

---

# Merging nature and digital play

**Eva-Lotta Sallnäs Pysander**  
Royal Institute of Technology  
Stockholm, Sweden  
[evalotta@kth.se](mailto:evalotta@kth.se)

**Annika Waern**  
Uppsala University  
Uppsala, Sweden  
[annika.waern@im.uu.se](mailto:annika.waern@im.uu.se)

## ABSTRACT

Access to outdoor play is becoming increasingly scarce for children, due to current trends in city planning, changes in parental strategies, and the increasing dominance of digital play. This problem formed the core of the four-year collaboration project DigiFys in which urban planners, landscape architects, and interaction designers set out to develop new strategies for designing landscape and digital interventions *together*, drawing on the strengths of both perspectives to create integrated play opportunities. Play research shows that natural elements such as vegetation, natural materials and terrain present a range of benefits for play and well-being. Interactive technologies have been found to be inviting and engaging for children's play. In this article, we present one of the designs coming out of the project and use it as a vehicle to pose the critical question: what *are* the play values we are looking for, in outdoor play?

---

Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for third-party components of this work must be honored. For all other uses, contact the owner/author(s).

*CHI'19 Extended Abstracts, May 4-9, 2019, Glasgow, Scotland, UK.*

© 2019 Copyright is held by the author/owner(s).

ACM ISBN 978-1-4503-5971-9/19/05.

DOI: <https://doi.org/10.1145/3290607.XXXXXX>

## KEYWORDS

Nature play, interactive technology



Figure 1. The tube and a connected sphere hut in a housing area.



Figure 2. The tube at a schoolyard.

## THE ROLE OF NATURE IN OUTDOOR PLAY

In general, children's outdoor play is revered as "a natural and critical part of a child's healthy development" [8]. Playing outdoors provides a varied environment with many levels of challenges that develop both motor and sensory abilities [9]. But outdoor play is much more varied than so: it fosters social competence and teaches risk assessment, and lets children use their creativity [8]. Even the variable conditions such as wind, snow, sun, dusk, heat and cold are conducive of variability in play [14]. Talbot and Frost [17] coined the term 'Playscape' as a way to think about how a particular landscape can afford play and what they call "magical thinking". Access to nature and natural materials is often considered a crucial part of the outdoor experience [22]. In her detailed study of outdoor play in a natural forest, Fjørtoft and Sageie [10] discusses how the shrubbery affords both hide-and-seek as well as imaginative play (e.g. playing 'house'), whereas more sturdy trees would afford climbing and open spaces running and games of 'tag'. Retaining natural landscape environments has been found to increase the variety of play activities pursued by children not only in the natural landscape but also in adjacent hard-made areas [13]. Access to loose material has been found to be particularly important [14,15], Interventions such as planting areas in the schoolyard have been used as a way to improve the physical wellbeing of the children, and change the culture of play in the school grounds [7]. Herrington and Studtmann [11] used landscape interventions to redesign play at a schoolyard, e.g. by installing a sequence of stepping-stones that encouraged children to move in previously unused areas. A particularly interesting observation from this study was how the mere act of planting some bushes moved play out of the fixed installations into two 'houses' formed by the bushes. The authors note that the children that were dominant in this play activity were another group than those who dominated the physical activities afforded by the ordinary fixed installations. Presenting a varied landscape is thus not only a way to afford multiple forms of play, but also a way to create more flexibility in the social roles among the children. It may also serve to counter gendered differences in the amount of outdoor play [8].

## DIGITAL TECHNOLOGY AND NATURE PLAY ENVIRONMENTS

Looking at the development of interactive play technology, most products on the market focus on encouraging physical play. Within HCI research, we see a larger focus on open-ended play [5,6,21], but this work places a large focus on the individual artefacts. This is true even for work in the field of interactive playgrounds, where studies rarely take place in an actual outdoors playground setting but rather in gyms [19,21] or even lab settings [18]. Many studies on interactive playgrounds in outdoor settings also primarily focus on the digital props and the isolated play with them [16]. Hence, little work on digital technology has taken into account their physical outdoor setting and how the play values offered by the digital can work together with those offered by the physical outdoor environment, nature, and greenery.



Figure 3. Interacting with the tube



Figure 4. The tube in a public park



Figure 5. Tubes and connected huts.

### THE DIGIFYS PROJECT

The project DigiFys [[1,2,3] was a four year collaboration between interactive play designers and landscape architects, investigating ways to develop play installations integrated within the landscape. Play environments have been built by a partner constellation from academia, industry and municipalities, in five iterations. A key strategy in the project has been to make use of natural environments, greenery, and natural loose materials, and to enhance these with interactive technology. The designs have been evaluated from the perspective of what type of play that develops. Hence, the studies present a rich resource towards what play activities that are enhanced or made possible through the integration of digital installations in nature environment.

The design process has been guided by walking tours including children-led walks [4] at their local play areas. The interactive artefacts developed in the project share common design goals: they are designed to invite open-ended play [20] and to be possible to integrate in landscape architecture. They are also designed to be combinable in different constellations with the aim of enhancing a natural landscape rather than replacing it.

One example of the prototypes developed is the *tube* that shown in Figure 1-6. It is directly inspired by the importance of loose materials, and designed to be used in an environment where there is ample access to such. The tube registers when objects such as water, stones and twigs, are being put through and can recognize certain qualities of the objects. In the current design these are liquidity, noise, and movement (the tube is equipped with a water-sensor, an infrared barrier and a vibration sensor). Through the use of multiple sensors, the tube reacts in different ways to different materials passing through. This is intended to broaden the experience for the children, and invite them to explore and engage with the tube in different ways. The tube features both audio and visual feedback. The tube projects a soundscape around it, that gets more intense as the tube is used more and fades down when the tube is used less. Each sensor-activation also triggers its own sound. Visual feedback on the tube takes the form of a sequence of RGB LEDs mounted on the tube. Just as the ambient sound landscape reacts to the intensity of play, the number of LED that are lit increases the more the tube is used. Each sensor activation generates a specific sound and colour on the LED lights. Throughout the project, the tube has taken many physical forms as shown in the figures. Feedback can also be integrated into other elements of adjacent installations. This form of feedback can vary from immediate interaction feedback and/or slowly creating an ambient soundscape or lightscape. Different tubes can be connected to each other both physically (through gutters) and digitally, or the interaction with the tube can provide feedback in a separate playhouse.



Figure 6. Feeding stones in a Tube.

## PLAY VALUE

As previously reported, a dominant form of play that emerges around the tubes is a kind of ‘work play’ activity [1,2,4]. This is a highly energetic form of engagement, in which the tube is constantly ‘charged’ by putting various materials through it, (or de-clogged when things get stuck in it), while its feedback is being monitored by the children. The children will shout things like ‘faster, faster’, ‘one yellow [led]!’, ‘two!’. If the tube is large (as was the case in one of our earlier installations), or connected to other tubes or a hut, children will often run back and forth between the different installations to check what is going on. The children will also often interact socially to develop different roles, and negotiate changes of social roles throughout. The activity is sometimes given a narrative frame (in our installations we heard ‘feeding the cow’ and ‘fuelling the spaceship’), but sometimes the feedback itself seems to be enough framing. While this could be interpreted as an explorative activity directed towards understanding and appropriating the function [12], it was something the children kept doing. The children could continue with this activity for long periods, shifting roles and with children entering and leaving the ongoing activity. In our residential area study [4] we also saw children returning to the installation to engage in the same form of play. While we have seen this kind of play emerge even with a single tube in isolation, the environment of the tube has a strong impact on its play value. Placing the tube in a gentle slope affords running back and forth, whereas a steeper slope or several connecting gutters inspires more social organisation and task distribution. Obviously, access to natural loose materials is important, but the children will also make sure to reuse the materials at hand – scooping up water and sand, saving sticks and pinecones.

## DISCUSSION

The tube is just one example of the installations trialed within DigiFys. Other installations, and even other versions of the tube, invited very different forms of play engagement. From our studies, we see that interactive technology offers rich opportunities for inviting to play, and that both sound and light feedback serve this function. There is a strong honeypot effect [23] in digital play installations, in that children will often gather to figure out what is going on. But if the play activities offered are less rich than those made available in the landscape otherwise, this could lead to impoverished rather than enriched play.

Throughout the course of the project, we have begun to develop an understanding of the *play values* offered by enhancing outdoor spaces with digital technology. We believe that in nature-rich environments, it is critical to understand and preserve the values that are already in place, using technology as an invitation to explore what is already there. In more impoverished environments, we argue that adding technology as well as vegetation and natural materials can enrich the play values by adding both variability and imaginative material.

## REFERENCES

1. Jon Back, Caspar Heeffer, Susan Paget, Andreas Rau, Eva-Lotta Sallnäs Pysander, and Annika Waern. 2016. Designing Children's Digital-Physical Play in Natural Outdoors Settings. *Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems*, ACM, 1359–1366.
2. Jon Back, Caspar Heeffer, Susan Paget, Andreas Rau, Eva Lotta Sallnäs Pysander, and Annika Waern. 2016. Designing for Children's Outdoor Play. *Proceedings of the 2016 ACM Conference on Designing Interactive Systems*, ACM, 28–38.
3. Jon Back, Elena Márquez Segura, and Annika Waern. 2017. Design for Transformative Play. *ACM trans. On Computer-Human Interaction*.
4. Jon Back, Laia Turmo Vidal, Annika Waern, Susan Paget, and Eva-Lotta Sallnäs Pysander. 2018. Playing Close to Home: Interaction and Emerging Play in Outdoor Play Installations. *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, ACM, 156.
5. Tilde Bekker and Janienke Sturm. 2009. Stimulating physical and social activity through open-ended play. *Proceedings of the 8th international conference on interaction design and children*, ACM, 309–312.
6. Tilde Bekker, Janienke Sturm, and Berry Eggen. 2010. Designing playful interactions for social interaction and physical play. *Personal and Ubiquitous Computing* 14, 5: 385–396.
7. Anne Bell and Janet E. Dymont. 2006. *Grounds for action: Promoting physical activity through school ground greening in Canada*. Evergreen.
8. Rhonda Clements. 2004. An investigation of the status of outdoor play. *Contemporary issues in early childhood* 5, 1: 68–80.
9. Lars-Ove Dahlgren and Anders Szczepanski. 1997. *Utomhuspedagogik. Boklig bildning och sinnlig erfarenhet. Skapande vetande*.
10. Ingunn Fjørtoft and Jostein Sageie. 2000. The natural environment as a playground for children: Landscape description and analyses of a natural playscape. *Landscape and urban planning* 48, 1–2: 83–97.
11. Susan Herrington and Ken Studtmann. 1998. Landscape interventions: new directions for the design of children's outdoor play environments. *Landscape and urban planning* 42, 2–4: 191–205.
12. Corinne Hutt. 1981. Toward a taxonomy and conceptual model of play. In *Advances in intrinsic motivation and aesthetics*. Springer, 251–298.
13. Gunilla Lindholm. 1995. *Skolgården. MOVIMUM sekretariatet för den yttre miljön, vid Sveriges lantbruksuniversitet i Alnarp*.
14. Fredrika Mårtensson. 2009. Lek i verklighetens utmarker. I eds. M. Jensen and Å. Harvard. *Lek för att lära: Utveckling, kongition och kultur*: 163–188.
15. Simon Nicholson. 1971. How not to cheat children, the theory of loose parts. *Landscape Architecture* 62, 1: 30–34.
16. Susanne Seitinger, Elisabeth Sylvan, Oren Zuckerman, Marko Popovic, and Orit Zuckerman. 2006. A new playground experience: going digital? *CHI'06 extended abstracts on Human factors in computing systems*, ACM, 303–308.
17. James Talbot and Joe L Frost. 1989. Magical playscapes. *Childhood Education* 66, 1: 11–19.

18. Daniel Tetteroo, Dennis Reidsma, Betsy Van Dijk, and Anton Nijholt. 2011. Design of an interactive playground based on traditional children's play. *International Conference on Intelligent Technologies for Interactive Entertainment*, Springer, 129–138.
19. Gordon Tiemstra, Renée Van Den Berg, Tilde Bekker, Mark de Graaf, and others. 2011. Guidelines to Design Interactive Open-ended Play Installations for Children Placed in a Free Play Environment. *DiGRA Conference*.
20. Linda de Valk, Tilde Bekker, and Berry Eggen. 2013. Leaving room for improvisation: towards a design approach for open-ended play. *Proceedings of the 12th International Conference on Interaction Design and Children*, ACM, 92–101.
21. Linda de Valk, Pepijn Rijnbout, Tilde Bekker, Berry Eggen, Mark de Graaf, and Ben Schouten. 2012. Designing for playful experiences in open-ended intelligent play environments. *IADIS International Conference Games and Entertainment Technologies*, 3–10.
22. R White and V Stoecklin. 1998. *Children's outdoor play and learning environments: Returning to nature*. White Hutchinson Leisure & Learning Group. Retrieved 3 December 2001. .
23. Niels Wouters, John Downs, Mitchell Harrop, et al. 2016. Uncovering the honeypot effect: How audiences engage with public interactive systems. *Proceedings of the 2016 ACM Conference on Designing Interactive Systems*, ACM, 5–16.