Augmented Reality: Now a Business Reality

Abstract

Augmented reality (AR) is no longer an element of science fiction; it is gradually making its way into our everyday lives. It promises to change the way we view the world and how businesses engage with their customers and employees. The rapid adoption of mobile devices and the potential uptake of wearable devices such as smart glasses is spurring interest in augmented reality. Today, it is making inroads across a variety of industries like print and media, retail, and manufacturing. The future of AR is exciting, as it offers companies enhanced capabilities such as designing and executing effective advertising campaigns, improving equipment maintenance, ensuring seamless tracking of inventory, and building sustainable industrial applications.

In this article, we discuss how AR is being used by businesses across industries, to drive customer engagement and improve employee productivity. We also discuss how mobile devices are helping organizations implement AR at various levels. In addition, we have drawn a comparison of some popular mobile software development kits (SDKs) available in the market, and how they can be used to create simple and user friendly AR mobile applications.

About the Author

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Augmented Reality: The Next Big Thing

Augmented reality (AR), an innovative technology that presents an enhanced view of the real world, is increasingly gaining prominence across industries. Ronald Azuma, in his paper, A Survey of Augmented Reality¹, defines AR as a technology that mixes virtual stimuli with real ones. These multifaceted stimuli (audio, visual, or through physical sensations) are interactive in real-time and can be registered in 3D. A simple example would be the appearance of an icon or related information on a smartphone's screen when the integrated camera is directed toward a particular landmark like a petrol pump or a restaurant. AR based applications enable users to view information associated with the physical objects in the vicinity, thus enhancing the user experience.

There are mainly three ways by which companies can implement AR: mobile devices, wearable devices, and sixth sense.

Mobile based apps are helping companies improve their existing processes and reinvent customer experience. For example, retail giant IKEA² uses an AR based application to help customers make purchase decisions by letting them visualize how a certain product will fit in their home space. Equipment manufacturers like Panasonic Factory Solutions Company of America (PFSA)³ and Intel⁴ use mobile devices to provide technicians with real-time information about machines including part details, repair history, and performance graphs, to assist with repair and maintenance operations. Apart from this, AR can also be used to monitor the shop floor, and train personnel, thus improving workforce efficiency and plant productivity.

The emergence of wearable devices such as the ones manufactured by companies like Google and Meta, have given a new dimension to augmented reality. Looking much like an ordinary glass, Google Glass offers a whole new level of experience to the user by displaying informative graphics and playing associated audio pieces. These graphics get refreshed based on the user’s requirements that are conveyed via head movements. Wearables have immense potential to improve operational efficiency and enhance user experience. Boeing⁵ and BMW

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have already started using these for assembly and maintenance procedures. This has reduced the need for carrying physical layouts or instruction manuals and has improved employee productivity by providing them the required information in a timely manner.

Though still in the prototyping stage, sixth sense promises to take AR to a whole new level. With the ability to recognize hand gestures and take necessary actions to interact with the surrounding environment, this technology promises a lot, but is yet to see a practical implementation.

**Augmented Reality Using Mobile Devices**

Among the three application areas mentioned in the previous section, usage of augmented reality in mobile based apps is increasingly gaining prominence. Such apps leverage the numerous smart features available on mobile devices today, like accelerometer, global positioning system (GPS), large displays with multi-touch capabilities, faster processors, graphics processing units (GPU), and high internet speed. The target (real-world object or marker) is identified and captured using the device’s camera, and the AR software detects feature points in the target image matching these with the feature set in the database. On finding a successful match, the content (2D/3D object or video) is displayed on the screen using OpenGL (technology used for rendering 2D/3D graphics) and Java Native Interface (for enabling communication between Java and other languages). Every target image is assigned an augmented rating. The higher the augmentable rating of an image target, the stronger the detection and tracking ability it contains. A lower rating (say 0) indicates that a target is not easily tracked by the AR system, whereas a higher star rating (say 5) indicates that image quality is good and can be easily tracked.

**Developing Applications Based on Augmented Reality**

Although the concept sounds complex, AR has been simplified for real-world application by several niche companies specializing in this area. Some such companies have launched software development kits (SDKs) of their own, to simplify the development of AR based applications. Among these, Vuforia from Qualcomm, Metaio, and Wikitude, are some of the more recognized SDKs as they provide a range of development options and features that can be customized as per the business requirement.

**Vuforia**: Qualcomm’s Vuforia (award winner at AWE 2013⁷) is one of the most popular AR SDKs among developers. Its advanced features and capabilities give developers the freedom to develop applications beyond technical limitations, allowing users to customize and add the required features.

**Metaio**: Metaio’s award winning SDK⁷ has a powerful 3D rendering capability and enables easy and quick development, thereby becoming a favorite among developers.

**Wikitude**: Wikitude has been voted the best augmented reality browser⁸ for the past four years, and as the best AR developer platform or tool⁸ in 2011 and 2012. This powerful SDK provides both experienced and amateur developers the ability to develop powerful AR applications with ease.

The following is a comparative analysis of these three SDKs based on seven key parameters:

- **Tracking ability**: These SDKs use computer vision technology to recognize and track planar images (image targets) and 3D objects such as boxes, in real-time. In addition, they have the ability to track QR codes, small cylindrical or quadrilateral objects, word associations, as well as multi-target and virtual buttons. The tracking is stable and provides a good user experience. While Vuforia is a good choice for using virtual buttons for tracking, Metaio scores higher when it comes to tracking 3D images. Wikitude is recommended when either or both – virtual buttons and 3D images – need to be tracked.

- **Operating system (OS) support**: All the three SDKs provide support for iOS, Android, and Unity. Metaio also provides web support that is currently not available with Vuforia. Wikitude has gone a step ahead, and supports Blackberry 10 as well as smart glasses. As of now, it is the only SDK that extends support to Blackberry. Its development is based on more widely used web technologies such as Javascript, HTML, and CSS, and does not require the knowledge of native platforms. This feature allows it to support PhoneGap and Titanium.

- **Storage ability**: Vuforia is the only SDK that provides free storage facility to the tune of 80 images on a mobile device. Its latest, paid, cloud version allows the storage of more images. Metaio provides a paid storage facility of up to 3 GB, though one can choose from a variety of storage options available on its site. Wikitude prefers storage on the device for quick results, and has the ability to track around 1000 images in a single dataset. There is no limit to the number of datasets though, which places immense pressure on the device’s storage and computational abilities.

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Documentation support: Vuforia SDK has the best documentation support among the three. It also has a functional user community that addresses users’ queries in a timely manner. Metaio and Wikitude still have some catching up to do in this aspect.

Licensing: Vuforia comes in two versions. The basic version is free but is not an open source tool. It can be used to build AR applications but users aren’t allowed to make changes to its core framework. The cloud version is licensed and provides much more flexibility in terms of storage and scalability. On the other hand, Metaio and Wikitude’s free version comes with limitations and watermarks. However, both provide multiple licensing options.

Ease of development: Vuforia is code-based and does not provide drag and drop features, which can be a limitation for developers not adept with basic native platforms. For those with knowledge of native platforms, it allows extensive scope for experimentation and creativity. However, application development can be a tad slow, hence it may not be ideal in scenarios where a quick output is expected. Metaio provides a more user friendly interface with drag and drop features to develop applications quickly, and requires limited knowledge of the native OS. Wikitude application development is based primarily on JavaScript. This makes it a cross-platform application, and hence, more widely acceptable.

GPS support: Vuforia does not provide GPS support and therefore cannot be used for building applications that require location based services. On the other hand, Metaio and Wikitude provide good support for location based applications.

Table 1 summarizes the comparative analysis of the three SDKs.

<table>
<thead>
<tr>
<th>SDK</th>
<th>Tracking Support</th>
<th>Platform Support</th>
<th>Graphics</th>
<th>Cloud</th>
<th>GPS</th>
<th>License</th>
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<tbody>
<tr>
<td>Vuforia</td>
<td>2D images, markers</td>
<td>iOS, Android</td>
<td>Unity3D</td>
<td>Yes</td>
<td>No</td>
<td>Free and Paid for cloud</td>
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<tr>
<td>Metaio</td>
<td>2D images, markers, Geo, 3D</td>
<td>iOS, Android</td>
<td>Unity3D</td>
<td>Yes</td>
<td>Yes</td>
<td>Paid</td>
</tr>
<tr>
<td>Wikitude</td>
<td>2D images, 3D images, Geo, marker</td>
<td>iOS, Android, Blackberry</td>
<td>HTML, Proprietary</td>
<td>Yes</td>
<td>Yes</td>
<td>Paid</td>
</tr>
</tbody>
</table>

Table 1: Comparative Analysis of Vuforia, Metaio, and Wikitude

Augmented Reality: Transforming User Experience

The SDKs in the market today have already started expanding the scope of the augmented reality concept and its application. From making interactive greeting cards to assembling airplanes, the usage of these products has increased manifold, and has spread to a variety of industries. SDKs have made the development of AR applications simple and viable for even those with limited software development experience. Companies can now launch their AR applications in a short span of time, and completely reimagine the way users interact with products. However, adoption of applications based on augmented reality, and their success in the longer run, will depend on how much value end users see in employing such applications, and how well they are trained to put these into daily practice.

Note: This article provides a broad overview of some widely known SDKs, along with listing some areas of comparison, and does not draw any conclusion as to which is superior. The suitability of an SDK depends on the specific business requirement. It would be advisable to examine all the business scenarios before making a final decision to use any of the SDKs discussed in this article.
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