Ever wider and deeper: Augmented Reality in 2010

A Mobile AR Summit Position Paper

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During **2009**, augmented reality (AR) technology and applications rapidly increased in media attention and public consciousness. Two **significant drivers** of this were the widespread deployment of ARToolKit in the Flash web-based environment and its subsequent use in hundreds of widely-seen web-based applications, and the release of location-based (GPS+compass) mobile applications on the iPhone platform such as Layar and Wikitude. The growth thus represents a move from applications built by experts in computer vision, towards use of tracking technologies by the services and marketing sector.

AR's popularity in 2009 was also characterised by media hype, eerily similar to that which accompanied the early development of virtual reality technologies. Many of the AR applications in 2009 were depending primarily on the "wow" effect of people unfamiliar with computer-vision seeing for the first time real and virtual objects composited together. However, by the end of 2009, popular commentators outside the technical community were already tagging new AR application releases as **"me-too" applications**. Indeed, companies eager to not be seen to be "missing the AR party" released many applications lacking in originality, interactivity, or indeed any useful purpose whatsoever.

In 2010, we at ARToolworks expect that much of the air will be let out of the AR-hype bubble. Companies that wish to use AR technologies to enhance their products or services will need to go beyond mere static re-presentation using image compositing. AR applications will not capture the public's attention or spending unless they conform to the same usability, purpose and quality criterion that these companies apply to the other areas of their business. Applications will have to focus on quality interaction, with **meaning and purpose**.

The convergence of a variety of technologies in consumer **mobile devices** has created a significant shift in the possibilities for AR applications. When we build interactive AR applications that are deployed in a fixed location, we face the challenge of sufficiently bringing external objects and actors to life in the fixed space around the installation. This is an outwards-in transferral of information. In contrast, in deploying mobile AR applications we face the opposite problem, that of guiding the user to the information. In part, this may be why most of the mobile AR applications gaining attention in 2009 focused on the re-use of large existing databases of geo-located information. The scale of these databases ensures that there is always content present for the user to interact with.

To move beyond this type of static presentation, some significant outstanding challenges facing mobile AR must be addressed:

- Identifying tracking frame of reference: GPS and compass provide a coarse-scale global frame of reference for tracking; marker tracking is totally relative. Marker-based tracking, through the iconic nature of the markers, provides strong clues to users that AR content is available, and these cues will be more important for more-sparsely distributed interactive AR content, e.g. an AR-based product display in a shop. Bridging these frames of reference will enable marker-based AR to be combined with location-based information to enable new types of interaction with AR content. Tracking technologies that can **bridge these frames of reference** are already available (for example inertial tracking, on-the-fly map-making optical tracking) but these are not currently available on consumer-level devices (for example, no consumer mobile devices have the gyroscopic sensors required for usable inertial tracking).
- Exchanging interactive 3D content between service providers and consumers: A tractable number of industry-standard formats exist for the exchange of 2D geospatial data, which makes it easy for servers and mobile clients to agree on a common language for location-based data exchange, enabling a potentially diverse ecosystem of devices and services to grow around the concept of location-based static AR presentation of geospatial data. When we consider what will be required for a similarly **healthy ecosystem** of servers and mobile clients exchanging the information required for 3D interactive AR experiences, it is clear that there is currently no industry consensus. We can see the beginnings of some attempt to implement 3D model formats, e.g. X3D, for the exchange of AR content, but there is little attention being paid to the needs for interactivity that are likely to be required for real growth of mobile AR applications. Of course, there are likely to be successful bespoke implementations, but it is in the long-term interest of all parties if formats (and indeed implementations) are published openly and royalty-free.

We at ARToolworks are keenly aware of the benefits for the industry of open-source efforts; ARToolKit's first open source release in 1998 initiated the development of a whole industry of AR research and development, and in 2010 we see that the commercial successes built on ARToolKit Professional continue to accelerate — both in number and scale of deployments. We will continue to support AR research and industry through our **open-source** efforts in 2010, including the very interesting and exciting mobile AR space, and we look forward to seeing your applications in the headlines and on the PCs and mobile devices of consumers worldwide.

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