

Context-Sensitive eCommerce

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ABSTRACT

Physical commerce has existed for thousands of years. Although the Internet is a relatively recent phenomenon, *electronic commerce* conducted over the Internet represents an increasing proportion of all commercial transactions. We believe that the most significant benefits to commerce can be realized through *augmented commerce*, a combination of the best of physical and electronic commerce worlds. In particular, we believe that ideas from the area of augmented reality, involving see-through head-mounted displays, can provide considerably more context in purchasing decisions than is possible using a desktop browser. This richer context enables more informed decisions and will lead to significantly greater levels of online transactions.

Keywords

Electronic Commerce, Augmented Reality.

INTRODUCTION

Consumer access to the Internet has provided a rich new channel for retailers. Electronic Commerce, or eCommerce, is proving to be a lucrative and versatile way to market products and services to the growing number of consumers with Internet access. So far, some of the most notable players in the eCommerce arena have been companies that provide media based products and services (Amazon, CDNow). The success and rapid growth of these companies can be attributed, in part, to the context-free nature of the purchasing decisions for these products – most people aren't particularly concerned with how a book or CD case will look in their home, they are more concerned with the content of those physical objects. However, for many other physical products, the decision to buy is based heavily on the way the product looks and feels in its intended context of use. For example, furniture has to look good with the existing décor of a room, and clothing needs to drape and fit correctly on the body.

Content-oriented products, such as books and CDs, can easily be previewed by providing textual or audio excerpts on a web site. Images of appearance-oriented products can also be previewed in a browser, but the context of those images has to be imagined by the user. This paper proposes an alternative presentation that uses Augmented Reality (AR) technologies to bring virtual products into the consumer's physical context. We will describe the use of AR to project furniture into the user's home to facilitate the buying decision. We will also discuss other eCommerce uses for AR technology.

ONLINE FURNITURE SHOPPING

We start with a scenario in which a consumer is choosing a new coffee table to put in the living room. In a present-day online furniture store, the user can view a picture of the table, along with various comments and information about the piece. The furniture is nearly always shown in a context that is different from the user's home, or worse, in no context at all in a solid color background. In either case, it is difficult for the consumer to comfortably decide whether the table would fit with their home in terms of size, style, and color. Even if the user were to download an image of the coffee table and paste it on top of a digital image of the living room, the user would not be able to walk around and view the setup from different angles or with different lighting conditions.

Ideally, the consumer would physically place each prospective coffee table in the living room, and evaluate how well it looks and feels. Although this approach is possible, it is not very practical, especially if the prospective coffee tables are heavy or the furniture store is far away (and it becomes even more impractical with larger pieces of furniture). What we seek to provide is as close an approximation to this ideal furniture shopping experience as we can within an eCommerce application.

AN AUGMENTED SHOPPING EXPERIENCE

Many of the interactions above can be supported using Augmented Reality (AR). AR is, broadly speaking, the practice of augmenting the user's physical environment with virtual representations of objects [1]. This is typically accomplished by using see-through, head-mounted displays (HMDs) to blend the real and the virtual views. Many AR

systems also incorporate head tracking in order to maintain the correct virtual viewpoint. Some include various haptic devices such as force feedback gloves to allow for more complex modes of interaction between the physical and the virtual world.

An AR variation on the coffee table shopping scenario might provide the user with a lightweight, see-through HMD. In our prototype, the furniture retailer downloads a detailed three-dimensional model of the coffee table to the consumer's computer. Through the HMD, the consumer sees a full sized, three-dimensional representation of the table projected into the physical living room [2]. The consumer can now position the table in the room, seeing how it fits with the current décor and other pieces of furniture. The consumer can also walk around the table, viewing it from all possible angles. They can evaluate whether table is the right shape and size, whether it fits in the room with the other furniture, and whether the colors and styles work well together. The online retailer can now provide a more engaging, and informative buying experience through the AR equipment. In the end, the decision to buy is based on a much more involved level of interaction with the product.

Previewing in context

The ability to *interact* with the virtual product as if it were the physical product is a significant advantage over being able to merely *view* the product in a browser. However, the real power of the AR based system is its ability to present the product in its intended physical context [3]. Products are no longer represented by small photographs on a desktop monitor, but rather by realistic virtual representations appearing in their intended environments and situations.

The augmented commerce solution to the furniture shopping dilemma provides a much richer context in purchasing decisions than is possible in either physical or electronic shopping sites, and these more informed decisions will lead to a greater volume of purchases from early adopters of this technology.

BEYOND FURNITURE

The prototype described above centers on furniture because that is one of the most striking examples of how this technology can be useful. We believe that this type of system can be just as useful for many other physical products. Most physical products, from a simple trashcan to an expensive couch are subject to a set of physical constraints. Both may have to fit in a confined area, or match existing products. The AR system is very good at giving the consumer a representation of how the products look and how they fit in terms of size, style, and color. For a large class of products, this is the bulk of the information a purchaser needs.

For the consumer, these context-sensitive previews translate into more fun and engaging buying experiences. For the retailer, this translates into more sales, as a more informed and happier customer tends to buy more. Once the purchases are made and the products are delivered, the same AR system could be used to instruct the consumer on how to assemble, install or maintain the accessories [4]. Scenarios could be imagined such as the planning of and subsequent modifications to a garden, or a virtual mirror, where the user wears a body suit that allows for virtual clothing to be correctly fitted to the body, and gloves that allow the user to feel the fabric of the virtual clothing.

LOOKING AHEAD

The AR prototype described above does have limitations, such as the inability to provide a sense of touch, including information such as weight or texture. However, future versions may incorporate the use of force feedback gloves to provide such information. Another limitation is the availability of three-dimensional (3D) models of products; however, since a growing number of products is designed using 3D virtual representations, we expect that such models will become increasingly available.

A third limitation is the accessibility of AR technology. While the prototype has been built using technologies that are available today, they are not yet sufficiently mature for the average consumer to be willing and able to use this technology. Eventually, AR technologies will become unobtrusive and intuitive enough to gain widespread use and acceptance. In the meantime, the online furniture prototype gives us a glimpse of how AR can become a powerful tool for augmenting the online shopping experience.

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