

# The Art of Prototyping

## Developing the Drift Table

**Andrew Boucher** > Royal College of Art > [andrew.boucher@rca.ac.uk](mailto:andrew.boucher@rca.ac.uk)

**William Gaver** > Goldsmiths College > [w.gaver@gold.ac.uk](mailto:w.gaver@gold.ac.uk)

▶▶▶▶▶ SPECIAL SECTION

The Drift Table was developed as part of an ongoing project on domestic technologies in which we are particularly interested in promoting non-utilitarian, “ludic” values in the home [1, 2]. The project started with a Cultural Probes study of London households [3], followed by development of a workbook of about 50 concept studies and sketch proposals. Influenced by this preliminary design work, and also by ethnographic studies of information flow in the home, our colleagues at Lancaster University developed a functional prototype of a table using inbuilt load sensors to track objects placed upon it [5]. We, in turn, developed a new set of proposals

based on load sensing. The Drift Table was conceived as one of these proposals.

The initial concept sketch for the Drift Table (Figure 1) suggested a dining table whose entire surface would be a screen displaying aerial photography slowly scrolling depending on the distribution of weight placed upon it. The final design (Figure 2) is a much smaller coffee table with a porthole for looking at the imagery, as well as a few other functional features (e.g., a place display and reset button). The evolution from the first sketch to the final design crystallized over a period of months through explorations of several considerations:

- *experience* issues about the imagery to be displayed and ways to interact with it

- *aesthetic* issues around designing domestic electronic furniture
- *engineering* issues concerning how to produce a prototype that would be quiet, safe, and reliable.

Our approach to each of these aspects depended crucially on our initial decision that, instead of developing a prototype useful only for short-term demonstrations, we would aim to produce a robust and highly finished product that could be tested for extended periods in people’s homes. We wanted users to suspend their perception of the Drift Table as a research prototype, and instead encourage them to consider the ideas and concepts it embodied in the same way as any consumer product. This implied building the Drift Table to be utterly reliable, easy and unobtrusive to install, and, above all, at a sophisticated level of detail and finish.

### **Experience: What Is a Drift Table?**

Our initial design development focused on the experience offered by the Drift Table. Worried that the basic scenario of “drifting” over landscape images might seem boring, we explored a range of other options through a new series of sketches and collages. Some focused on presenting imagery in novel ways (Figure 3), while others explored expanded functionality (Figure



4). Since we were also uncertain how to obtain the aerial photography suggested by the original proposal, we also explored different sorts of imagery, from scans of the floor under the table to magnified views of globes or maps (Figure 5).

Many of these issues were resolved when GetMapping, a company that had published a photographic atlas of England [4], agreed to donate a copy of their entire data set—about a terabyte of high-resolution digital images of England and Wales—to the project. This was a key moment in our design development. As we will discuss, it posed a significant challenge to our technical skills given the hardware available at the time. But it also promised to make the final product extremely rich in content, encouraging us to resist the temptation to over-complicate the table's functionality.

Once the conceptual design of the Drift Table had been decided, the rest of the development involved refining the table as an aesthetic object engineered to work reliably. The issues were deeply intertwined. Potential aesthetic choices were constrained by technical feasibility, while engineering solutions were constrained by the need to achieve a desirable aesthetics. This is reflected in the difficulty of completely separating these issues in the following discussion.

### Aesthetics: What Does a Drift Table Look Like?

From our initial sketch, we quickly abandoned the idea of a dining table and decided to make the Drift Table an electronic coffee table instead. There were various reasons for this choice, but we mainly wanted

people to engage with the table in a casual and comfortable way. Moving away from the task-oriented environment of dining to the relaxed space around a coffee table was an important step in promoting ludic values through the design.

Treating the screen was crucial in embodying the idea that the table gives direct access to a different perspective on the world, rather than simply incorporating a computer display. We decided against making the whole surface a display as indi-



Figure 1: The original sketch design for the Drift Table



Figure 2: The realized Drift Table prototype



Figure 3: A design sketch suggesting that people might have to peer into the table to see the view



Figure 4: A design sketch suggesting that people might be able to call pay phones in the areas shown on the display

Figure 5: A sketch suggesting alternative sources of imagery for the Drift Table



# The Art of Prototyping

cated by the initial sketch, and instead developed some of our earlier sketches to create a kind of porthole into which people could peer to see this other world. This involved mounting an LCD screen about 50 mm below the surface of the table, which has a 100 mm diameter aperture cut into it. This arrangement allows users to see new views as they move their head from side to side, and, because the edges of the screen are never visible, the landscape appears to go on indefinitely. A Fresnel lens mounted level with the surface adds to the impression of depth and creates interesting distortions at very wide viewing angles. Not only does the arrangement work well to avoid a computer aesthetic for the display, it also helps de-emphasize the Drift Table (not distracting like a

TV) and retains surface space for the objects that, after all, control the scroll direction.

We explored the form design of the Drift Table through a vast array of sketches, scale models, and full-scale mock-ups (see Figure 6). Through these iterations and tests, we explored how to achieve a form that would be practical in terms of the need to house a great deal of equipment while remaining aesthetically appropriate for the home. Aesthetically, we wanted to avoid both nostalgia and hyper-modernism, seeking instead to find a relatively understated aesthetic appropriate for an everyday domestic technology. We tried many forms for the

Drift Table, concluding that the best solution would be a simple (not to distract from the photography), rounded (not to emphasize any direction to drift) box (useful for putting things in).

The Drift Table (see Figure 2) incorporates materials chosen to reflect the simplicity of the basic idea. The upper surface is white laminate, to provide the best contrast with the imagery, while the side panels are wood veneer to provide an inherently domestic look. The only additional features are a small text screen (which displays the name of the nearest town or location) and a reset switch (that enables the user to return to an image taken directly above their house). Both these features are located near the power cord in order to suggest that they are part of a service panel and subordinate to the table's central functionality.

## Engineering: How Is a Drift Table Built?

The simple appearance of the Drift Table belies the complexity of its interior. Given that 120-gigabyte hard disks were just

Figure 6: A small sample of the models and mockups used to develop the design



Figure 7: A CAD model of the technologies and layout used to construct the Drift Table

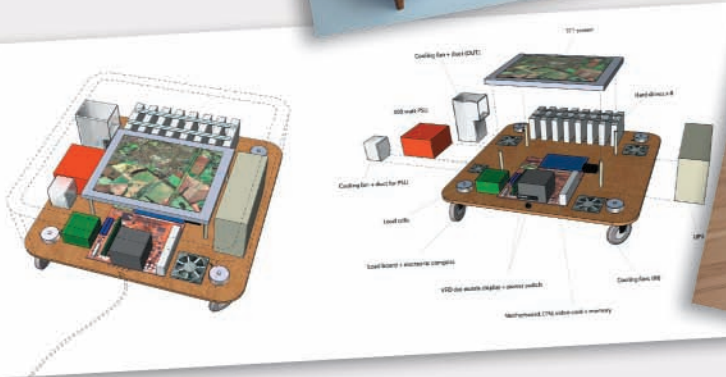
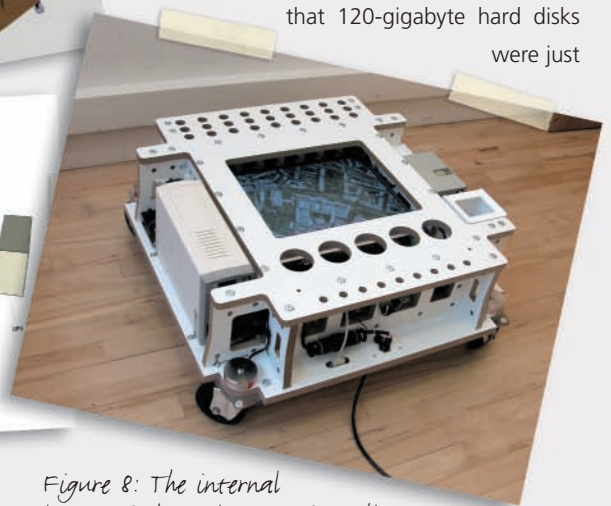


Figure 8: The internal layout of the realized Drift Table



becoming available when we built the table, it was clear that we would require a server-style PC with enough processing capability to fetch and display the terabyte of data provided by GetMapping. This presented a major choice for the design: whether to make the Drift Table self-contained, or a display for data streamed from an external server. We decided to pursue the (far more difficult) self-contained approach because it appeared most likely to achieve the authenticity of a finished product, and because it seemed most in keeping with the idea that the Drift Table somehow contains the world on view.

But building the Drift Table to house a server-size PC, load sensors, battery backup, and cooling was a significant challenge. As we pursued the form design through a large number of models at various scales, we also experimented with possible technical configurations using 3D CAD modeling software (Figure 7). The final internal composition of the Drift Table (Figure 8) is an indication of the detail work that was required to make the prototype robust, reliable, and safe. Capable of continuous runtime without failure, special attention was paid to cooling, wiring, and software. In addition, the internal bracing prevents chassis flex that can compromise the load sensing accuracy.

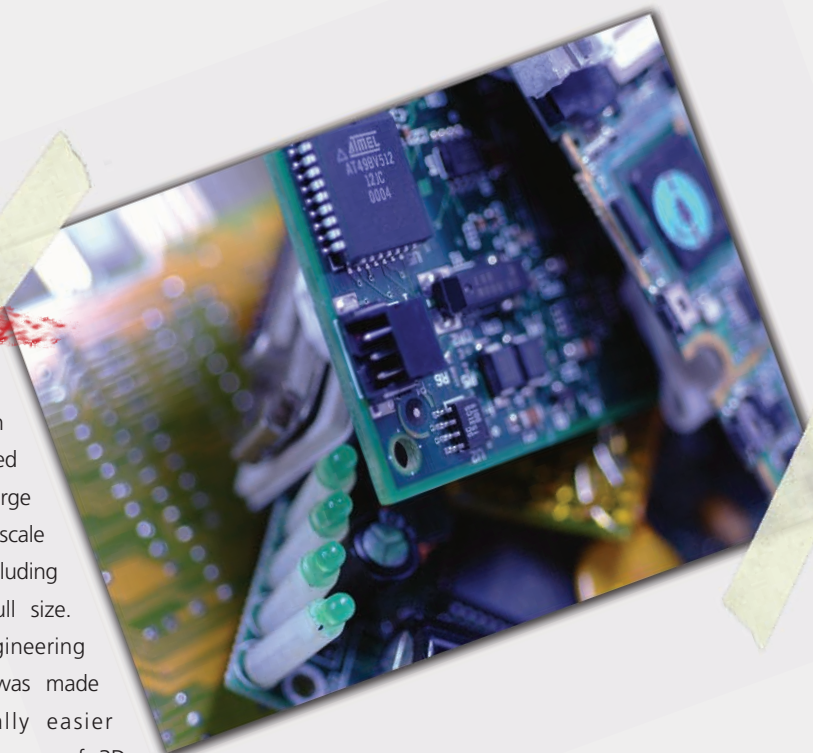
### Building a Highly Finished Prototype

In sum, we used a number of approaches for prototyping the final design of the Drift Table. In general, we pursued the concept development largely through imagery including sketches, diagrams, and collages. The

form design was explored through a large number of scale models, including some at full size. Finally, engineering the table was made substantially easier through the use of 3D modeling software to experiment with different layout possibilities. Used together, these techniques enabled us to converge on the table's final design reasonably quickly and with a good degree of confidence about the final outcome.

One of the most important lessons we learned in developing the Drift Table was the value of creating a highly finished, robust prototype. This was crucial in allowing users to suspend disbelief and engage fully with the device over long-term trials, and has also meant that the Drift Table can be exhibited for long periods of time without problem. Such attention to detail and finish are perhaps not normally associated with an experiment or prototype, but there are real benefits to be gained by doing so.

**REFERENCES** 1. Gaver, W., Bowers, J., Boucher, A., Gellerson, H., Pennington, S., Schmidt, A., Steed, A., Villars, N., and Walker, B. (2004/1). The Drift Table: Designing for ludic engagement. Proc. CHI'04 Design Expo. New York: ACM Press. 2. Gaver, W.W. (2002). Designing for Homo Ludens. 13 Magazine No. 12, June 2002. 3. Gaver, W.W., Boucher, A., Pennington, S., and Walker, B. (2004/2). Cultural Probes and the value of uncertainty. <interactions> magazine. xi(5), pp. 53-56. 4. Getmapping (2001). England: The Photographic Atlas. London: Harper Collins. 5. Schmidt, A., Van Laerhoven, K., Strohbach, M., Friday, A., and Gellerson, H. (2002) Context acquisition based on load sensing, Proc. Ubicomp.



#### ABOUT THE AUTHORS

Andrew Boucher is a research fellow at the RCA currently working on the Equator Project, a six-year interdisciplinary collaboration funded by the Engineering and Physical Science Research Council (EPSRC). The RCA Equator team leads an investigation of the home that examines the idea that people want to enjoy playful and exploratory activities in their domestic environment that capitalize on notions of wonder, curiosity, and daydreaming. This work focuses strongly on the role of users in the design process from initial ideas to realization, specializing in particular on the deployment of new technology prototypes in people's homes.



Bill Gaver is professor of design at Goldsmiths College in London and a principal investigator in the Equator IRC. He has pursued research on innovative technologies for over 15 years, working with and for companies such as Apple, Hewlett Packard, IBM, and Xerox on topics such as auditory interfaces, theories of perception and action, and interaction design. Currently he focuses on design-led methodologies and innovative technologies for everyday life