# What will work where and when? A Mobile AR Test Suite and Lab

## A Position Paper for Mobile AR Summit @MWC 2010

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***Abstract*—** There are only a few categories of mobile devices for which mobile AR applications are widely available today (e.g., iPhone 3GS, Android-based handsets, Nokia N97). This represents a small fraction of the total potential target market. Already, even with only a relatively limited number of devices, the independent software developer must invest significant resources in device testing.

When the number of devices capable of mobile AR increases, and the range of applications multiplies, there will need to be a minimum level of AR user experience which is provided when a device or application promotes that it is AR compatible or offers AR-assisted content.

This paper makes the case that there needs to be an ecosystem-wide level effort to address device fragmentation and anticipate the needs of end users, hardware manufacturers and software providers.

### I. INTRODUCTION

Companies which develop software for use by PC users are well acquainted with the problem of fragmentation. There are many different versions of operating systems, extensions and configurations. A company striving for a Web experience, as easy as that sounds, must conduct extensive testing with different browser releases. Testing for compatibility is costly and may significantly increase the time to market.

There are thousands of different configurations of mobile devices on the market. But, the users of 99% of these different devices are not expecting to experience AR with their mobile terminals (today). Today, AR and the related technologies, such as visual search and location-based services, are reserved for the users of smartphones. Within the smartphone category there are many options. Here again, those who are downloading and using (testing) AR on their mobile devices are only the users of Android-based handsets and those with iPhone 3GS devices. It's an interesting group of users, no doubt, but a small fraction of the target population. They are early adopters; some are geeks and many just love all that is new.

Mobile AR is new, but it *is* going to evolve and mature. In parallel with the enabling technology and platform evolution, the number and types of devices and combinations of devices, networks and services which are suitable for AR are going to multiply. Already, the number of Android-based devices has blossomed from 3 or 4 worldwide in summer of 2009 when there was the big "splash" of attention in the media, to nearly 20 by the end of the same year. Numerous sources predict that there will be over 50 different Android-based mobile devices introduced within the first half of 2010. While the Apple iPhone and iPod models on which AR is supported are few in number today, Apple will release a new OS in the future. Users of Symbian-based smartphones are also an important category of the market whose needs for AR services cannot be met exclusively by Nokia or ignored by providers of mobile AR applications and digital content. And, there are tens of millions of Windows Mobile and RIM Blackberry users which could benefit from an array of AR-assisted professional applications (as well as consumer services).

In the future, there will be more displays suitable for use with mobile AR applications. Eyewear, for example, will reduce the need for the user to hold up their handset to experience AR while on the move. Augmented Reality is not limited to visual experiences. There may be auditory-enabled AR applications and services, personal audio assistants, which will be part of the complete AR-assisted universe.

Is there any doubt that the fragmentation of devices is already an issue for the developers of mobile AR applications and providers of enabling technology? If allowed to continue without an ecosystem-level strategy to address this issue, there will be three types of outcomes:

- AR application developers will be required to test their software on many models of mobile devices, resulting in high costs and slow release of new features to the market. There will probably be high customer service costs borne by this group as well.
- Handset manufacturers, providers of custom or other categories of mobile devices, and mobile network operators will pre-load tailor-made solutions they offer to their customers, perpetuating islands of content and technology in order to differentiate themselves and win loyalty of their subscribers.
- Low interoperability, poor interactivity and high range of supported AR "views" will produce high level of end user frustration and disillusionment, typical of the high technology hype cycle, and delay the general adoption of this promising group of technologies which fuse the digital and physical worlds.

If something is not done to assure a minimum benchmarkable performance and reliability across many mobile device portfolios, mainstream users of mobile devices (those which choose not to adopt closed mobile platforms) will test, be disappointed and not embrace mobile AR.

## II. The Minimum Mobile AR Experience

The companies directly impacted by the current proliferation of seemingly "AR-ready" devices need to study the technologies available and come to a definition of a minimum mobile AR experience (the "MMARE"?). This MMARE could, for example, include definitions of:

- the minimum resolution of information which is displayed to the user,
- the maximum level of false positives produced by an image search system or when GPS reach/performance is believed to be low,
- a maximum level of power consumption by the AR application, and
- minimum tracking guidelines of an object in the user's camera view finder.

One of the MMARE objectives is to leave open the opportunity for continued exploration and innovation in new mobile user experiences and interactivity, without sacrificing the potential value of the content which is promised the user in a particular application or service. This is one of the elements which would enable CrossPlatform AR [1].

Another objective is to expand the size of the target market for mobile AR by offering mobile AR experiences to users who do not have the resources or choose not to purchase the highest performing devices. Only with MMARE type definitions will the mobile AR application publishes (ISVs) and their partners be able to break free of very tightly defined device specifications (or closed platforms) to which they are presently constrained.

## III. The Mobile AR Test Suite

If a minimum mobile AR user experience can be defined for users of many types of devices, then there needs to be a suite of tests which verify that the application or service meets the agreed upon definition. One could image a test for AR game performance. A test suite would have levels. For example, passing one level of tests would certify that a technology is suitable for "industrial" or military applications. Another level might be for navigation applications and a separate one for social AR services.

This test suite would not need to be totally re-invented but be based on existing software tests for mobile devices, such as those which were necessary before there was interoperability of MMS technology between different devices.

One may even hope that there would be multiple definitions of this nature. It is possible to envisage a minimum hardware specification which must be met before a mobile device model meets the criteria of being "mobile AR-ready" and for this to be included in the test suite protocol. In this scenario, the providers of core enabling hardware technologies would need to agree on performance of graphics processors for AR tasks and strive to meet and exceed such specifications before furnishing the chips to handset manufacturers.

## IV. The Mobile AR Test Lab

It's natural to begin such the development of such tests and specifications with the formation of physical or virtual test lab to which a group of stakeholders belong and provide financial support. Representatives of the different components of the ecosystem (Figure 3 in [2]) would collaborate on the definitions and development of testing protocols. Once the definitions and protocols are established, these could be incorporated into the existing test labs for mobile technology.

If a test lab solely for Mobile AR testing were desirable, such a facility would need to be operated by an independent organization or third party which could guarantee up-to-date catalog of mobile hardware devices and software applications, low cost, rapid turn-around (hours or days, not weeks) and detailed test results which provide the ISV or provider of enabling technology clues necessary to the resolution of the problem.

The Mobile AR Test lab would need to encompass both image-based and locative AR experiences, 2D and 3D rendering and other upcoming categories of display technology (e.g., eyewear) in order to meet the needs of existing and future technology providers.

## V. Possible Strategic Partners

There are existing organizations which could partner with the MMARE test development group. For example, the GSMA could make this an activity group. The W3C Mobile Web Initiative could contribute protocols or experience in the certification of standards and there are private partners which might be suitable as well. Kronos Group is another potential partner in the development of industry-wide test suites and testing facilities.

InfoStretch is introducing the Perfecto Mobile Cloud Testing service at MWC2010. The service permits clients to create a private handset cloud in which to test mobile apps and content on hundreds of real handset devices and covering several mobile networks. The service is designed to reduce the time for mobile network operators, OEMs, independent software developers and value added service companies to assure mobile user experience quality.

## VI. Conclusion

Mobile AR experiences are only in the first of many generations. In order for applications and services to provide consistent rewards to users and yet continue to evolve, there needs to be a minimum mobile AR experience defined and test suites developed to ensure that users, enabling technology developers and digital content providers continue to evolve and benefit with the minimum of technically-avoidable disappointments.

## References


[1] Perey, C., *Cross-platform Augmented Reality: The market need and potential solutions.*

[2] Perey, C., *Where's the money? Mobile AR Revenue Streams*