Showing Real-time Recommendations to explore the stages of Reflection and Action

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Abstract
The majority of Personal Informatics (PI) tools which use Ubiquitous Computing (UbiComp) devices are focused on the *collection* stage of PI as described by Li et al. [4]. However, tools supporting the *reflection* and *action* stages with UbiComp are underexplored. To date, tools for reflection are mostly limited to visualisations of prior performance of an individual, and how to support *action* is still very much in debate. In this work, we explore how *reflection* and *action* might be supported through UbiComp and HCI techniques. We implemented Tip-Me-lens; a prototype designed for exploring and understanding recommendations based on PI data in context. It uses AR tags to differentiate between products; while a mobile device and its camera act as a *magic lens* which visually overlays digital and real-world browsing. It acts as a futuristic grocery shopping tool that displays recommendations on-the-go as they relate to one's dietary goals.

Author Keywords
Personal Informatics; Augmented Reality; Mobile Devices; Proxemics; Ubiquitous Computing; Human Computer Interaction; Information Visualisation.

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

General Terms
Design; Human Factors

Introduction

One of the main goals of Personal Informatics (PI) is to help individuals undergo a healthy change in behaviour. This happens by allowing them to reflect on their data and act on a solution based on their new understanding of themselves. This usually happens within the *reflection* and *action stages* of the five stages of PI (with *preparation, collection,* and *integration* as the prior three stages) [4]. However, there is usually a weak support for the *action stage* in PI tools. As Li et al. mention in their paper, "Most systems do not have specific suggestions on what to do next" and thus this becomes a barrier in the application of PI [4]. Designers of PI tools cannot safely assume that the person using them will have adequate knowledge on how to apply the self-knowledge they get from the tool. Hence, PI tools must be designed with a way of being able to show recommendations or suggestions to aid in the *action stage*. Furthermore, while abstract visualisations of an individual's history works well in finding factors and analysis of one's data [5], it does not necessarily provide individuals with insight on how to act. This shows that there is a need to connect the *reflection* and *action stages* in context.

Figure 1: A person uses Tip-Me-Lens, a mobile device application that shows real-time recommendations. It bridges the gap between a recommender system and real-world browsing of a simulated store shelf through

Li et al. explored the possibility of using UbiComp technologies to aid in PI [5], focusing on using them for data collection (e.g. connecting individual sensors in the wild). While they showed great insight on how to improve data collection with UbiComp, the term UbiComp, as coined by Weiser [8], goes beyond isolated tasks to those in context with everyday life. This indicates that the *reflection* and *action stages* may also benefit from UbiComp. There are PI systems that already exist in the wild that make use of UbiComp technologies such as UbiGreen and UbiFit Garden [3][2] which support *reflection* through rich visuals, and *action* by giving a list of alternatives to what an individual is currently doing. While these tools have become successful in their own way, we wish to go further in supporting combined *reflection* and *action* stages –to explore the possibility of providing real-time and dynamic recommendations in context with the individual's data.

Figure 2: Nutrition facts will show up as a detail on demand when a person taps over the highlight –revealing information as to why a food item is recommended.

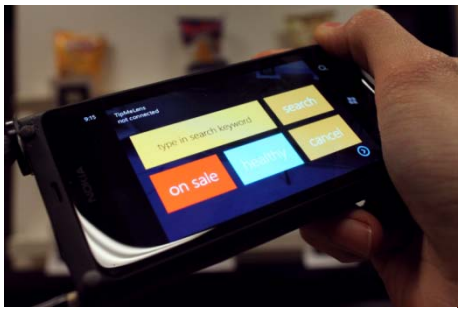

Figure 3: shows the menu from which users can select to browse other pre-defined searches or search with their own keywords or queries.

In this work, we consider PI tools that are for tracking one's nutrition. Currently, most tools under this category only allow people to log the food they eat but leave the decision making to the individual (i.e. weak support for the *action stage*). Some tools may give a list of food alternatives but they are only lists and are not in context with the individual's information. We implemented Tip-Me-Lens (see Fig. 1 and video figure) as an exploratory prototype to provide real-time recommendations based on an individual's data. It uses AR and principles of Human-Computer Interaction (HCI) proxemics [1] and information visualisation. Tip-Me-Lens acts as a type of *magic lens* which immediately highlights items that are recommended within a space. Bridging the gap between recommender systems and real-world browsing will not just help people with browsing or searching within the physical world as they do with digital information, but it can act as simultaneous reflection and suggestive action tool.

Tip-Me-Lens

Tip-Me-lens is a prototype which uses a mobile device and Augmented Reality to highlight healthy food items on a shelf. It is intended to help people who wish to track their nutrition. It has a database of food items and a profile of the person using it, and determines the recommended healthy food items based on the person's profile. Tip-Me-lens was inspired by the Nokia City Lens (http://www.nokia.com/ca-en/lumiaupdateapps/). It also brings the interfacing guidelines outlined by Mulloni et al. for information browsers with AR [7] from a large to a small scale scenario (i.e. from browsing infrastructures to browsing a store shelf). Tip-me-Lens borrows ideas from the theory of *proxemic interaction* [1], applying its concept between people and non-interactive items (e.g. food items on a store shelf).

We implemented Tip-me-Lens with three component layers: *The phone client* identifies the items' AR tags through the use of the SLAR toolkit (http://slartoolkit.codeplex.com). *The proxemics client* keeps track of the person's proximity and location data through the use of the proximity toolkit [6]. Lastly, *a server* provides as a link between the proxemics and phone clients.

Features

Automatic Highlighting –Tip-Me-Lens highlights recommended items as it detects and identifies AR tags (see Fig. 1). The type of highlight shown depends on how far the person is from an item. From afar, the highlight is only a box. As the person shows more interest on the item and gets near, it shows the name of the item, and close-up, it shows the calorie information and the name of the item. If the person wishes to know why the product is recommended, he or she can tap over the highlight to see a nutrition fact visualisation based on his or her daily nutrition needs (default 2000 calorie diet; see fig. 2), and a list of friends that like the item from social media (fig. 3).

Direct Search – Tip-Me-lens can be used to browse other pre-defined lists aside from recommendations based on a person's nutrition profile. It can also be used for search based on product description, product names, and queries (e.g. calories > 200; see fig. 4).

Location and Awareness – By using the distance and orientation data between the shelves and the person from the Proxemics Client, Tip-Me-Lens is able to point the person towards the location of the items. This gives people awareness of where the search for or recommended products are. Fig. 5 shows the tracker

Figure 4: Social Network data can be used as recommendations.

Figure 5: Tip-Me-lens tracks a person's location data and uses it to point him or her towards the recommended items.

and awareness feature which is accessed by orienting the phone parallel to the ground.

By allowing people to see and search for recommended items and by showing the reason behind, Tip-Me-Lens supports both *reflection* and *action* to happen in situ.

Conclusion

There is much to do to extend Tip-Me-lens into a full PI tool which can aid people in all of the five stages of PI. It does not have a historical view nor does it support data collection. Its current state is only one side of a coin; it is currently more of a recommender that supports only *reflection* and *action*. However the ideas behind Tip-Me-lens show potential on being able to help people act on their goals and possibly to maintain them.

In this paper and video, we have outlined the details of Tip-Me-Lens, a prototype PI tool which aims at helping people who are in the reflection and action stages of PI. It makes use of AR technology, and principles of HCI and information visualisation. While the idea behind Tip-Me-Lens is still in its infancy, it has shown potential for combining aspects of real-world browsing and recommender systems. It shows that being able to highlight items on a shelf makes finding or search for items easier. Through UbiComp techniques, we have explored a way of supporting both the *reflection* and *action stages* within the same context and in situ.

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