Living Typography: Robotically Printing a Living Typeface

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Figure 1: A robotically planted living typeface.

ABSTRACT

Artists and designers have been exploring how robotics can be used to interact with our environment in new ways. Robots connect computational design processes with the physical environment, making digital interaction with nature possible. We present a robotic process for planting that enables the computational design of landscapes. We demonstrate how robotic planting can be used for generative art and design by creating a living typeface grown from seed. The robot draws a message by 3-dimensionally (3D) printing a blend of planting media and seeds. When the seeds germinate, the glyphs emerge from their substrate in a flush of green. The letterforms become dynamic living organisms. Artistic agency shifts from the artist to nature.

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CCS CONCEPTS

• **Human-centered computing** → **Visualization**; • **Hardware** → **Emerging interfaces**.

KEYWORDS

robotics, digital craft, nature, typography

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1 INTRODUCTION

As interfaces between the digital and the physical, robotics have the potential to dramatically transform how we interact with our environment. While much work in robotics has focused on automating tasks, creative applications of robotics can enable novel interactions. Artists and designers have been experimenting with environmental applications for robotics such as interactive performances, generative fabrication, and non-standard construction.

Figure 2: As series of seven silhouettes showing the changing outline of the letter C as it grows over the course of two weeks.

Artists, for example, have used robots to enable online communities to plant and tend gardens [10, 12], to autonomously care for gardens using machine learning [11], and to plant fields with algorithmically generated patterns of crops, herbs, and flowers [13]. Architects have used robotic fabrication and assembly processes – such as weaving tensile structures [5, 18], automated brick laying [2, 6, 9], stone cutting [3], assembling timber frames [7, 19], constructing complex formwork [4, 8], and 3D printing metal [16] and concrete structures [20] – to construct the built environment in new ways. Landscape architects have used autonomous excavators to computationally construct landscapes [15, 17]. We present a novel process for robotic planting (Figure 3) and demonstrate how it can be used for generative art with a living typeface (Figure 1). Our concept of living typography differs from generative typography [1, 14] in that creative agency is shared with nature, rather than just the artist and algorithm. This planting process could be scaled up with field robotics for applications such as generative design in landscape architecture and automation in agriculture.

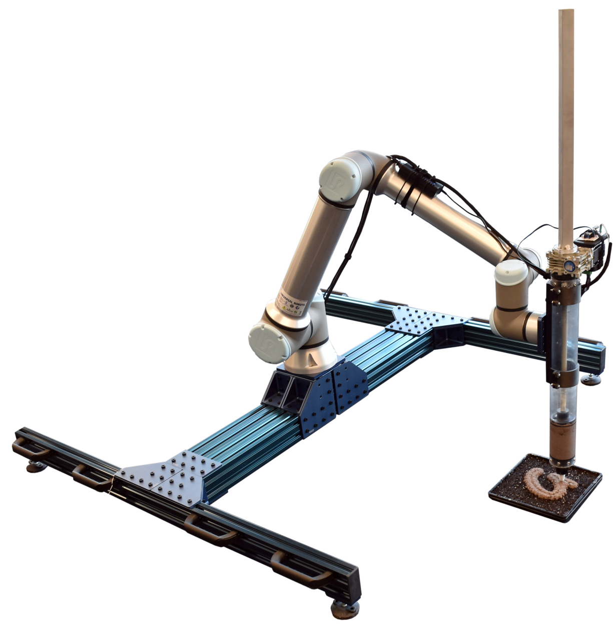

Figure 3: Robotic planting process

2 PROCESS

In Living Typography letterforms are drawn with robotically seeded plants. A message is written in seed by a robot and grows into a unique living form of typography. until it is harvested and eaten. The design is 3D printed by a collaborative robotic arm mounted with an extruder (Figure 3). The extruder prints a blend of planting media and seeds, creating 3D forms – here, letterforms. As the seeds germinate, seedlings sprout out of the planting media, their roots growing into the ground below. The design transforms from a clay body into a profusion of green plants. The topographic typeface becomes community of living organisms, competing for light, water, and nutrients. Its shape and color change as the plants grow (Figure 4). As the shoots grow and spread, the letterforms become bolder and more vibrant, with leaves adding weight. The minute detail of the leaves jostling for space and light creates a complex form with an irregular, convoluted edge (Figure 2). Eventually the letterforms become obscured as the plants spread into the negative space between the strokes, filling the counters. When the letters disappear in a field of green, the plants are ready for harvesting and serving as microgreens.

3 CONCLUSION

Living Typography demonstrates how generative art can interface with nature through robotics, distributing agency between artist, algorithm, machine, and nature. In this demonstration the 3D printed letters become a living form of typography in which nature has creative agency, transforming a standard typeface into a unique, evolving form. Integrating sensors into the robotic system could enable real-time interactions with environment. The seed printing process demonstrated here could be scaled up with field robotics to plant entire landscapes, enabling the algorithmic design of ecosystems for the sake of art and ecology.

Figure 4: Evolution of 3D printed letters over the course of two weeks.

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