Devotional Gardening Tools

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Abstract
Gardening as an activity is devotional, built on the idea that through practice and effort, particular results can be obtained. Devotion is performative, taking time, skill, and repetition to get the results that you want. Human-scale farming depends on the labor of people to get things done, relying on hand tools and particular kinesthetic actions to change the earth in a plot.

Digital media technologies afford the creation of tools that can materialize rhetoric, creating alternate functionality emphasizing issues of practice through use. Creating gardening implements that build on the repetitive physical nature of gardening work allows handwork to become something broader: representative of, more reflexive and meditative technological practice.

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H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction
Devotional Gardening is a research through design project that examines possibilities of tools that serve a purpose beyond raw functionality. While tools are most

commonly used as a means of focusing and harnessing human power for more efficient labor, grafting meanings from one space onto another serves to open the frame of the roles for both design and work.

Augmenting traditional gardening tools to create space for spiritual experiences using electronics creates a tension in two dimensions: one, countering the idea of gardening and small-scale agriculture as being somehow more natural or closer to the earth by mediating the experience in an unexpected way; and two, through using electronics as a digital medium for fostering a resonant spiritual experience with material objects.

This project consists of 4 prototypes: a set of shears, a trowel, a hand cultivator, and a shovel. Each object is intended to be both functional and reflective. The physical use of the tool is mapped to enact a different kind of meaning as well as support their original purpose. In this paper I describe the conceptual context of the *Devotional Gardening* project, the design of the objects, and outline opportunities for research at the intersection of speculative design, computation, and "mundane" tool use.

Background

Thinking about the role of technology in religious contexts is not new to the CHI community [1,9,10,11]. Woodruff et al have explored the use of home automation systems to get everyday things done on the Sabbath day, when devout Jewish populations are forbidden from exerting mastery over the world. This work provides a fascinating glimpse into long-term interactions with a smart home, motivated by religious observance. In the homes surveyed, X10 home automation systems are used to free participants from earthly mundanity to focus on higher issues [9]. Woodruff and her co-authors offer a compelling vision of technology being used to support religious practices, but interaction between the practices themselves and the technological system is absent. Offering an alternative, Wyche et al's work *Sun Dial* provides a mobile application that supports Muslim Prayer practices [10]. *SunDial* provides an unobtrusive means to remember the Salāt prayer times on a user's own mobile phone. This is a more direct implementation of technology design for devotional practice, but still, the technological work is there to remind and prompt, not mediate. Gaver et al's *Prayer Companion* focuses the work of a community of devotional practice towards the outside world [5]. The Prayer Companion itself is a stalk on which an LCD display rests. The display aggregates potential prayer topics from RSS feeds, news streams, and social network content. Placed in a community of cloistered nuns, the Prayer Companion offers a stream of potential topics for prayer. This is an excellent example of designing for a direct mediation of religious experience, but still lacks a kind of reflexivity. What would it mean to focus on the practice itself?

HCI research in the last few years has become deeply interested in material practices. Goodman and Rosner talk about the importance of handwork, especially with respect to how it encapsulates many separate threads: "Leisure handwork touches on questions of embodiment that have lately preoccupied human-computer interaction research, such as *thinking through doing*, *performance*, *visibility of collaborative tools*, *risks and uncertainty in physical co-presence*, and *thickness of practice*" [6]. Gardening practices in particular provide an access point for HCI researchers to consider how

"sensory sensitivity" offers contextualized interactions with the garden. Experimentation, trial and error tied to the practice of tilling the land, created a situational understanding as to why particular plants would grow well or poorly.

Kuznetsov et al's work in *Nurturing Natural Sensors* extends this line, describing how professionals in the field can glean information from contextual clues that laypeople may lack [7]. The understandings gleaned from these biosensors reflect a deep connection to the materiality of the work involved—long hours and dedication to the substances there create expertise in evaluating whether fishes' sliminess indicates that the water quality is acceptable, for example. This "sensory sensitivity," as Goodman and Rosner call it, is a hallmark of handwork and reifies the value of physical interaction with material objects to construct knowledge about a practice.

What these papers don't do is connect what we already do in our everyday lives to the domain of devotional practices. All of us exhibit devotion in our everyday lives, to our family, our work and our hobbies. How can we exhibit this? What does it mean to reframe our perspective on the everyday? *Devotional Gardening Tools* provide a link from the mundane to the sublime. While not religious *per se*, these tools seek to connect what might be considered as a duty to what can be looked at as devotion.

Building tools for gardening that also support devotion is at a nexus of all these research threads—from the tacit understandings and deep sensory familiarity of handwork and the context-specific knowledge of small-scale agriculture production. These strands become recontextualized through drawing a connection from everyday activities to resonant spiritual practices. Connecting these practices to spiritual motivations offers an opportunity for creating reflective technologies that can be deeply embedded in existing personal processes.

Devotion

Religious experience is full of examples of devotional practices. That Christian worshippers return to fill the same pews every week, or that observant Muslims take the time and effort five times daily to face Mecca and pray belies a level of dedication unmatched by other parts of our lives. These strong feelings come from investing a part of yourself in something bigger than you are. At the same time, particular devotional practices reframe the unknowable, imperceptible majesty of religious experience into something human-scale, something material. A user of a Catholic rosary counts along wooden beads-as-events, physicalizing the tenets of Nicene salvation. The Greek worry beads *kombolói*—the name comes etymologically from "prayer rope"—offers a similarly palpable interaction to salve tension. While not itself a religious object, the beads are manipulated to assuage tension, nervousness, or worry. East Asian cultures, too, have tools for focusing on spiritual domains. In certain ways, the singing bowl of the Himalayas is similar to the rosary and kombolói: it provides a focal point for meditation. Moving the mallet around the rim provides a sustained 'singing' tone as well as a continuous motion on the part of the player. Implements used to maintain the rock gardens of Japan, too, reflect devotional interactions. The precision of gravel raked into lines, the specific arrangement of rocks and trees: all point to a systematic approach to effecting change in space,

assisted by particular devices. What motivates this approach? How can we characterize it?

To begin to unpack these layers of connotations and meanings, it's been helpful to consider what it means to approach devotion as a practice. This isn't meant to be an exhaustive, complete list of how and what makes something 'devotional.' Rather, this is intended to be a set of guidelines to approach design practice, a way of framing existing praxis to inspire design concepts. Below is a working definition for "devotion."

Devotion is performative. To be devoted to something, it's necessary to do something. There should be a behavior that is associated for the devotee. By enacting devotion, it should be clear that the performer is devoted to that thing.

Devotion is sited. A particular way devotion can be enacted is by physically returning to a particular location. While this location may not be geographic, there's a focal place or object that is the epicenter of the performative devotional act.

Devotion is repetitive. Repeated performance is what might distinguish devotion from something that is merely intense, or harrowing.

Devotion is personally relevant. This distinguishes devotion from other kinds of repeated, sited behaviors in the everyday. While many people are thankful for their morning cup of coffee, for example, and many people may even love it, few could honestly claim to be devoted to coffee on a spiritual level.

Finally, devotion is spiritual. There are lots of personal things that we do that are repeated and located in particular places. To call something devotion, though, demands an appeal to something larger. Devotion reflects our best intentions as people.

Devotion and Gardening

Designing for devotion at first seems like a strange way to approach generating technological artifacts, especially in the context of small-scale agriculture. On initial glance, these properties seem fundamentally very different. Looking more deeply, however, there exist evocative similarities between them: for one, gardening and religion are both fundamentally *practices*. They are performed, at a particular place, repetitively. Worshippers and horticulturists both enact their devotion over and over again in the hope of creating results—piety on the one hand and produce on the other.

The goal with this work is to create objects that represent a design fiction [2] around how gardening is understood. Working a plot is something that is done out of practical desires like obtaining food, but is also a practice reflecting a deeper desire to connect directly with the earth, as well as embodying a conscious political choice and commitment of time and energy for uncertain future reward. Ultimately, the idea behind these objects is to understand the idea of devotion as a practice, and support the experience of devotion wherever it can be found.

Gardening as an activity emphasizes this kind of devotion, the idea that through practice and effort, particular results can be obtained. Performing this devotion takes time, discipline, and repetition to get

the results that you want. By building gardening implements that emphasize the repetitive physical nature of gardening work, performing the work develops into a broader practice—one that is more reflexive and meditative than before. Inspiration for these objects are drawn from the tools that support devotion described above.

Gardening Tools

Tools for gardening support and mediate particular goals in and of themselves. These tools are purpose-built to support particular types of interactions and to produce particular results. Obviously, a hoe is not constructed to perform the same work as a hymnal. But what happens when these contexts are conflated? How do we project aspects of religious or spiritual devotion onto a new space? Digital media technologies allow the creation of tools that embody rhetoric, creating ancillary functionalities that help to underscore issues of practice during use. Instrumenting traditional gardening tools to create space for spiritual experiences using electronics creates a tension in two dimensions: first, by offering a contrast to the idea of gardening and small-scale agriculture as being somehow more natural or closer to the earth through mediating the experience in an unexpected, technological way; and second, by using electronics as a digital medium for fostering a resonant spiritual experience with material objects themselves.

Prototyping process

The first step in prototyping was to create a low-cost system to test multiple types of garden tools and interactions. PVC pipe is inexpensive and easy to work with, allowing handle "blanks" to be created with ease. In order to seem more like a proper tool handle, blanks for single-handed tools (such as trowels or hand cultivators) were cut to eight inches, and blanks for two-handed tools (such as rakes or shovels) were cut to forty-eight inches, or four feet. Once cut, the blanks were spray-painted a neutral brown color, approximating wood.

In order to experiment with many different types of tool, cardboard cutouts of many common gardening tools were constructed. These included hoes, shovels, scissors, trowels of different sizes, hand cultivators, and others. Mixing and matching different heads with different blanks allowed inexpensive experimentation with forms and interactions. Because one of the goals with this work is to produce tools that are familiar, some experimentation is constrained: putting a trowel blade on a long handle built for two hands creates something that looks rather like a weapon. Alternately, a large tool head like a shovel or full-sized rake on a handle for single-handed use creates a tool that may be novel or amusing, but wouldn't be very functional or easy to use. These could be interesting in a project where producing strange, unusual tools to critique existing methodologies was the goal, but for this project, existing interactions needed to remain the same, only augmented.

Finally, electronic circuits were constructed that allowed simple interactions to control outputs. Circuits that accepted input like touch or galvanic skin response (GSR), as well as motion or simple switches were tested with various configurations of tool head and handle to create evocative interactions. This process that led to four prototype tool concepts, described below.

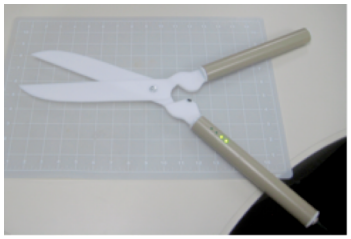

Figure 1: Augmented Clipper prototype (with electronics)

Figure 2. Augmented trowel form prototype

Clippers
The traditional gardening and hedge-clipping tool is shaped like a larger, more aggressive pair of scissors that one might use for arts and crafts. The gardening tool is two-handed, though, and in place of round handles for fingers, it has shafts for full-handed use, along with a more robust hinge. To use the clippers, the handles are held away from the body facing outward with the inside of the forearm facing up. Pushing the hands together closes the blades.

These clippers (see Figure 1) have a switch at the point controls 4 LED lights embedded in the upper handle, letting a user to count between five states: all lamps off, one on, two on, three on, and four on. This cycle "grows" from the bottom of the tool to the top (towards the blades) and lets the gardener ascribe cyclical experience to the repetitive clipping.

Stepping between count levels provides a level of self-hypnosis on the part of the gardener. Focusing on the electronic evidence of progress will hopefully invoke a nature of devotion: a consistent doing; a state of being.

Trowel
Customary gardening trowels are small, single-handed tools with a pointed shovel-like blade. A trowel is very versatile, with many gardening uses, and is in many ways the symbol of the home gardener. Fundamentally, the trowel is about digging and shifting small amounts of soil. Unlike other kinds of trowel (like a bricklayer's, for example), the gardener's trowel is not about flattening or smoothing anything: the curved shovel-head can be used to create furrows or dig holes for planting seeds, or to dig out and transplant small plants that need to be moved.

This augmented trowel (Figure 2) has a transparent section at the bottom part of the handle, away from the blade. Inside this hollow handle is a microcontroller that takes as input a capacitance sensor. When the tool is inserted into the ground, the blade senses the change in capacitance, making a LED light in the transparent end of the tool illuminate. Based on the electronic principle of needing a "common ground" to ensure that circuits are able to communicate effectively, the goal of the trowel is to help a gardener feel like they have a much more tangible, direct connection to their plot.

Hand cultivator
Along with the trowel, hand cultivators are the tools that are most associated with the garden, although for many, the use of a hand cultivator is mysterious. Like the trowel, the hand cultivator can be used to turn soil. The hand cultivator, consisting of one or many tines sticking curving out and down irregularly, is best at pulling and scraping. To that end, it can be used to pull weeds, dig planting rows, and make sowing lines. The hooked tines mean that it can also be used to chop into the soil. This is useful for loosening up hard-packed earth that would otherwise be unworkable.

Very much like the augmented trowel, this hand cultivator has a transparent section at the end of the handle that houses a light. Inside the handle is an accelerometer that detects the motion of the tool, as well as a microprocessor to store the frequency of the last few pulls. Once the tool stops being used, the light pulses the frequency of the most recent interaction, echoing back the user's behavior. The "ghost" actions serve to both emphasize the work that's just been done

while offering an opportunity to reflect on the behavior itself.

Shovel
Shovels are essentially larger scale trowels used for bigger, more involved jobs. This two handed tool has a larger, much wider blade to move more earth, while sacrificing some precision and delicacy. This tool is about moving soil, digging as much as possible as quickly and easily as leverage can provide.

In the augmented tool, the places where a gardener would grab a garden shovel have two sets of conductive rings. As the gardener grips and uses the shovel, the palms of their hands get sweaty, making better conductive contact between the electrodes. Once the galvanic skin response hits a high enough value, a vibration motor in the handle of the tool (essentially a DC motor with an offset weight on the shaft) begins to pulse. Feeling the tool thrum along to the work of the gardener is intended to create a collaborative feeling, where the tool becomes a partner in the effort being made to move earth. Rather than devotion being a one-way interaction, in this case the gardener can feel the devotion that the tool has for being used.

Conclusions

Tools in particular work well for examining issues around practice. Because tools use is constrained to particular physical interactions and has a particular goal in mind, building systems that taking the materiality into account when designing is both necessary and straightforward. The shift in context that these tools offer reframes a simple, everyday physical practice in a new light. Attributes like an amateur gardener's dedication to his or her craft; ideological goals in choosing what, how, and when to sow; the necessity of repetitive actions to get seeds planted, keep plots weed free, and nurture young shoots are not intrinsically religious acts. Choosing to examine these practices this way, though, offers designers a way to leverage the materiality of constrained, tool-oriented interactions in ways that support revelatory valences.

Much like other HCI work involving designing for reflexivity or ambiguity [4,8] or leveraging art practice as inspiration for design [3], these tools seek not to create prescribed experiences that can be understood in one "correct" way, but rather provide an open opportunity to reflect on the nature of the material action of gardening as well as the goals and ideological values of that practice.

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