear at random locations across the floor (Figure 1) and players are required to touch them to stop them from moving. When a turtle is "held down" it will go into its shell and stop moving. The aim is to hold down all of the turtles at the same time before time runs out. The ability to successfully hold down all of the turtles at the same time relies on a coordinated approach by children. While clearly a physical game, this also requires problem solving, cooperation and communication as players decide who is in the best position to stop each turtle.

### Jungle Garden

Children are provided with stamps, e.g. flowers, vines and leaves, that they can use to create their jungle garden (Figure 2). The stamps available change frequently, providing children with interesting choices. The current

stamp can be placed at any location on the mat through a child's actions (e.g. stepping, jumping, banging). Stamps of a particular kind can be spread by the child standing near or on that stamp and then moving around to create a spread of identical plants/leaves. Stamps will fade over time, and children will have to keep creating stamp pattern to keep their jungle active and interesting. Jungle Garden seamlessly blends creativity with cooperation and physical activity.



Figure 1: Trap-a-Turtle

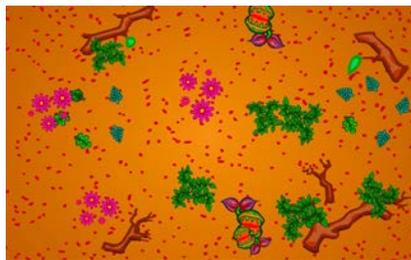


Figure 2: Jungle Garden

### Bush Bugs

Children touch walking bugs to divert them into the bush that matches the symbol on each bug's back (Figure 3). The match can be a shape, letter, or number. In the latter case, the number on the bug must match the number of spots on the bush. Children work together on these challenging tasks to get the bugs home.

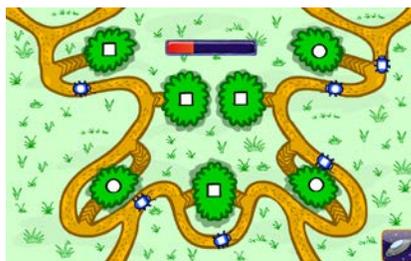


Figure 3: Bush Bugs

### STOMP FIELD TRIAL

A user study has been carried out in a kindergarten with 31 children aged between three and five years. Video data was collected across six, 90-minute sessions. While complete analysis of data has not yet been undertaken, preliminary viewing of the video footage of four children playing Jungle Garden (Figure 4) demonstrates the type of interactions enabled. Children were constantly stepping,

tapping and jumping to create jungle patterns. One child liked kneeling and lying in the garden and did so repeatedly. Comments like "the leaves follow us", "flowers!" and "look at mine" show the children's attentive interest in the experience. The following exchange demonstrates the type of social interaction that occurred:

S: [stepping quickly across the mat] *Get some more leaves.*

B: [lying on the mat, jumps up and starts stomping] *Yeah, run and make a big pile.*



Figure 4: Young children playing Jungle Garden

### DISCUSSION AND CONCLUSIONS

We have designed games for young children that are open-ended and discovery-oriented, supporting autonomous, child-initiated play. Early analysis of field trial data indicates that young children are able to independently interact with Stomp experiences, free from adult guidance or intervention. Children's experiences are highly physical and social interaction occurs frequently. Future work involves further analysis of user studies to assess each game's effectiveness in promoting physical, social and cognitive activity.

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