Mobile Acuity
The Pioneers of Mobile Visual Search

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1. Background – Technology Drivers

The 6th August 1991 is widely recognised as the birth of the World Wide Web. This is the date that Tim Berners Lee announced the project on the alt.hypertext newsgroup and made the tools and service publically available for the first time. What followed was an unimaginable rate of growth of content and services that has profoundly changed all aspect of our lives.

This rapid growth made it increasingly difficult for users to find relevant content and so the web search engine industry was born. Being the favoured company to help users find content turned out to be incredibly valuable and this fact drove the growth of the Internet giants of today. Although the Web has always supported multi-media content the predominant way to search the web was, and to a large extent still is, to use text queries.

In the same year that the Web went public, the nascent mobile phone industry went digital with the launch of the first GSM services. Digital data services continued to evolve over the following years but it would be a further 16 years before access to the Web through mobile devices would become mainstream. This was largely down to major improvements in usability and awareness with the launch of the iPhone and a succession of competitors. From this tipping point the growth of the mobile web has continued at a phenomenal pace and by 2014 more people will access the Internet using a mobile device than using desktop computer or laptop.

A key driver for the growth in the mobile Web is ease of use. Touch screens have transformed the user experience and easily installable apps have simplified access to data and content provided by web apps over the Internet. Device sensors are being exploited to further improve the user experience in ways that are not possible or practical on non-mobile devices. Location is being used to bring more relevance to search results and voice recognition is being used to shortcut the awkwardness of typing in small keypads or screens.

2. The Growth of Mobile Visual Search (MVS)

Cameras on mobile phones have proved popular since the mid 90's and by 2006 half of the world's mobile phones had a camera. Although the camera was designed for the simple purpose of taking pictures early innovators had other ideas. In Japan, where a proprietary mobile "Internet" was growing in popularity in the early 2000's, Toyota had invented a barcode that could be read using a camera (the QR-code) and this provided a novel way to connect physical objects to digital content by attaching a barcode to the object.

Whilst Japan was getting excited about QR-Codes, innovators from NASA's Jet Propulsion Laboratory, from two Californian tech companies and from Edinburgh's department of Artificial Intelligence (a team who would later form Mobile Acuity) were independently thinking beyond barcodes. Their idea was to apply new techniques emerging from Artificial Intelligence and Computer Vision research to enable a mobile device to recognise objects in front of the camera and to return relevant search results. This activity heralded the dawn of Mobile Visual Search (MVS).

Although Mobile Visual Search is still in its infancy, today it has come a long way in the intervening decade. Google and Microsoft have built MVS into their mobile platforms (Google Goggles and Bing Vision), Amazon acquired one of the early MVS companies and made book and CD covers searchable and Ebay is launching MVS with the prediction that this will lead to nearly £100M of new sales for the company in 2014. HP has recently announced the launch of an MVS platform to bridge the world of print to digital and their competitors are following with similar offerings. There are, however, only a small number of independent MVS technology providers in the marketplace, Mobile Acuity being one of the market leaders.

The underlying technology underpinning MVS is still in its infancy. The techniques are highly specialist, not widely published and difficult to replicate. The range of objects that can be effectively recognised is not yet universal and many years of fundamental work is required to fully solve the problem. Today the most effective objects for recognition are those that are fixed in shape and highly textured such as printed materials, product packing and logos. What now seems certain however is that MVS is going to increasingly close the gap between the real world we live in and the digital world we increasingly depend on and value.

3. Mobile Acuity – the Pioneers of MVS

Computer vision specialists, Dr. Anthony Ashbrook and Dr. Mark Wright from the University of Edinburgh, founded Mobile Acuity in 2006. Anthony is now widely regarded as one of the pioneers of mobile visual search, recognizing the opportunity to take his vision knowledge and apply it to the evolving consumer mobile sector.

The founders are credited with inventing and creating the world's first MVS system that allowed users to have some control over the association of images of objects and the corresponding search results.The first

> "We understood that the quality of the data in our system was crucial to its success. We didn't believe that scraping images and content from the Internet would result in efficient searches with results relevant to a mobile user so we developed two novel features to solve this problem."

feature of Mobile Acuity's pioneering image recognition software is an API and web interface that allows businesses, and other users, to directly upload images and associated search results. An example would be a business uploading their visual assets to make them searchable. This feature is now commonly known as a Data API.

The second feature allows the end user, who runs a search, to recommend additional search results or to add their query image to the system if the searched object is completely unknown. This feature is now commonly known as 'Crowdsourcing'. An example would be a user linking an image of product to comments, for example on Twitter.Underpinning this invention is one of the world's leading MVS software

> Mobile Acuity's patented technology bridges the gap between offline and online media.

implementations. Mobile Acuity's platform has been developed in-house over a number of years and has been validated in a range of large-scale commercial applications including major retail, marketing and publishing companies.

4. Cloud and On-Device MVS

Today, Mobile Acuity offers two leading MVS solutions to the market, namely Cloud MVS and On-Device MVS.

For large-scale campaigns and product databases containing millions of images Cloud MVS is the optimal

solution. With a simple 'point and click' action using the mobile device's built-in camera, consumers gain access to their marketing promotions and digital content within seconds.

For a small number of images (up to 100 in total), the On-device MVS solution offers consumers an instantly rewarding and engaging experience. The 'scanning' camera action, together with the optional multi-response 'Action Layer', means consumers have access to exclusive content, online shopping and can share content with friends with a single click, in real-time.

5. Case Study - Cloud MVS

Background

HMV listening post is a mobile app that enables consumers to listen to music previews by simply taking a photo of a CD cover. This can be a physical CD in store or a printed image of the cover art, such as a poster, flyer or in HMV advertising. Mobile Acuity's image recognition technology is used within the app to allow music to be visually searched via the CD cover art and matched to the track samples. The consumer is then able to instantly preview and purchase the album in store or online.
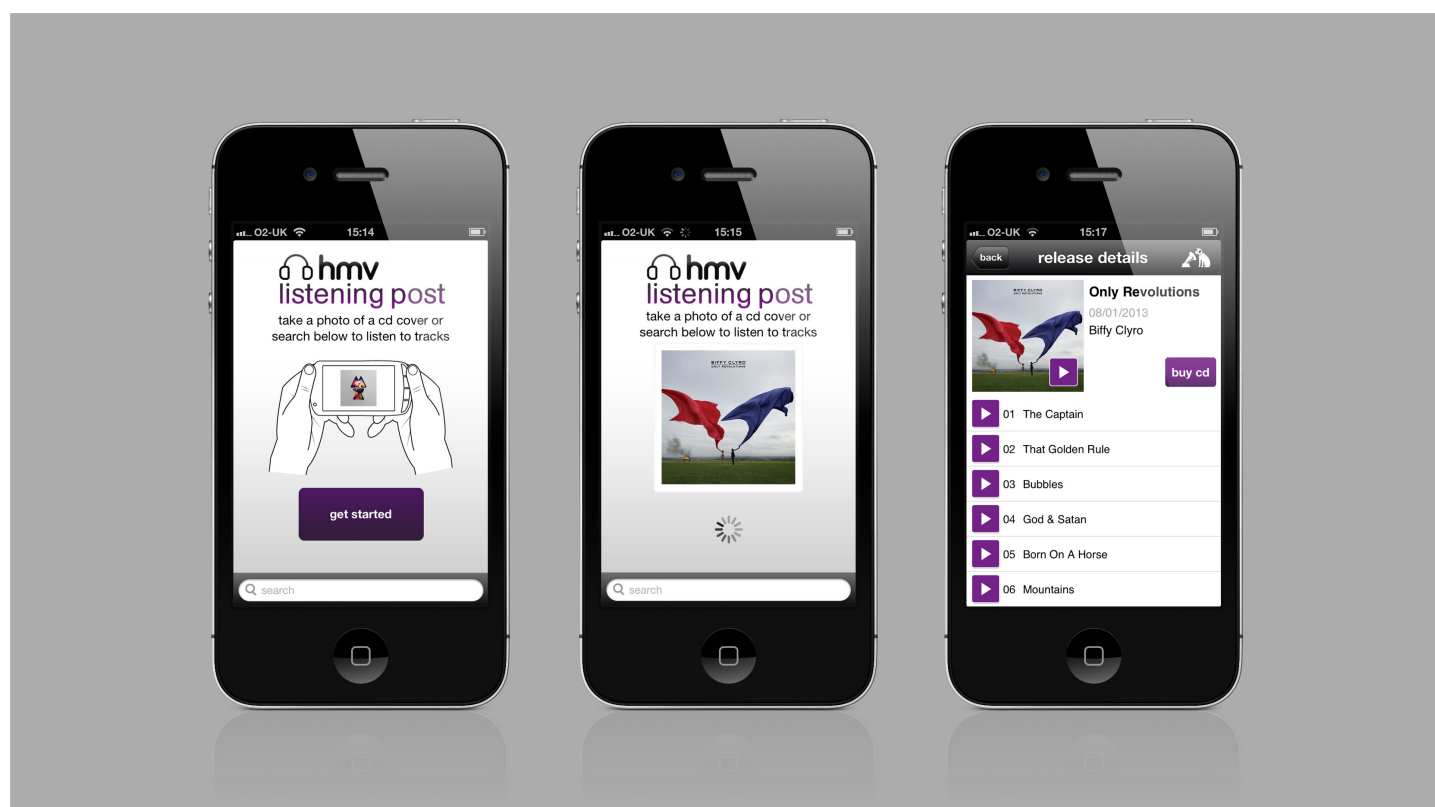
Solution

The Mobile Acuity Cloud MVS API was integrated within 7digital's existing API to develop a Visual Music Discovery (VMD) service for its partner network.

7digital worked with existing partner HMV to create the first licensed VMD application. The 'hmv listening post' is a mobile app that directly accesses Mobile Acuity's Cloud MVS API to enable consumers to listen

to music previews by simply taking a photo of a CD cover. This can be a physical CD in store or a printed image of the cover art, such as a poster displayed in store or in HMV advertising.

Within seconds, a search for the image is made against the database of the UK's most popular 100,000 CD albums for a match. As soon as a match is made, the track list is visible and the consumer is able to listen to 90 seconds of each song before being able to purchase the album via hmv.com or hmvdigital.com. New CD releases are uploaded to the scalable database on a weekly basis, which ensures the very latest albums are instantly available to consumers however, and wherever, they wish to sample the music and make their purchase.

6. Case Study - On-Device MVS

Background

New York agency, King & Partners has developed an app — Agent 3.1 — for fashion brand 3.1 Phillip Lim. The app uses Mobile Acuity's On-Device Mobile Visual Search (MVS) technology to allow consumers to gain exclusive insight into the brand and the designer. The app acts as a special 'lens' to the brand, unlocking exclusive content, hidden items, product details, designer inspiration, behind the scenes access, shop looks and links to special offers, creating a unique and interactive customer experience. 3.1 Phillip Lim's design sensibilities are 'all about the subtle details, the hidden transformations in the clothes — designed for the curious global citizen - making this app a perfect agent for discovery'.

Launched in September 2012, the 'Kill the night' comic book style printed collateral is linked to this additional online content. Using the Agent 3.1 app, select areas of the campaign material can be scanned with an iPhone or iPad camera to access further content on a mobile website. There are also custom looks that can appear and users can link to an online shop to purchase the items. The app also contains 'Action Layer' buttons for users to share the brand content via Facebook and Twitter or contribute to an online discussion.
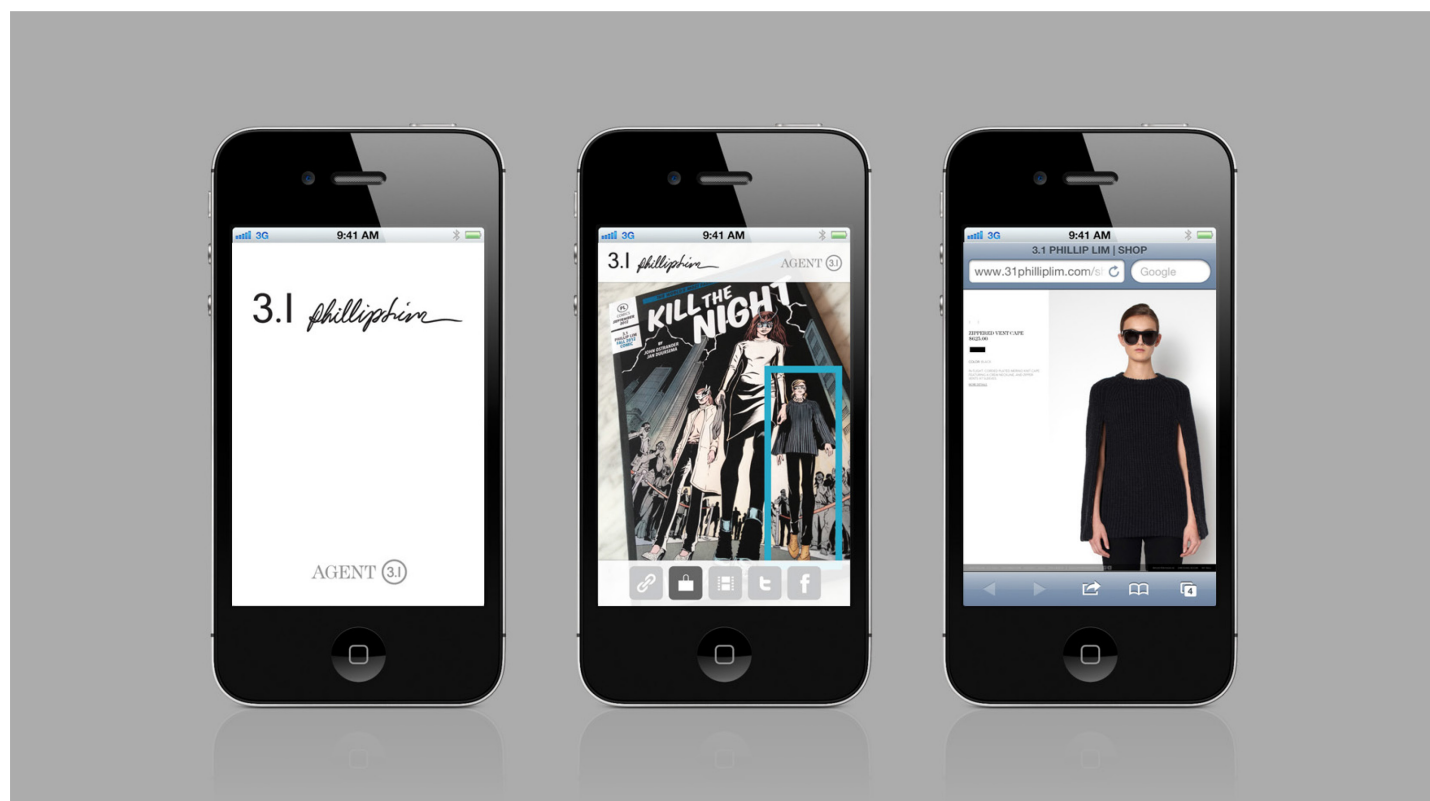
⬡ Solution

The Agent 3.1 app embeds the Mobile Acuity real-time mobile visual search SDK with a custom-branded user interface. Selected images and content from the Agent 3.1 campaign collateral range are linked to different mobile microsites.

An additional 'Action Layer' adds custom-designed icons enabling users to instantly share their discovered content with friends via Facebook and Twitter, to create an engaging and fully interactive, luxurious and unique experience.

7. Summary

In an increasingly digital world and one where devices are increasingly mobile (evolving from Smartphones today to wearable computers and "eyewear" in the near future), new and disruptive ways to search for information and content are being developed. One of the key technologies in this brave new world is Mobile Visual Search (MVS).

Mobile Acuity and its founders are pioneers of Mobile Visual Search. Their patented image recognition technology bridges the gap between offline and online media by linking printed material and physical objects to digital content, social media, commerce and marketing. Their Cloud and On-Device MVS solutions enable brands, retailers and publishers to better engage with their customers, seamlessly integrate communication channels, aggregate content and enhance brand/customer experience.

Leading companies worldwide have implemented Mobile Acuity's image recognition technology, providing a fast, accurate and immersive brand experience for their consumers.