

# Improving the Shopping Experience with an Augmented Reality-Enhanced Shelf

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## Abstract

With the introduction of augmented reality in the business domain, the line that separates e-commerce and traditional trading is becoming thinner than ever. We present here our ongoing research concerning the integration of product-related information in a physical store context, considering the reconciliation of e-commerce and brick and mortar stores and setting the foundations to further explore the feasibility of bringing recommendations closer to customers and study possible interaction issues. For such purpose, a tool that provides wine information is being developed making use of the new advances in augmented reality technology (HoloLens).

## 1 Introduction

In recent years, online shopping has seen an enormous growth, increasingly threatening classical ways of retailing. E-commerce, however, and traditional brick and mortar stores, both have their own advantages and disadvantages (Otto & Chung, 2000). Due to the popularity of online retailing, physical stores have been trying to face the new competition by enhancing the shopping experience with the adoption of new computer technologies. Within this context, there have been several attempts to make physical shopping environments more interactive, such as shopping carts equipped with displays (Kahl et al., 2011) or new forms of shop shelves (Haiges & Wood, 2014). More recently, Augmented Reality (AR) is a technique leading retailers have been focusing on (Bodhani, 2013). AR is used to increase the user experience by enhancing the real world with the addition of computer generated virtual objects. Although it has been researched for around 30 years, it has not been until recently that AR has experienced the most noticeable improvements, proving itself of great usefulness for creating selling opportunities (Olsson et al., 2013). Mobile AR (MAR) applications are the most common ones in the business domain, making use of smartphones to support costumers through the purchase process. Other AR technologies, like see-through head mounted devices,

have not long ago become more practical and are opening new doors (and raising new questions) for human-computer interaction, although they have not been fully explored yet (Chatzopoulos et al., 2017).

In this research, we aim at bringing some of the advantages that online shopping has (individualized experience, access to product information and user opinions) into a physical store situation by using AR technology (HoloLens). For such purpose, a system that detects products (wine bottles) and offers additional data is being developed, improving the decision-making process by integrating filtering and recommending features. Besides, due to the still very recent entry of AR head mounted displays into the market, this study will permit us to further examine the issues of such devices concerning user interaction.

## 2 Related Work

Augmented reality is starting to be widely used in very different research areas. Regarding shopping advice and product information retrieval, several systems have been created, most of them in the MAR domain. As close examples to our research, (Ahn et al., 2015) approaches this topic with a mobile app that offers information about products in a store shelf, specially focused on the creation of a healthy shopping cart, while the system described in (Zhu et al., 2010) runs in a hand-held tablet that uses AR to place products into contextual settings and provide recommendations.

## 3 Augmented Reality Approach

### 3.1 Concept

The idea behind our research is to provide shopping assistance “in situ”, not only presenting a product’s specific information, but also other data that might not be so easily available (e.g. customer ratings). While more conventional MAR techniques using smartphones have shown to be helpful in providing customers with additional product information, we believe that AR in a see-through head mounted device can provide a new level of user experience through increased immersion (Figure 1) and also offer interactive features that cannot be realized with standard mobile devices.

Besides providing information, the system should include features supporting more complex operations like product filtering and recommending. To make our approach more versatile, product recognition would be desirable, enabling the identification of present items and their location in the shopping shelf. Lastly, it is also in our aim to explore different ways of user-computer interaction in such environment, not only influencing the virtual world through gesture communication, but also incorporating a virtual avatar who should guide the user through the shopping process and react to voice commands.

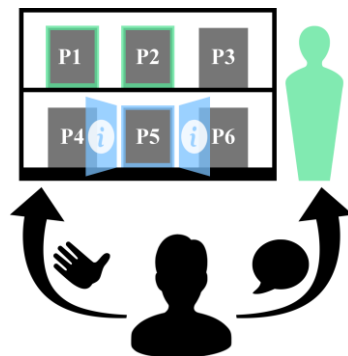


Figure 1: Augmented reality elements displayed over a real shopping shelf, managed through voice and gestures.

## System

A prototype wine shop is currently being developed providing various types of product information by combining a HoloLens with a physical bottle shelf (Figure 2). We have chosen wine as application area, judging it as a domain where certain expertise is needed to make a wise purchase and seemingly a scenario where the average user might obtain benefit from our approach.



Figure 2: First image shows bottles that have been detected, while in the second one the bottle's information is being accessed by the user.

The system runs under Microsoft's HoloLens, making use of the Vuforia SDK to recognize markers attached to the wine bottles (although it is planned to use label recognition in the near future). Once a bottle has been identified by focussing one's head direction on it, a white outline appears surrounding it, indicating that the user is now able to interact with the item. By using hand gestures, the user has the ability to select one of the detected bottles, displaying the wine's information around it as a hologram with different sections (e.g. expert and customer ratings, awards, type of wine, foods that are appropriate for it). Then, for each provided section,

the user can click on it to receive more detailed information about that specific field (like expert and user opinions, features of the wine's region and the grape used to make it). Browsing the wine shelf by clicking on the bottles the user is interested in is a fully functional feature.

The system is still in an early stage and features regarding filtering wine bottles by their characteristics or producing wine recommendations are not implemented yet, as well as the addition of a virtual avatar, but they are soon to be included.

## 4 Conclusion

We are developing a tool that brings e-commerce and traditional physical stores closer together, using recent improvements in the field of augmented reality to provide product information directly on top of real world objects. The prototype uses a head mounted display (HoloLens) to supply information for wine bottles (in a wine store context), including online-created content like user ratings. Filtering bottles by attributes, generating recommendations and adding a virtual avatar are among the features that will be implemented in the next step. Further research will include the study of the diverse ways of interaction between user and system that can be applied in such scenarios.

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