Green Food Through Green Food: A Human Centered Design Approach to Green Food Technology

m.c. schraefel

Electronics and Computer Science

University of Southampton

Southampton, UK S017 1BJ

mc+green@ecs.soton.ac.uk

Abstract

"Real sustainability will only be possible by consuming less." A ubiquitous computing path to *consume less* while improving health is to help us consume less processed food (60-70% of US/UK diet) in favor of whole food. The paper shows both the rationales for this focus and identifies key design challenges: interaction cycle, expertise and politics.

Author Keywords

Food; interaction; processed food; human performance.

ACM Classification Keywords

H.1.2 Human Information Processing

Introduction

The best way to improve the sustainability of human-food interaction through the food lifecycle, according to Sellahewa and Martindale[5], is simply and fundamentally to consume less. There are many points within the food cycle where we can consume less. Growing consumer demand for better soil practices to consume less energy/resource, understanding food provenance to reduce transport costs of food, reducing food packaging, making more food packaging recyclable, and increasing composting of food waste are examples of socio-political interventions that "green up" sustainable food practices, lessening consumption of associated resource at each stage of the food cycle.

These components of food process may feel somewhat remote for most of us [4]. Taking a human-centered design approach, if we look at where we touch the food cycle most - eating - and focus on that, we have the potential to develop innovative technology designs to

help us get to green by a simple heuristic with complex implications: "Eat less, mostly plants." This is the council of omnivore food author Michael Pollan at the conclusion of *In Defence of Food*. Where obesity is a growing norm, eat less so that one feels fed but not full is also a heuristic of many nutrition coaches to help people achieve and sustain a healthy weight practice. In other words, by eating less overall, and less of particular components in the food chain, we succeed not just in reducing GHG, but we also have an opportunity to improve health [2]. Indeed, a green food agenda that focuses on reducing a carbon footprint without concurrently optimizing human wellbeing would seem critically flawed.

In the remainder of this paper I outline one way to harmonize sustainable food goals of consume less via an eating focus and in so doing identify research opportunities for green ubiquitous computing design.

The High Cost of Cheap Foods

The simple premise to achieve better sustainable food practices with better nutrition practices is to reduce consumption of processed foods. By processed foods, we generally (but not exclusively) mean foods that are no longer in their whole state. Breads, pastas and cereals are examples of processed foods because their main ingredient - flour - has a considerable chunk of its seed and, thus its nutrients, removed. Processed meats, transfats, are additional examples of highly processed, engineered foodstuffs whose main value is as cheap filler or shelf life extender. Another category of processed to consider is so-called Frankenfood, or genetically modified food. The top GMO crops are all feature in highly processed, packaged foods and

especially fast foods: wheat, corn, soy, canola, cotton (as cotton seed oil) and sugar[1].

Processed foods are also generally more calorically dense and nutrient poor than their whole-food counter part. White bread has fewer nutrients than a sprouted, whole grain alternative; brown rice has a higher protein content than the more refined white. "Fat free yogurt" may actually have more calories than its fat full cousin because of sugars added for sweetness and fillers added in lieu of the fat. Fast food Fries will have fewer nutrients and sugar added than the whole potato slice version; they will likely be fried in a cheaper oils rather than baked as well.

For a variety of reasons to do with nutrient make up, producing high craving and low satiety, highly processed food is easy to over-eat. This fact is exacerbated by presentation: such foods are frequently served in large portion containers and are designed to be eaten when we pay less attention to the act of eating: one in five meals is eaten in the car in north America.[2] 16% of Americans eat in front of the TV. When we focus on something else other than food, we overeat it.

The consequences of all these combinations of calorie dense / nutrient poor foods is that we quickly absorb more far calories than we need, where excess intake is translated to fat. Likewise the lack of appropriate nutrients to meet even baseline daily requirements to

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[1]   http://www.care2.com/greenliving/6-frankenfoods-to-avoid.html

[2]   http://www.dosomething.org/tipsandtools/11-facts-about-american-eating-habits

avoid disease means that we do not have the resources for our bodies and brains to function well. For instance, hormones like cortisol for stress and insulin for fuel management, estrogen and testosterone for healthy growth, are all produced from amino acids that are in turn derived from protein. The main source of protein in the vast majority of western and increasingly eastern eaters' diets is meat. Protein is usually one of the most compromised / least present nutrients in processed foods. Meat of course is also the most energy costly food to produce, responsible for 70% of food-based green house gases [1]. In other words, processed food consumption readily leads not only to increased likelihood of overweight and obesity, but to risk of non communicable conditions like Type II diabetes, chronic fatigue, depression, cardio vascular risk all increase. Eat crap; feel like crap.

Follow on Costs
Processed food accounts for nearly 70% of calories consumed in the US and 65% of calories in the UK [3].[3] Imagine that every meal, well over half to three quarters is calorically high and nutritionally light; that this composition is strongly associated with diseases associated with poor nutrition, thus adding to the sustainability costs of the food chain. If we begin to swap out even a quarter to half of the processed food on that plate with whole food alternatives, we immediately (1) reduce the calories consumed and so achieve a "consume less/eat less" green goal, and we simultaneously improve the nutritional health qualities

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[3] In Brazil, only 27% is processed [3]. One explanation of the difference, that shows how cost is a motivating factor in food choice is agricultural subsides: in 2011, corn syrup, high fructose corn syrup, corn starch and soy oils received 17 billion USD in subsidides; 261 million was spent on apple subsides[8].

of the meal, improving health outcomes like healthier bodyfat levels [8] and better nutrient profiles for physical and mental functioning, lowering incidence of health care costs associated with poor nutrition.

Swapping Like for Like or Whole for Processed
One kind of swap might be to replace processed food as found in ready meals with home made versions of the foods. In 2005, this is what a Sweedish study [6] did to compare GHG of ready meal, semi-prepared and home made versions of a "typical sweedish meal:" meatballs, potato, bread, carrots, milk. The overall cost worked out to be a wash in terms of total GHG impact. Neither a baseline healthiness of the meal was considered, however, nor was the different nutrient content of the meals based on sources. That said, this one to one swap does not meet this paper's proposal to swap out processed foods for whole versions. For instance: white bread, whether home made or purchased is based on processed (white) flour; potatoes served without skins (not whole) eliminate most of the nutrient value from the tuber. Costs for these processing refinements are greater than whole food alternatives, maintaining more calorically dense and nutritionally lighter meals.

The Eat Less, Mostly Plants Infrastructure?
To achieve the goal of "consume less" a target goal of the eat less (processed) food approach would be to see meals increase whole foods on the plate and thus decrease processed. All good flows from this is the simple heuristic. Achieving this transition, however, asks ubiquitous computing to tread new ground both in terms of skills and engagement with political process. Indeed, the paper so far has mainly been establishing some background in order to highlight three challenges for our community that it seems must be addressed to

carry out human-centered ubiquitous design for green food interaction.

1: Design Politics. Despite significant criticism, fast food (predominantly also frankenfood) crops, are still heavily subsidized in the US at a ratio of approximately 50 to 1 for (Corn and Soy) to Apples [8]. In other words, what design qualities does an application need to have to contend with the ubiquity, cost and convenience of crap? Does contention with the *status quo* become an explicit part of the design process.

2: Expertise. As our designs in such an agenda become more behavioral and domain-expert specific, are we sufficiently expert as a community ourselves in concepts like motivational interviewing, behavior

change processes, nutrition and nutrition coaching, physiology and cognition to be able to design such infrastructure to best support the many nuances of eat less, mostly plants? Do we need to "skill up"?

3: Ecosystem rather than Aps: To support practice change, we need to consider where, what and how an effective pervasive experience needs to be deployed to best support people learning about not only new kinds of eating, but new shopping and new food preparation practices where eating becomes a more conscious, foregrounded and primary activity. Where and when in the environment do we put this information? Rather than pursuing green food design individually, do we need to develop a shared agenda on key challenges for collective effort to achieve meaningful effect?

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