AR technology is widely seen as the next big thing, but how easy is it to develop apps based on this new revolution.

By **Kris Sangani**

DEVELOPING AR APPS

THE LATEST TECHNOLOGY craze on mobile devices, augmented reality (AR) has been around for many years, predating the era of the smartphone.

AR aims to supplement information in layers on top of an actual image, as seen through a mobile device's camera. The resultant image can then be displayed on screen.

All of this has been made possible thanks to a number of technologies that are now found on smartphones and tablet devices. These include sensors such as accelerometers and GPS, large clear displays with multitouch capabilities, faster processors and graphic processor units (GPUs), and high Internet speeds.

These technologies were not specifically designed with AR in mind. Therefore, the concept will present challenges for any app developers working to create useful software that can truly be described as augmented reality.

Over the past few years a number of AR apps have been made available for Android and iOS devices. Many of these are primarily marketing-related and AR is seen as an ideal platform. If you want to find the location of the nearest ATM machine, bank or restaurant, for example, then AR can offer a fun and practical way of finding them.

GPS-based applications take advantage of the Global Positioning System (GPS) tools already found in your

'You won't require a significant amount of extra programming knowledge if you are already familiar with software developer kits for the main mobile platforms'

smartphone. The applications use the position of your device to find nearby landmarks and any other point of interests (POI). Once the POI or landmark is located, the user can get additional information about it or get directions. These apps provide the user with education in real-time via their mobile devices.

Marker-based, or image recognition, apps use a camera to recognise an image in the real world, calculate its position and orientation, and then augment the reality. They overlay the image with content or information for the consumer.

The reality of AR

However, as the technologies on smartphones are not specifically designed to enable AR the problem comes when trying to maintain a certain level of quality and accuracy of AR, particularly when TV adverts and science fiction movies promise such a massive change to how we interact with the real world.

Pattern recognition, for example, depends on a good quality camera, which most modern smartphones possess. But the world which we live in exists in 3D. While your smartphone camera works well when interpreting 2D glyphs such as barcodes and QR codes, an actual object is far more challenging.

Another obstacle is the quality of compass and accelerometer technology in the current generation of mobile devices. Naturally, these depend on interpreting the planet's natural magnetic radiation to determine direction. However, they aren't very good at filtering out all the electromagnetic interference found in built-up areas.

Any owner of an iPhone, for example, has occasionally been instructed by their device to wave it in a large figure-of-eight motion when the compass has gone haywire. Typically, if a large object – such as a train or a tram, happens to go past while you're using your device's digital compass, it's likely to go crazy.

Another issue is the accuracy of the GPS. Currently, it is only accurate up to six metres. For simple direction finding this is fine, but for anything more mission critical it could be problematic. If you are creating a geolocational app that does not require pinprick accuracy, however, then the current level of technical development will suffice.

This explains why many of the applications currently under development involve locating buildings rather than anything that requires greater accuracy. Image recognition technology could be used to enhance the accuracy, but this would depend on the scenario.

Software development

So what can be created with the developer tools already available? And what type of knowledge would you require? The good news is that you won't require a significant amount of extra programming knowledge if you are already familiar with the software developer kits (SDKs) for the main mobile platforms.

There are a number of companies who specialise in AR that have released their own SDKs. You can use these to develop augmented reality apps yourself without a great deal of extra programming knowledge.

Layar has been around for a number of years, winning awards for its own branded app. The company encourages organisations or individuals to develop 'Layars' for use with its app. This is all part of its business strategy to make its >

INTERVIEW

3D SOFTWARE

BEN VAUGHAN, CEO of AR Toolkit, has spent the last 20 years involved in the real-time 3D visualisation industry, prior to which he spent five years as an investment banker and seven years as a strategic marketing and investor relations consultant. In addition to his role at AR Toolkit, Vaughan is on the board of Simulation Synthesis Ltd, a developer of real-time 3D authoring software.

Q. Was it envisaged back in 1999 that AR would be used in a mobile environment?
A. Yes, but the technology didn't exist so we had to work with desktop environments. The first development was on Windows, Mac and Linux. We were using 3D avatars, which were tracked and controlled by real-time motion and layering video. Not quite the same as using a live video stream, as we do nowadays, with real-time data on top of that.
Q. What was the turning point for AR technology?
A. Nothing was really selling until 2009. On the mobile platform, we were first with a software development kit (SDK) for the iPhone platform. This was a straight port by AR Toolkit back in 2007.
Q. What is your business model?
A. We generate our revenue in two ways. The main one is selling licenses, and we also do technical development for people who require it. That could be porting it to new platforms. We have ported it to a smart TV platform, for instance, but I can't tell you which company. Another example is adding in new features – we will only do that if it's features that we want anyway. If we can find somebody who will pay us for something that we want to do, then we'll do that.
Q. How easy is it to use your toolkit if you're an existing mobile app developer?
A. If you were an iPhone developer thinking about doing an augmented reality app, it would probably take you about 40 minutes to get familiar with our stuff. It's literally that simple. If you were an Android developer, again you would have absolutely no problem at all using AR Toolkit.

But you would need to be a developer on whatever platform you're working on. These are software developer kits. They are not for people who do not know how to program.
Q. Is there an example of your software being used that you are particularly proud of?
A. To be brutally honest, we're proud of very few uses of our SDKs. All of them are virtually gimmicks. In common with many technologies, it is picked up by advertising and marketing companies. After several years saying essentially the same thing, you say "well, so what?".

The vast majority of our applications are not for use outdoors. There are good uses of augmented reality at the moment. From the beginning of last year, we have seen a noticeable change in our customer base. There are more industrial applications. They want to integrate augmented reality into the workflows of their own software.
Q. Where do you see the technology going in the next two years?
A. The current generation of smartphones aren't very convenient and they're not user-friendly for AR. You're not going to want to look at an object through your camera phone. No one does. It's ludicrous. However, it is the only thing that's portable, easy and works and that's why it is used.

Google Glass is close to the vision that I've had for the past 25 years – to be able to walk down the street wearing your ordinary glasses with a see-through display. This is what Google is working on now. This will be a step forward toward my original vision.

INTERVIEW

REALITY DEVELOPMENT

DIRK GROTEN, CTO at Layar, is responsible for the R&D and development team, which is based in Amsterdam, Kiev and Donetsk.

Q. What type of industries do your customers come from?
A. We see most interest in the print industry. The media industry is really about reader engagement. There is still a lot of interest in creating brochures and engagement with the readers. Currently with print, you're not going to know how your readers are engaged. With augmented reality, you can see how your readers are viewing your content.
Q. You have a geolocational aspect to your service. What industries use this?
A. It's really very varied. We have a lot of real estate agents. They create geolocation layers. You may see somebody using it to promote an event at a specific location. Museums, art events and universities are doing this. It's getting more local than it used to be. If you think of a service such as Yelp, they have a huge database and benefit from our service.
Q. Is anyone developing B2B services using Layar?
A. There have been initiatives from architects and engineering companies to show their work to prospective customers so they can visualise it before it's built. But the GPS accuracy needs to be improved upon. We are working on this.
Q. The Galileo project opened up its toolkit. Are you looking at this?
A. I've had a brief look at it. There will be a definite trend in using it if you can make it more accurate than current GPS. It would also require hardware and there is a toolkit. The main shortcomings of GPS is the lack of accuracy. If you can reference what the camera sees then you can play something on top of it.
Q. Where would you like to see the accuracy improved?
A. One of the big issues is still the compass. In most devices it's very inaccurate. Even if I know your location down to the centimetre, I cannot show you if the compass is out by even 10 per cent. Obviously, we are looking at ways to combine vision and geo. That requires us to have a database of the entire world in relation to imaging.
Q. Are you seeing any hardware improvements to improve compass accuracy?
A. There are some in the pipeline. More accurate compass technology does exist, but it depends on miniaturisation and price, and if manufacturers are willing to pay extra for more accuracy. So it's a little bit of a chicken and egg problem.

One of the issues that you will always have is that the compasses rely on the Earth's magnetic poles, which are prone to interference. There is magnetism all around you, especially in big cities, that could be more powerful. Being able to filter this out is pretty tough. I live in Amsterdam and we have trams that generate huge magnetic field when they pass because of the electric current that they use. If I'm standing on a road and a tram goes past, my compass just goes wild. It's going to be very difficult to correct.
Q. Are you interested in developing for Google Glass?
A. Definitely! Although it's still not proper augmented reality. They are not covering your entire field of view. They don't transform reality. If you look at proper augmented reality hardware, it's still very bulky. You need a lot of computers and processing power. The only way to do it properly is to have the camera view projected on small screens with the projections on top of it – within the lens.

Google Glass is still very interesting because it gives you contextual information about what you're looking at. It doesn't do augmented reality, but it does do some type of reality.

< app the de facto standard for augmented reality. In fact, there is a fierce war among software companies to become the Google of augmented reality – even Google has entered the fray with the development of Google Glass.

Blippar competes with Layar and would also like to become, to all intents and purposes, the go-to platform in AR. Aurasma and Nokia have also developed similar branded apps. No doubt, others will follow suit.

If you want to add your slice of AR to their apps, which they brand and market as being available on most mobile devices, then, in most cases, it's a simple drag-and-drop operation with negligible programming expertise required.

AR Toolkit

But not everyone wants to use the pre-existing branded applications. If you view AR as a function and not as an application, many would like to use augmented reality in existing apps.

AR Toolkit was one of the earliest companies to develop augmented reality apps. In fact, their software predates the introduction of feature-rich applications on smartphones. Surprisingly, the founders did not originally envisage AR technology being incorporated into mobile technology.

The company, based in Washington State, USA, was started by five leading engineering academics – three of whom are still professors. Their toolkit is available to download by anyone, but to use it commercially you have to purchase a license. The reason for allowing it to be downloaded by anyone is to increase the pool of developers who could add further functionality to it.

New technologies, some of which are only a year or two away, will allow developers to create a raft of new professional AR applications, some of which could make a real difference to our lives.

The Galileo satellite system, currently being developed with support from the EU, will offer European users a more accurate and reliable service. This will underpin a new generation of highly intuitive and sophisticated apps and consumer technologies, one of which will most definitely be augmented reality.

To encourage this, Galileo will provide the world's first specially developed commercial signal to try and boost private sector exploitation of its data. The project has already garnered interest from a variety of contributors including representatives from the aviation, maritime, rail, road, pedestrian, offshore oil and land surveying industries. This gives an indication of how widespread the use of AR could be.

Satellite navigation

The University of Nottingham's Centre of Excellence in Satellite Navigation, GNSS Research Applications Centre of Excellence (GRACE), along with the Satellite Applications Catapult, the Technology Strategy Board, UK Space Agency and EADS Astrium, recently launched the UK leg of the European Satellite Navigation Competition.

The competition is on the lookout for new ideas from the public for how we use these precise positioning and timing signals to create new technologies. The best entrants will be helped to turn their ideas into reality through financial prizes and business support, patent advice, and introductions to industry partners.

Chip-making company CSR is adding a new feature of indoor tracking to its line of SiRFusion location technology.

The company recently demonstrated devices that pulled together several different technologies to make reliable and accurate indoor navigation possible.

The company's SiRFusion platform and its SiRFstarV mobile chip architecture amount to the latest navigation technology that customers could use in smartphones, tablets and other mobile devices to track a person's location as they're walking through a big building.

The motion-tracking system combines navigation data from the GPS and Wi-Fi network triangulation, as well as motion-sensing devices in the smartphone itself including gyroscopes and compasses. Separately, each one of these systems has its own limitations but together they can do a decent job. *

Layar

SEE PAGE 4

Download the Layar app to see example

LAYER