BONDI Augmented Reality - David Rogers
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Abstract

The potential for creating powerful, cross-platform Augmented Reality (AR) applications for mobile devices through the use of widgets and web applications is huge.

OMTP BONDI [1] is a project created by the Open Mobile Terminal Platform [2] to connect the web securely to physical device functions. OMTP BONDI implementations are currently being demonstrated on a number of mobile platforms including Android, LiMo and Windows Mobile with more expected to be announced in 2010. AR is a maturing technology with technical and usability challenges to overcome, but the future looks impressive.

Augmented Reality with OMTP BONDI

In the past year, a number of AR applications have been developed for the iPhone, S60 devices and Android. The primary reason for this recent surge in development has been the integration of sensor hardware and the ability to access this through developer APIs, alongside other functionality such as the camera.

The majority of applications developed on these platforms have been native – i.e. they are written specifically with that platform in mind. One of the main weaknesses of native applications is the inability to transfer them across devices. An iPhone app won't run on Android and nothing from the outside can run on a proprietary RTOS System. In the long term this is detrimental to the uptake of the application and its richness. Significant development effort and cost needs to be expended to ensure that the application will run on as many platforms as possible. This takes time away from feature development.

The Power of WebApps

One possible route to solving the problem of application fragmentation is to use the components of the browser to provide cross-platform capabilities. In this always-connected age, most of the useful information you need to display is most like going to reside on the web. Everything from tweets, Flickr images, local information to interesting content is probably going to have to be downloaded from the Internet. The most efficient mechanism of getting information from the web is to use web standards and the web runtime of the device.

Developing a website is much easier than developing a native application which would perform exactly the same function. However, what has prevented web applications from achieving their full potential is a lack of access to physical functions. Plug-ins exist for web cams and other peripherals on laptops and PCs but these are generally proprietary and not open to third-party development.

Another reason that the web has never been fully connected to the physical world is the question of security. Allowing unfettered access to premises sensitive features such as location and the camera has obvious implications. There are other questions of integrity and abuse by malware of these features. The mobile industry and web community have been working to try and address these challenges, opening up web applications to their full potential and defining self-contained web applications called widgets.
How would you develop an AR widget that could run on different platforms?
The contents of widgets are based on AJAX technologies – JavaScript, CSS, HTML and XML – in effect a mini website all packaged in a renamed zip file – to .wgt. All the visuals are therefore created via HTML and a stylesheet, with dynamic elements being controlled by the JavaScript.

BONDI uses the W3C Widget specifications [3], which OMTP helped to define. This suite of specifications will ultimately ensure cross compatibility across many different types of devices, not just mobile phones. The main specification in use here is the Widgets Packaging and Configuration specification [4] which defines the zip mechanism for packaging and a configuration xml file which defines what the widget does and where its icon is etc to make it into an 'application'.

JavaScript Interfaces

OMTP BONDI defines a set of JavaScript interfaces to the features that you may want to use to create an AR application. Importantly, the widget framework is extensible such that new APIs can be added in the future without major architectural implications for a developer. The current most relevant APIs to AR are:

- Camera (Available now – BONDI 1.0-1.1) [5]
- GPS / Compass (Available now – BONDI 1.0-1.1) [6]
- Accelerometer / gyroscope (BONDI 1.5 – Sensors API)
- NFC (BONDI 2.0)

Using the camera API, developers can overlay images, pointers or data in appropriate positions to images coming back from the camera. This could be further enhanced in later versions of BONDI.

The geolocation API supplies information such as heading, latitude, longitude, velocity and altitude allowing the developer to use this for geo-tagged imagery or for situational awareness. If a 3D map view was required, this information would be crucial.

Developers are encouraged to develop shareable libraries built upon the BONDI device APIs to make the development of such applications even easier. Third-party JavaScript libraries are easy to integrate into a widget, just by adding the appropriate '.js' file to the package. Likewise, new APIs can be submitted to BONDI by getting directly involved as members of OMTP.

Access Directly from a Browser

BONDI APIs can also be called from inside a webpage. That means that you can just navigate to the page through your browser and if a BONDI call is made, you can get access to the functions you need. You wouldn't have to install something specific; you could even be directed there by an NFC tag you touched on a poster.

Security

The widgets themselves are digitally signed to ensure integrity and identity. Different levels of trust can be assigned dependent on the signatory. OMTP BONDI defines a security policy framework which helps to govern access to device features. Rich policies can be created which can arbitrate on behalf of the user, reducing the need for prompts and acting in a more useful and intelligent way than simple binary go/no-go policies. Policies can be updated and replaced by a delegated trusted third party that the user decides upon. This could potentially be an anti-virus vendor, a consumer organisation or even a charity.

An Example – BONDI AR on Android

Droidget [7] is a widget player based on OMTP BONDI from Gclue (an OMTP affiliate member). The video shows a demonstration of an AR application being used to pick up markers from real-world objects then use the device to control the object remotely [8]:

Limitations of AR

The user experience of current AR applications could be described as quite 'clunky'. There are still a number of technical and practical issues to be overcome to create a seamless experience for the user, but we're in a position to be able to glimpse into what the future holds now. The mobile industry should address the core issues of processing speed, memory and also the battery life issues created by the camera being in preview mode. Developers should ensure that their applications have the ability to compensate for the physical issues; loss of GPS or network and latent inaccuracies. They must also consider the way in which users will interact with the device – blocking fiduciary markers and reference points and dropping them out of view as well as rapid movement which is too quick for the camera to capture. Whilst the technology is still its relative infancy, usability is paramount.

Standards

Standards are beginning to emerge to tackle the problems outlined above with device APIs and their security. The specifications for OMTP BONDI can be found at [9]. This work has been input into W3C as part of the charter to the device APIs and policy working group (DAP) [10]. All of OMTP's BONDI specifications are submitted, royalty free to the W3C DAP working group.

Future Applications of AR in Widgets

The opportunities and possibilities for AR widgets are endless. Some examples could be overlayed photos on your location for sight-seeing to interactive museum exhibits, gaming, indoor navigation of buildings and remote AR from another location. Spatial Augmented Reality (SAR) could be based on information from a group of people in a specific location, from their broadcasted mobile device information. Advertising could be broadcast targeting a particular demographic or interest.

Toys

Mattel have launched a range of toys based on i-tag such as the Avatar I-Tag range of toys which can be used to generate characters and vehicles from the movie Avatar [11]. The company who created this, Total Immersion [12] have also created a range of AR baseball cards (as shown below):

An Augmented Reality Baseball Card [13]

Users would like to be able to experience this kind of AR on the move, not just in front of a laptop. One great part of the AR experience is the wow factor from showing something to another person. It is only natural that people would want to be able to share that experience with their friends. What use is a toy if you can't play with others? This is where the mobile can play a clear role – not just through viewing the toys with AR, but actively interacting between them – Top Trumps [14] and battling games would take on a whole new dimension.

Future Platforms

BONDI is not confined to mobile – feasibly it could live on anything with a web runtime. Widget enabled TVs are available now [15]; in the future cars and other home appliances will be web-enabled.

In a car you could use the mobile device as a generic Head-Up Display or control the AR from the device through to a pair of sunglasses using Bluetooth or another wireless method [16]. These uses of AR are already being applied in the military and also for emergency services using systems such as the

Earthscape ARS [17]. It isn't hard to imagine how much money governments could save on road signs in the future if everyone had an AR HUD available to them.

Example Road Sign Cost [18]

Summary

OMTP BONDI is one technology that developers could use to create interoperable, rich Augmented Reality applications in a cost-effective manner. As hardware technology develops and more device functionality becomes available, BONDI APIs will expand to cover those features to offer developers an ever-richer set of tools to create stunning widgets and web applications for users.

References

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