Green Food Technology: Ubicomp Opportunities for Reducing the Environmental Impacts of Food

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Abstract
Everyday food and drink consumption makes up a significant proportion of global greenhouse gas emissions (16% of the total footprint for an average UK person [3]). Digital technology offers much scope for helping to reduce this—promoting reflection, increasing transparency of product and supply chain impacts, and so on—but the greatest impacts are predicated on a deep understanding of the configuration of everyday practices. This presents an interesting challenge for Ubicomp, stemming from the deep social and cultural influences on what people purchase, eat and throw away. This workshop brings together participants from a diverse range of disciplines to develop an understanding of existing food consumption practices, and reflect on how this domain can profit from novel Ubicomp technology and interaction designs.

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Food; Interaction design; Sustainability

ACM Classification Keywords
H.m [Information Systems]: Miscellaneous.

General Terms
H. Information Systems: H.m Miscellaneous

Topic and rationale

Food production, distribution, consumption and waste accounts for a large proportion of global greenhouse gas emissions (16% of an average person's carbon footprint in the UK [4]). Food wasted in agriculture, retail and by consumers, results in higher demands for energy and other materials for production, packaging and transportation. Approximately one third of edible food is wasted in the US, equivalent to 2% of annual energy consumption [11], and studies have shown that consumers are responsible for up to 30% of total food waste in the UK [1].

There is potential to substantially reduce the environmental impacts of food with the support of digital technologies, but first a deeper understanding of the domain is necessary: sustainable food consumption presents interesting challenges for Ubicomp and HCI, given both the complexity of environmental impacts of foods (direct and embodied emissions spread across production, distribution, consumption and waste), and of everyday food practices that are e.g. socially, culturally, economically and practically defined. This complexity presents challenges, but it also offers many opportunities for technological intervention spanning the whole food consumption process.

Previous workshops have focused on food and interaction design [7, 9], and on food and sustainability in general [6]. This workshop extends this series with a specific focus on environmental sustainability. Although the community also has a strong interest in sustainability [12], only very recently has research addressed both human-food interaction and environmental sustainability [2, 8].

This workshop provides a forum researchers and practitioners from a diverse set of disciplines to come together to provide breadth of perspectives on food and sustainability; share understandings of existing food consumption practices and their carbon impacts; and to consider the challenges and opportunities for Ubicomp in supporting the emergence of more sustainable alternatives. In particular, the workshop will focus on four important themes:

- Understand everyday domestic practices and their impacts
- Opportunities for food retailers, suppliers, and beyond
- Learning from alternative food cultures
- Technologies for sustainable human-food interaction

Workshop objectives and themes

This workshop aims to bring together members of the Ubicomp community with an interest in food and sustainability to a) understand and learn from existing food consumption practices and their environmental impacts, b) think about the role of suppliers, retailers and policy makers in this domain, and c) consider how Ubicomp technology and interaction design can bring about more sustainable food consumption.

We suggest 4 themes of particular interest in this area in order to prompt submissions, but we welcome submissions outside these that offer interesting and unique viewpoints.

Understand everyday domestic practices and their impacts
Food practices are influenced by a complex array of factors, and their construction varies greatly between individuals, demographics and across cultural boundaries. What people purchase, consume and waste is influenced by things like availability, price, and individual and

household diets and tastes. Food consumption can also be understood as enacted in practices of everyday routines for households and individuals [10]. It is in these practices that foods are habitually purchased, consumed and wasted without regard to their impact. In order to design for sustainable food practices, we need a comprehensive understanding of how food is currently interacted with in everyday life, and how this is reflected in carbon impact. Moreover, there is a need to connect these practices with broader discourses on environmental sustainability [13].

Opportunities for food retailers, suppliers, and beyond
Sustainable HCI researchers have drawn attention to the need to move beyond the individual when designing for sustainability [14]. For food, it is valuable for the community to explore the role of Ubicomp technology and interaction design for affecting, retailers, suppliers and policy makers. How can Ubicomp and HCI help bridge the gap between the consumer and these organisations, e.g. to avoid waste, highlight impacts? For example, should supermarkets and suppliers be responsible for making available the carbon impacts of their products, and how could Ubicomp and HCI support this process (managing shared responsibility, providing transparency, etc.)?

Learning from alternative food cultures
Communities developed around a common interest in alternative food practices are becoming more and more common. Examples include locavorism (e.g. the Fife diet[1]), slow food movements, community gardens and food co-ops, and these have already been identified as an interesting design space for HCI [5, 9]. Understanding how to support the development and prosperity of such communities could teach us important lessons about designing for sustainable human-food interaction.

[1] http://www.fifediet.co.uk

Moreover, although communities like these are often motivated by environmental concern, its not always the case that their practices are more sustainable e.g. in the Northwest UK, local food includes lamb and hothoused tomatoes! And so it is important that Ubicomp considers how new technologies can support existing, engaged communities also.

Technologies for sustainable human-food interaction
Digital technologies have significant potential to reduce the environmental impact of food consumption and waste, and intervention designers should consider all parts of the process, from decision making at home, to the supply chain that makes food options available to consumers. For example, approaches may seek to provide greater transparency of impact, stimulate critical reflection on individual and household practices [15], 'nudge' or persuade towards more sustainable practices [2], or provide a communication medium between consumers and retailers or policy makers.

The vast array of foods available to consumers poses a huge challenge for measuring the carbon impact of a meal. The life cycle analyses (LCA) required to accurately account for the impact of any given product is extremely resource-intensive. This presents a challenge to designers of sustainable food technologies, to support the acquisition and availability of this knowledge or to design around what is already available.

We invite contributions from various disciplines on topics including, but not limited to the following:

- Studies of everyday domestic food practices and their meanings

- Investigations of the influence of businesses and policy on the carbon impact of food consumption
- Designs and evaluations of technologies to promote reflection on the sustainability of food consumption
- Designing interactions between consumers and suppliers
- Digitizing food consumption and carbon impact data
- Studies of the practices and environmental impacts of alternative food cultures
- Technologies that aim to empower, coerce or persuade users

Workshop organisers

Adrian Clear is a Senior Research Associate in the School of Computing and Communications at Lancaster University. Adrian's background is in ubiquitous computing, and his work has included tool support for data-rich, context-aware application development and smart-home platforms for sustainable living. His current research is in the area of technology design for environmental sustainability in domestic, everyday life.

Rob Comber is a Senior Research Associate at Culture Lab, Newcastle University on the SiDE Project. His research interests include the social practices in human-food interaction, the psychology of behavioural change, and qualitative research for design. Rob has co-organised successful related workshops at CHI'12 [9] and DIS'12 [7] in the area of food and interaction design and is a co-founding member of the ACM SIGCHI FoodCHI community.

Adrian Friday is a Reader in Ubicomp and Sustainability in the School of Computing and Communications, Lancaster University. Adrian is PI on 'Informing Energy Choices using Ubiquitous Sensing' (EP/I00033X/1) which brings together several disciplines to study the GhG impact of our daily lives using a mix of ethnographic fieldwork and ubicomp probes. His work concerning everyday practices surrounding food preparation and GHG impact is the topic of a recent paper at CHI 2013 [8].

Eva Ganglbauer is a researcher and PhD student at the HCI Group at Vienna University of Technology. Her research interests include ecological sustainability in HCI and human-food interaction, research through design approaches, and design theory and practice. Eva co-organised the recent 'Food and interaction design' workshop at CHI'12 [9].

Mike Hazas is a lecturer in the School of Computing and Communications, Lancaster University. Using observational approaches combining quantitative and qualitative data, Mike focuses on new understandings of sustainability within and beyond the home.

Yvonne Rogers is a Professor of Interaction Design and Director of UCLIC at UCL. Her research focuses on augmenting and extending everyday learning and work activities with a diversity of novel technologies, with recent work in the shopping domain [2]. Yvonne also co-organised the recent CHI workshop on food [9].

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References

[1] Ambler-Edwards, S., Bailey, K., Kiff, A., Lang, T., Lee, R., Marsden, T., Simons, D., and Tibbs, H. Food futures: Rethinking uk strategy. Tech. rep., Chatham House, 2009.

[2] Bachour, K., Bird, J., Kalnikaite, V., Rogers, Y., Villar, N., and Kreitmayer, S. Fast and frugal shopping challenge. In *Proceedings of CHI EA '12* (2012), 1459–1460.

[3] Berners-Lee, M. *How Bad Are Bananas?: The carbon footprint of everything*. Profile Books, 2010.

[4] Berners-Lee, M., Hoolohan, C., Cammack, H., and Hewitt, C. The relative greenhouse gas impacts of realistic dietary choices. *Energy Policy 43* (2012).

[5] Blevis, E., and Morse, S. C. Sustainably ours: Food, dude. *interactions 16*, 2 (Mar. 2009), 58–62.

[6] Choi, J. H.-j., Foth, M., Hearn, G., Blevis, E., and Hirsch, T. Hungry 24/7? hci design for sustainable food culture workshop. In *OZCHI 2009* (2009).

[7] Choi, J. H.-j., Linehan, C., Comber, R., and McCarthy, J. Food for thought: designing for critical reflection on food practices. In *DIS '12 workshop* (2012), 793–794.

[8] Clear, A. K., Hazas, M., Morley, J., Friday, A., and Bates, O. Domestic food and sustainable design: A study of university student cooking and its impacts. In *CHI'13. To appear* (2013).

[9] Comber, R., Ganglbauer, E., Choi, J. H.-j., Hoonhout, J., Rogers, Y., O'Hara, K., and Maitland, J. Food and interaction design: designing for food in everyday life. In *CHI'12 workshop* (2012).

[10] Comber, R., and Thieme, A. Designing beyond habit: opening space for improved recycling and food waste behaviors through processes of persuasion, social influence and aversive affect. *Personal and Ubiquitous Computing* (2012).

[11] Cuellar, A. D., and Webber, M. E. Wasted food, wasted energy: The embedded energy in food waste in the united states. *Environmental Science and Technology 44* (2010), 6464–6469.

[12] DiSalvo, C., Sengers, P., and Brynjarsdóttir, H. Mapping the landscape of sustainable HCI. In *Proceedings of CHI '10* (2010), 1975–1984.

[13] Dourish, P. HCI and environmental sustainability: The politics of design and the design of politics. In *DIS'10* (2010).

[14] Hazas, M., Brush, A. J. B., and Scott, J. Sustainability does not begin with the individual. *Interactions 19*, 5 (Sept. 2012), 14–17.

[15] Thieme, A., Comber, R., Miebach, J., Weeden, J., Kraemer, N., Lawson, S., and Olivier, P. "We've bin watching you": designing for reflection and social persuasion to promote sustainable lifestyles. In *Proceedings of CHI'12* (2012), 2337–2346.