Ambient Displays for Home Energy Consumption Awareness

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Abstract

Education and behavior modification are key to energy conservation[1, 2]. The first step toward this goal is making people aware of their use. Discussions with homeowners show that very few know the largest consumer of energy in their home and even fewer look at the energy meters attached to their house. The typical household energy meter consists of an odometer style numeric display and a rotating wheel that provides a real time indicator of electricity consumption. Although regular readings from the meter offer a general understanding of consumption, homeowners often describe the task as tedious. The cognitive overhead involved in keeping track of consumption far outweighs the level of information and understanding that it provides. Several factors are to blame: the means of representation, the granularity of information, and the location of the meter. As an initial investigation into displaying energy consumption, our students designed two prototype ambient displays that bring the display indoors, break the information into understandable parts, and are easy to read.

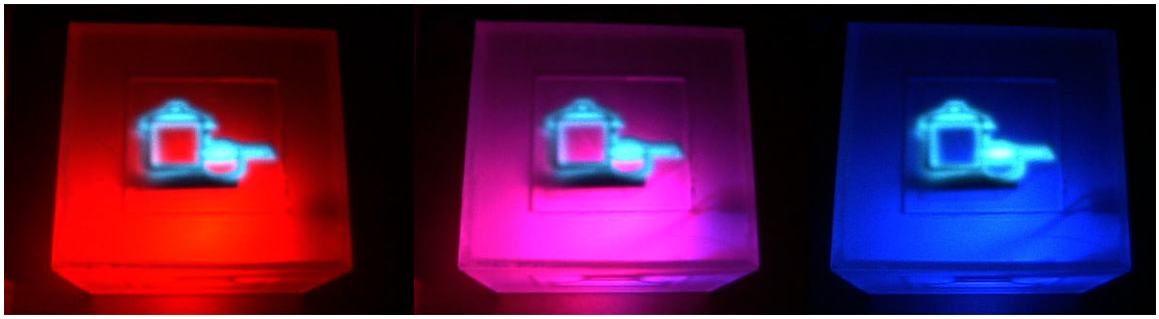

Figure 1 – These three photos show the shift in color–red (high consumption) to purple to blue (low consumption)–that represents energy consumption in the zone on the top face of the block. In this case the zone is the kitchen which is represented by the glowing pots and pans icon on the block.

The first prototype, Energy Cube, borrows an interaction paradigm from an earlier project: Navigational Blocks [3]. It maps household zones to the faces of a cube. Rotating the cube such that the zone of interest is on the top face sets it to display energy use for that zone. Built of translucent acrylic, the color of the glowing cube indicates current use compared to the average use in other zones (fig 1). If the homeowner is curious to know how much energy their kitchen habits consume, he/she rotates the block so that the kitchen icon is face up. As the color of the cube shifts from blue to red the homeowner becomes aware of energy use in the currently selected zone.

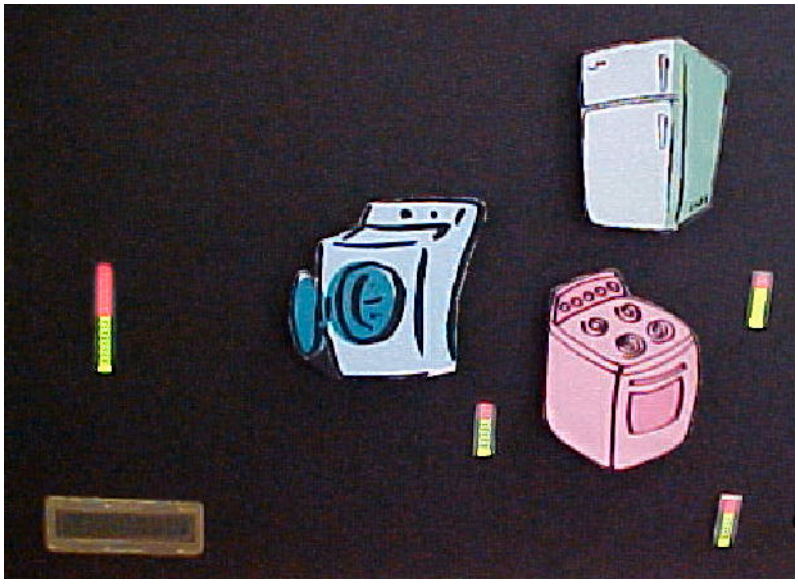

Figure 2 - Three Energy Magnets are attached to the board each representing a different appliance in the home. Next to each magnet is a bar graph that indicates current energy consumption. The large bar graph on the left indicates whole house consumption while the LCD screen on the lower left provides detail information.

The second prototype, Energy Magnets, allows the homeowner to easily configure the information being displayed with physical icons in the form of refrigerator magnets. The project is composed of a display board and a set of magnetic icons that represent household appliances (fig 2). Placing a magnetic icon onto the board triggers a nearby bar graph to display the related appliance's energy consumption. If the homeowner wants to know more about the consumption of their dishwasher in comparison to their clothes dryer they choose the appropriate magnets and place them on the board. Audio echoing indicates the recognition of the magnets, the LED bar graphs come alive, and a small LCD screen on the board provides more detailed information. Now, as the day progresses, a simple glance at the display provides a quick understanding of consumption and reading the LCD provides detail information such as kilowatts per hour.

Unlike the typical energy meter attached to the home, these two projects each provide a quick peripheral understanding of energy consumption. Through simple interaction, the displays also provide a granularity of information that is not available in typical meters. As a result, these displays help homeowners become aware of their energy consumption.

References

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