Considerations of Generic Framework For AR on the Web

Jonghong Jeon
ETRI, SRC

Email: hollobit@etri.re.kr
Blog: http://mobile2.tistory.com
     http://twitter.com/hollobit
What is the Augmented Reality?

Augmented reality (AR) is a term for a live direct or indirect view of a physical real-world environment whose elements are merged with computer-generated virtual imagery – creating a mixed reality.
What is the Augmented Reality?
Augmented Reality Platform consist of ...

Visualization

- Computer graphics
- Virtual reality
- 3D graphics
- Multimedia streaming
- Data visualization

Information Architecture

- Network
- Internet
- Web
- Search
- Database
- Data mining

Context Awareness

- Computer vision
- Marker recognition
- Detection & tracking
- 3D reconstruction
- Sensing
- RFID/NFC
- LBS/GPS/WPS

....
History of Augmented Reality

Ivan Sutherland creates the first augmented reality system 

Reference: https://www.icg.tugraz.at/~daniel/HistoryOfMobileAR/
Two Types of AR Trend

Visualization Approach

Informative Approach
## Two Types of AR Trend

<table>
<thead>
<tr>
<th>differences</th>
<th>Visualization Approach</th>
<th>Informative Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main focus</td>
<td>Made (Virtual) Reality</td>
<td>Information Provide</td>
</tr>
<tr>
<td>UI</td>
<td>3D object overlay (rendering and registration) and interaction</td>
<td>Navigation (or browsing) with related information</td>
</tr>
<tr>
<td>Requirements</td>
<td>Graphical performance &amp; computing power</td>
<td>Mash-up capability</td>
</tr>
<tr>
<td>Target Devices</td>
<td>Desktop (or higher)</td>
<td>Smartphone (or lower)</td>
</tr>
<tr>
<td>System type</td>
<td>Isolated system</td>
<td>Networked system</td>
</tr>
<tr>
<td>Augmented Target</td>
<td>3D object</td>
<td>Position, relationship, ..</td>
</tr>
<tr>
<td>Application Type</td>
<td>AR 3D game, AR advertising, AR based e-learning, Medical AR, AR based Technical Support System</td>
<td>AR information browsing, AR based Navigation, location overlays, geo-information services, gaming</td>
</tr>
</tbody>
</table>
Informative AR Examples and Applications

- Currently, there are four main categories of AR applications: navigation, location overlays, geo-information services, and gaming.

http://gigaom.com/2010/02/02/mobile-augmented-reality-apps-that-will-change-the-way-we-see-the-world/
AR Software Considerations

- the most important software environment for AR is the AR browser.
- A AR browser is a navigation application that ties geolocation data with digital contents.
  - Pulling in and managing geodata from both in-app sources and third party data sets
  - Rendering 2-D and 3-D objects
  - Linking to web sites or phone functions such as voice communications, text or email
  - Allowing geotagging (or commenting) by the user
  - Enabling data feeds from content providers to populate the mobile AR display
  - Interfacing with the smartphone’s camera for displaying output
  - Allowing the user to filter what is displayed to them in a mobile AR session
Augmented Reality on the Web?

Reality
(Live Video)

Augmented Information
✓ Virtual 3D Object
✓ POI (Point of Interest)
✓ Recognized object Info.
✓ Social Relationship
✓ Related Information
✓ Related Links

AR
By the Web
For the Web
Of the Web

Web
Augmented Information (or Link)

- For Who
- For What
- When
- Where
- For Why
- How

For me
For everyone
For ...
Target Object
Social
Phone Number
...
Location
Context
Interaction method
AR Contents Service Framework

AR User Agent

Interoperable Usability

Any Device

Internet

AR Contents Provider

AR Data Provider

Contents Authoring

Service Reusability

Contents Authoring

Service Reusability
Why Augmented Reality on the Web

Why do we have to use another browser?

Pros
- Do not need another application (AR browser)
  - Web User Agent can AR browsing
- Content Usability
  - Standards based AR Content Authoring/Providing/Consuming
- Effective AR Browsing
  - Reality (Live Video) + Augmented Link (Social, POI ...)
  - Nested AR contents browsing

Cons
- Performance issue
- Browser extension
AR Interoperability Issues

AR User Agent
- 3D/Interaction engine
- AR Markup Renderer
- Scripting
- Local Cache
- Additional Func.

Device Capability (Display, Video Camera, GPS)

AR Contents Markup

Open Marker Database

AR Data Format (POL, Person...)

images, text, animated and still 3D models, Voice

AR Data Provider

AR Contents Provider

Additional Func.
- Scripting

Device Capability (Display, Video Camera, GPS)

AR Markup Renderer

3D/Interaction engine

User Agent

AirTag
AirFilter
AirShout

AR Data Provider

Open Marker Database

AR Contents Markup

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AR Interoperability Issues

1. AR Contents Markup & Format
2. AR contents Transport/Interaction method
3. Representing 3D Interactive AR/MR Contents
4. Event Scripting Engine
5. Local Caching method
6. Additional functionality of AR Agent
7. Device Capability Access APIs
8. AR Data Mashup method
9. AR Data Format – POI(images, text, 3D models, URLs), Person..
10. AR Data Service API
11. Open Marker Database
12. Security & Privacy
Web Application Architecture

- **HTML5**
  (Web forms, Video/Audio, Canvas..)
- **Web Application APIs**
  (Web IDL, Web Socket, Web Worker, Web Database....)
- **XMLHTTPRequest**
- **Widgets API**
- **CSS**
- **Device APIs**
  (Calendar, Camera GPS, File,..)
- **XML**
- **ECMASCript**
- **DOM**
- **HTTP + URI/IRI+ Unicode**
AR on the Web - W3C’s point of view

- **Web User Agent**
  - ARML + POI data + ... ??
  - X3D, WebGL ??
  - Interaction/Gesture ??

- **Working specs**
  - XHR2
  - WebSocket + WebStorage
  - Device API + Geolocation
  - HTML5 (Canvas + Live Video)

- **Current Standards**
  - SMIL + SVG + RSS + Atom
  - JavaScript
  - XML + DOM3 + CSS3
  - URI/IRI (PyI ??)

- **Decentralized Extensibility**
  - HTTP + XHR
  - HTTP + REST

- **Future Item ??**
  - SSL, OAuth, OpenID

- **<HTML5>**
  - <Script>..</Script>
  - <X3D>..</X3D>
  - <POI>..</POI>
  - <KML>..</KML>
Conclusion - AR/MR standardization

- Made further efforts
  - Organize the new group (IG or WG)
  - Develop the standards for AR on the Web

- Working items
  - HTML5: Live Video Streaming (& codec)
  - Device API: Camera API (to control Live Video), Geolocation API
  - Web Application
    - Widget, XHR2, Web Socket, Bidirectional connection (IETF)
  - New Working Group's item ?? - AR/MR on the Web
    - PyI (Physical Object Identifier)
    - Registration & 3D object integration (with HTML5)
    - Interaction & Event Processing (with HTML5)
    - Representation of Augmented Link (POI marking, AirTag ...)
    - AR Ontology (metadata processing)
Conclusions

- AR related standardization activity in another bodies
  - ISO/IEC JTC1 SWG-planning
    - Korea National Representative – Propose to new work scope (AR) on JTC1
  - ISO/IEC JTC1 SC24
    - Hajin Kim (SC24 chairman)
    - Jeonghyun Kim (Korea Univ.) - Representing 3D interactive AR/MR contents (WG6)
    - WoonTaek Woo (GIST) – Collada extension for AR (WG6)
    - Korea National Representative - Proposal for New AR WG (maybe WG9)
  - OMA CD WG – Mobile AR
    - LG Electronics, Enswers, ETRI, Olaworks, AT&T ....

- ETRI has been coordinating these activities (in Korea)
  - We were already organized to AR standardization workshop twice
    - 1st AR/MR Standardization Workshop, (POSTECH, April 23, 2010)
      - [http://www.w3c.or.kr/~hollobit/ARKR/201004-workshop/](http://www.w3c.or.kr/~hollobit/ARKR/201004-workshop/)
    - 2nd AR/MR Standardization Workshop, (KIST, June 3, 2010)
      - [http://www.onoffmix.com/e/hollobit/1571](http://www.onoffmix.com/e/hollobit/1571)

- ETRI will fully support to W3C’s AR on the Web activity.
Thank you

For more discussion:

JongHong Jeon (hollobit@etri.re.kr)
+82-42-860-5333

Blog: http://mobile2.tistory.com/m
http://twitter.com/hollobit