Augmented Reality-Based Advertising Strategies for Paper Leaflets

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Abstract

While shopping websites provide rich customer support through their adaptiveness, static paper-based leaflets are still one of the most important advertising mechanisms for retailers even in today's digital world. With their physical qualities, they create a higher emotional connection and with that more positive memories for brands and retailers. In this paper, we investigate two concepts for Augmented Reality advertising for such leaflets to bridge the digital divide. One of them is following a Guerrilla marketing approach, which allows users to easily compare products of different retailers. The second concept investigates different strategies for visualizing cross-selling recommendations inside the leaflets. We report on initial user feedback and discuss ideas for future work in the field of Augmented Reality advertising.

Author Keywords

Augmented Reality, Paper Retail Leaflets, Recommendations

ACM Classification Keywords

H.5.m [Information interfaces and presentation]: Miscellaneous.
Introduction
While a large split of the margin has moved to online retail, which provides rich customer support, recommendations, wishlists and shopping carts, through their websites, even in todays digital world static paper-based leaflets are still one of the most important advertising mechanisms for retailers. They have a high effect on sales, promoting special offers or new products. Even though retailers often try to replace them with electronic counter parts such as an email version of the leaflet, the physicality of the leaflet is still an advantage. Physical material involve more emotional processing, which is important for memory and brand associations. Since more processing is taking place in the right retrosplenial cortex, when physical material is presented instead of just digital information it suggests that more emotionally vivid memories are generated [13]. In this paper, we present two approaches that try to bring together the advantage of the physical paper and the information of the digital world based on mobile Augmented Reality (AR) technologies. The first prototype is called GuerrillAR and resembles and guerrilla marketing approach for leaflets. The second prototype — called PageAR — allows for cross-selling recommendations between different products inside the leaflet. Those two prototypes try to take advantage of the brains emotional engagement with physical media and add a digital service on top of it to craft a message that has an emotional impact.

Related Work
Technology — especially personalized devices — and applications are getting more and more popular for retail marketing [1]. However paper leaflets still remain an effective and thus very important marketing channel [1, 13].

There are some initial research initiatives towards mobile augmented reality in the retail domain. Välkkynen et al. investigated mobile augmented reality for retail environments by proposing and evaluating an augmented reality x-ray system for products [14]. With the Virtual Mirror Bichlmeyer et al. presented an augmented reality approach for visualization of customer adapted shoes. As an extension of the miAdidas web application [3], the system records a video stream of the user wearing the standard model and overlays it with the customized design of the user. An application scenario for augmented reality and magic lens techniques [4] is product customization with mobile phones [6, 5]. With ShelfTorchlight, another use case for the retail domain was proposed by Löchtefeld et al. [11, 12]. In the ShelfTorchlight approach, a supermarket shelf and the products it holds are augmented with context-aware content by using a camera projector unit.

For a mobile AR supported leaflet browser off-screen visualization techniques can be used to guide the user. Halo [2] represents a seminal approach for visualizing off-screen objects that is very suitable for small mobile displays. In this visualization halos of different radius at the corners of the display indicate the position and distance of off-screen points of interest. To better cope with clutter on small displays Gustafson et al. introduced Wedge [7]. In this visualization technique triangular wedges are used to avoid overlapping halos. Another popular off-screen visualization technique called EdgeRadar [8] allows an easy tracking of off-screen moving objects with a radar view metaphor. Off-screen visualization was also used for augmented reality applications. Henze and Boll for example evaluated an off-screen visualization for magic lens and dynamic peephole interfaces [9]). But there exists commercial
products as well in particular tourist guides (e.g. Paris Skyline \(^1\) and Streetmuseum \(^2\)) and universal AR browsers like Layar \(^3\) and Nokia City Lens \(^4\) that already apply different concepts to deal with the clutter introduced by the overlays.

In the majority of these examples magic lens interaction \(^4\) plays a dominant role. In this paper we present two approaches that use magic lens augmented reality interaction that make use of off screen visualization techniques. To the best of our knowledge there exists no visualization strategies for cross pages recommendation inside paper leaflets. Furthermore the application of augmented reality for guerrilla marketing strategies has not yet been investigated.

**Analysis of Leaflets**

Considering that the objective of our research is to design effective AR-based advertising strategies for printed leaflets, it is essential that we analyze and understand the design of these leaflets. Even though adding digital services can add value to the leaflet, it would be dangerous not to ensure that the brand’s visual identities have a prominent place on the print. The paper leaflet should not become useless without the augmentation. Our sample consists of 16 German paper-based leaflets, mostly collected from mailboxes. They cover the following retail sectors: half are from local supermarkets; 3 out of 16 are from electronic equipment retailers; the remaining ones are from specialty stores selling flowers, furniture or other products. Our investigations revealed the following findings:

- Half of the leaflets had no printed page numbers, and none had page numbers on the first and the last pages.
- The layouts and sizes of the leaflets differ from each other, but those printed by the same company share the same size and layout.
- 11 out of 16 leaflets are organized with an orderly layout, and the product images are printed with a clear border.
- In most of the leaflets, 5-10 products are printed on each page. (avg. 7.02 products/page)
- The print quality is in 14 out of 16 sub standard printed on cheap recycled paper.

**GuerrillAR**

The first prototype that we present is called GuerrillAR. As the name suggests the underlying idea of this prototype is to combine guerrilla marketing strategies \(^\text{[10]}\) with augmented reality technologies. The concept of Guerrilla marketing was first coined by Jay Conrad Levinson and describes the idea of low-cost advertising strategies that rely on unconventional instruments \(^\text{[10]}\). While Levinson was referring to technologies like Graffiti or in newer editions of his book to social media advertising we envision taking it a step further and using augmented reality.

By augmenting the paper leaflet of a competing retailer with one’s own content it is easily possible for a retailer to allow transparent price comparison or quality comparison. The user simply takes his smartphone and points it to leaflet of the competitor and will see a personal adapted overlay on his device. As can be seen in Figure 1 it allows to not only show different prices but also comparable products or special bundle offers. This allows the retailer...
to effectively communicate the prices of their product portfolio while limiting the expenses. Without even distributing an own paper-based leaflet the retailer can take the advantage of the physicality of the paper while integrating context-aware content from the smartphone. The inclusion of the paper will generate stronger emotions when interacting with the leaflet and the application [13] and by that most certainly increase the effect of the application. This has been confirmed in our initial user feedback. Most people that we interviewed about the application liked the idea and stated that the comparison is very easy that way.

Our implementation is based on Qualcomms Vuforia SDK\(^5\). As for trackables we used scans of the competitor’s leaflet, which provided rich enough features. Since these leaflets are often available on the retailers website a day before they get delivered to the households such an application could be updated in time.

PageAR

While GuerillAR is an application for augmenting single pages with advertising content, we also investigated how we could support users browsing through multi-paged advertising leaflets. As our analysis revealed many advertising leaflets are multi-page documents not containing any page numbers, which could be leveraged to guide customers through leaflets. Therefore, the PageAR system investigates how we can guide customers through a leaflet and cross-reference products between pages. One motivation was the idea of connecting techniques people know from online retailers to the paper-based medium, which we can augment with digital information. Especially we were driven by the idea of providing recommendations such as, people who have seen product X also took a look on product Y. As such, PageAR solves the question of off-page visualization: how can provide visual guidance to a customer for navigating to a product on another page?

**Design Concepts**

We designed three different approaches that essentially solve the problem in two steps: (1) we notify the customer how many pages to turn in which direction, and (2) on the final page we provide guidance to the target product. Techniques for the second step can be adopted from the off-screen visualization, e.g. Halo [2], Wedge [7] and EdgeRadar [8]. Therefore we focus on the first challenge in PageAR. Therefore we designed three different solutions to guide customers from a current item to a target item.

\(^5\)https://developer.vuforia.com/
The Plateau technique is motivated by the idea of visualizing all pages between the current page and the target page as layers. This depth/height of the shown whole/pyramid shall indicate the amount of pages to turn. The end of the whole/pyramid already indicates the relative position of the target item on the final page, as shown in Figure 2a). The Pagination technique is motivated by visual page indicators, which can be found in smartphone menus like the iPhone and eBooks. The system shows the customer’s current page position and provides a hint on which page the target product is positioned. In Figure 2b) we have highlighted the page indicator at the bottom of the screen.

In the Arrow-based technique we provide simply arrows showing the user in which direction she has to turn the pages. Figure 2c) shows a screenshot of how this approach looks like. In addition to the direction the customer should flip the pages, the number of arrows indicates how many pages she should turn.

Implementation
We leveraged the software stack already used for GuerillAR, which is already able to recognize the pages. We extended the system to recognize single products and added a dynamic overlay, which displays the navigation support according to one of the three techniques. The rules for recommending items, i.e. the links for guiding users from one product to another one, are implemented in a dummy component (which currently only provides static recommendations).

Preliminary User Study
We conducted a user study to test the three different concepts for their performance and ease of use. We had 12 participants (6 female, 6 male) with age 24 on average. We counterbalanced the three conditions, and participants tasks were to find target products in a 36-page leaflet starting at specific items. We measured peoples performance in terms of the time they took to find the target products and the number of pages they have turned. One task comprised looking up 6 products using one of the three visualizations.

The average completion times of the tasks with Plateau, Pagination and Arrow-based approaches were 33.57s, 19.54s and 17.95s respectively (median 20.70s, 14.19s and 14.86s). We found that the Pagination and Arrow-based approaches are significantly faster than the Plateau technique (paired T-test, \( p < 0.01 \)). The average number of page flips for each task with Plateau, Pagination and Arrow were 7.28, 5.56 and 5.49 respectively; without any significant differences. In terms of performance Plateau was worst due to participants did not instantly understand the 3D visualization, but most of our subjects can reported that they better understood the visualization after some time.
Conclusion and Future Work

In this paper we presented two prototypes that investigate novel advertising strategies for augmenting paper leaflets that allows to combine the physical qualities of the paper with the personalized content of the smartphone. While with GuerrillAR we presented a radical guerrilla marketing based advertising approach - PageAR is meant to allow for effective cross-selling recommendations inside the leaflet. We reported on our preliminary user study testing three different visualization strategies for this.

For future work we plan to evaluate both prototypes in extended user studies. Especially we want to understand how a 3D based visualization can be utilized for navigation inside the paper leaflet. As for an extension of the existing prototypes we plan to integrate the information available on the user’s smartphone. For example one could infer a user profile from installed and used applications. Furthermore also the history of the products the user has been interested in during past application usage could be taken into account for the personal profile. Moreover not only the application could learn about the user but also the retailer can leverage the gathered data about the interests of the customer to design more targeted flyers or integrate this knowledge into their general marketing strategies.

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