7
Mobile News Design and Delivery

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1   A Brief History of Early Wireless Media Content

Since radio pioneer Lee de Forest first delivered audio news reports and music
via his wireless arc-transmitter in 1916 (Anonymous, 1916), wireless delivery
of media content has been an increasingly important part of the mass com-
munication landscape in the U.S. and around the world.

As much a self-promoter as a radio pioneer, de Forest observed, "Personal-
ly I can see no reason why the wireless telephone transmission of news in the
near future will not be a regular means of communication, and a very valua-
ble one, too, in supplementing by bulletin the various editions issued by the
metropolitan newspapers. All that is needed is the news, and a comparatively
few, well-located, high-power stations capable of covering the entire country.
Already we have in the United States, I should say, at least 200,000 amateur
wireless outfits waiting to receive news and music by the wireless telephone."

De Forest realized that wireless transmission of news was economically via-
ble as well, noting that wireless news publishers would be the only ones in the
world "who are not affected in one way or another by the higher cost of paper."
Since the experiments of 1916, the 20th-century witnessed dramatic growth
in wireless media, both in their content and distribution. Audiences have
swelled to the billions around the world. The technology for mass media has
changed significantly as well, including, the development of FM radio, wire-
less video transmission, satellite transmission, and the invention of mobile
audio and video receivers. With the invention of the transistor and then the
transistor radio, listeners were able to tune into audio media programs from
their cars or portable radios.

Yet wireless media content itself has evolved relatively little beyond becom-
ing somewhat more sophisticated in style, presentation, or production value.
The basic model of producing audio, and later video, programs, either live
or recorded, for one-way distribution to a listening or viewing audience has
changed little in the eight decades since de Forest's time. The same content is
often distributed to audiences via wireline media as well as to fixed-position
devices. The content is generally in no way designed for mobile media, and

is virtually identical whether received on a fixed-position or mobile device. Radio content, since it is in audio format, is the only type tailored for mobile or mobile wireless devices. There are some services, such as Vindigo (a subscription service that allows users to put phone books, directory services, guide books, and maps on mobile devices such as the Palm), that provide marketplace information such as restaurants, shopping or services (e.g., the nearest ATM) relevant to a user's location or destination.

The development and convergence of a series of wireless and mobile communications and computing technologies in recent years, however, presents a rare opportunity to dramatically transform media content for mobile wireless communications, especially in the design and delivery of news and information (Pavlik & McIntosh, 2003). News organizations are beginning to explore the implications of these technologies for news design, production and delivery. News services, such as the Associated Press (AP) and Reuters, are especially interested in mobile wireless technologies both for their reporting staff and audiences because of the speed and flexibility these tools provide. On one occasion in 2001, AP and Reuters both used mobile wireless technologies to report a much-anticipated decision in a court case in Lower Manhattan. AP reported the verdict by mobile phone. "We then got additional color material via Blackberry® from the courtroom," notes the AP's Rick Spratling.[1]

Using a computerized system that monitors the newswires, Reuters discovered that AP moved the story on the wire first by a few seconds—a critical span for traders.

Today, mobile wireless technologies are perhaps most important during times of crisis, such as during the immediate aftermath of the Sept. 11, 2001, attack on the World Trade Center when many telephone land lines were damaged or overloaded in Manhattan.

Against this backdrop, this chapter explores experiments with new forms of media content delivered to or accessed by consumers equipped with mobile wireless communications, conducted by a research program at Columbia University.

2   Today's Technology and Trials: The Situated Documentary

Through an interdisciplinary collaboration between the Center for New Media in the Graduate School of Journalism and the Computer Graphics and User Interfaces Laboratory in the Department of Computer Science, we have been developing and testing a new form of news content for mobile wireless

communications. We call it the "situated documentary." The name derives from the fact that the audience member experiences a documentary when at the location where the events reported on originally occurred. The documentary is thus "situated" within the context of where it took place.

The situated documentary uses a combination of mobile and wireless technologies assembled into a "mobile journalist's workstation," or "MJW."[2] In order for the situated documentary to work properly, it must not only be able to track where the user is standing but must "know" which way they are looking in order to superimpose the correct scenes over what is actually being looked at through a head-worn display. The computer must be fast in order to process large amounts of information that includes video clips and other multimedia. The MJW must be interactive as well, giving the user different options for what they want to see and what is available to experience. This navigation cannot be so obtrusive that it seriously interferes with what they are experiencing.

Through these combined technologies we can create what computer scientists call "augmented reality," a cousin of virtual reality, in which 3D displays are used to overlay a synthesized world on top of the real world. In a situated documentary, we combine augmented reality with mobile computing and communications to embed multimedia presentations into the real world, synchronized or stabilized either to the wearer of the MJW or to objects in the real world. This means that a three-dimensional model of the real world must be created for the computer in order to synchronize the computer information with objects in the real world.

To date, we have such a detailed three-dimensional model for the Columbia University Morningside Heights campus and parts of the neighboring community. Others, including university, corporate, and governmental agencies, are developing similar 3D models for the rest of Manhattan, New York City, and many other metropolitan and other areas across the U.S. and internationally. It is a laborious process that requires a lot of computing power.

Early applications of mobile augmented reality systems (MARS) have been primarily in the areas of manufacturing, where a welder might see a schematic overlaid precisely onto the surface where a weld is needed, or in medicine, where a surgeon might obtain a 3D visualization beneath a patient's skin where an incision may be needed.[3] These types of applications normally do not require the detailed and extensive geographic information that is needed for mobile augmented reality to be used in a documentary or newsgathering situation.

A situated documentary is a form of what might best be called "context-aware" media content. The core idea is to offer on-demand text or multimedia presentations sensitive to, aware of, or tailored to the geographic, or even temporal, context. In the case of the situated documentary, audience members wear the MJW at the site of past news or historical events. Through the

mobile augmented reality interface, users are immersed in a three-dimensional aural and visual re-creation of the past. In effect, it is a virtual time machine enabling the user to visit past times and events.

The situated documentary thus uses a first-person, or point-of-view, narrative structure in which the audience almost relives the events of the past, told according to basic journalistic principles such as impartiality, fairness, balance, accuracy, and using attributed sources. This is in contrast to traditional documentaries that invite the viewer to watch or observe the past as reported through the conventions of journalism in a third-person presentation on a flat or two-dimensional screen or through viewed re-enactments.

3   Situated Documentaries Produced to Date

To date, my students, working with those of Prof. Steven Feiner of the Computer Graphics Lab, have produced a series of situated documentaries demonstrating the viability of the MARS technology for the design and delivery of media content for mobile wireless communications. The first situated documentary recreated the 1968 student revolt or strike at Columbia University. Three-dimensional color-coded flags appear in world-stabilized locations indicating access points to either the 1968 revolt story or later news reports. These flags are activated simply by gazing at them for a half second or so.

Historical images, audio, and video are synchronized or stabilized against the present-day locations where they originally occurred, and users can see changes in buildings or locations by accessing virtual timelines through the MJW. This is particularly illustrated by a second situated documentary that explores the Bloomingdale Asylum for the Insane, which in the 1820s and 1830s occupied much of the space currently occupied by Columbia's Morningside Heights campus. Wearing the MJW, a user can select from a virtual timeline and see a translucent three-dimensional image of the original asylum superimposed on Low Library, transmitted in real-time via the campus wireless local area network, and move forward in time as well as space to see the 3D objects change. He or she might even enter the virtual structure, and should relevant information be available in connection to its interior, experience a further narrative from within.

My students are currently working on a situated documentary that hopes to provide a new look on the story of Edwin Howard Armstrong, a Columbia University engineering professor and the inventor of FM radio in the 1930s. The situated documentary being developed may give a new level of access to the story in the context of the place where much of Armstrong's research occurred.[4]

4   Tomorrow's Possibilities

To date, all our situated documentaries have been based on the Columbia campus and have been historical in nature. These limitations are increasingly less important, as wireless infrastructure expands and develops, especially broadband radio spectrum technologies such as WiFi (IEEE 802.11) for providing low-cost (or even free) wireless Internet access, as in the case of NYC wireless[5] and ubiquitous wireless local area networks which can provide high-speed Internet access. In September 2004, Philadelphia announced that the city was examining a project to create a city-wide wireless network.

Moreover, as mobile communications and Internet access devices proliferate and consumers grow increasingly comfortable with accessing Internet content and communications from mobile devices, there will no doubt be further opportunities to deliver to consumers context-aware media content, including news and entertainment.

There are at least three forms that context-aware news and entertainment content can take in the mobile wireless arena. First, in the near-term, context-aware media content is likely to feature breaking news or entertainment that is of a highly localized nature (i.e., information about current or recent news or cultural events specific to the location the consumer finds him or herself in) or is sensitive to the consumer's planned route, destination, preferences, demographics, or the time of day.

Marketing information is also likely to exploit the context-aware capabilities of mobile wireless communications devices. For example, whether it takes the form of spam or is delivered on demand or in exchange for time-sensitive discounts or other rewards, retail outlets might provide textual or multimedia presentations about their shops—virtual store-fronts or signs—embedded into the real-world but displayed only on wireless mobile devices. Prof. Feiner's above mentioned lab has created a virtual display for Tom's Restaurant on Broadway, the famous upper West Side diner featured in the hit television comedy series, *Seinfeld*. Walk past Tom's today wearing the Lab's mobile augmented reality system, and you'll see a virtual display overlaid near the top of the diner revealing the *Seinfeld* connection. At some point in the not-too-distant future, virtually any location in the world might boast similar virtual annotations for the appropriately equipped visitor or tourist. This information might take the form of "news you can use," where buildings and other locations or points of interest are clearly labeled and layers of additional information are available on demand. A mundane example that would likely be very popular at certain times would be information on nearby businesses that have public restrooms.

A variety of other possibilities exist in the middle-term. Imagine tapping into various meta-data that today exist in increasingly digital and online form.

Via a head-worn or hand-held display with wireless connectivity, media or other organizations might provide different types of data maps presenting three-dimensional views of those data overlaid onto the real world to which those data connect. For example, consider mapping current or historical crime data onto the locations where those crimes occurred.[6]

News organizations today routinely gather crime data on their communities, but they rarely present the data systematically or make it available to mobile wireless devices. Within a few years it may be routine for media organizations to make crime data available to mobile wireless devices via the eXtensible Markup Language (XML).

Facilitating things even further may be NewsML, Reuters publicly available variation of XML for media organizations. NewsML is a form of XML created and given away by Reuters and approved as an open standard by the International Press and Telecommunications Council.[7] In fact, Reuters is one of the leading news organizations already contemplating the design and delivery of context-aware news and information, particularly financial data. Reuters has launched a project in London to develop a next-generation editing system to produce NewsML- and XHTML-enhanced content and to make news even more targeted, customizable and platform-independent.

There is no reason why a future special archive section might not feature multimedia content and be delivered to wireless mobile devices; in fact, anyone with a PocketPC and wireless Internet access could do so today. The content would not be user or real-world synchronized or stabilized, but adding geo-referencing capabilities is not a significant technical difficulty.

5   Making the Invisible Visible

Other forms or types of information might also be displayed or overlaid upon real-world views. Among the most interesting possibilities would be to display information about the immediate or nearby environment which otherwise might be invisible to the individual. For example, imagine donning a wireless-capable head-worn display, looking skyward and seeing the size of the hole in the ozone layer, or the ultraviolet ray index, or the pollution content in the atmosphere.

In the future it may also be possible to capture video and audio in three-dimensional format for use in situated documentaries. Today, audio and video used in situated documentaries are in two-dimensional format because the cameras and microphones used typically capture only two-dimensional media. Increasingly, devices for capturing sound, pictures and video in three

dimensions are being developed. As these devices develop, situated documentaries utilizing three-dimensional audio and video will make the user experience even more lifelike.

6 Unintended Consequences

Although such 3D media can make the situated documentary even more engaging and contextualized, it has the potential negative effect of blurring the line between the real and the synthetic. At present, the overlaid media are always readily identifiable by the audience member. In a future where 3D media are seamlessly produced, such differentiation may be increasingly difficult. Moreover, the long-term health or psychological impact of the use of mobile augmented reality in the real-world has not been fully tested and questions remain.

7 Conclusion

Converging wireless and wearable technologies present unique opportunities for news and information providers to create content designed for location- and other context-aware mobile devices increasingly deployed in the marketplace. Near-term opportunities include delivering breaking news and other information contextualized and customized to the location of individual audience members. Middle- and far-term opportunities include designing news and narratives that embed three-dimensional multimedia reports to mobile audiences.

Whether and how this future is realized depends on a number of factors that merit further research. Among these are: (a) whether audiences will find sufficient value in context-aware news and information to make its development commercially viable; (b) whether (and how quickly) the traditional culture of editorial production in news organizations will be adaptive enough to adopt new narrative models for news (i.e., they were generally very slow to embrace the World Wide Web as a medium for creating interactive news and are only beginning to do so now in a significant way); and (c) will there be sufficient wireless bandwidth to support the delivery of customized three-dimensional news and information on demand.

The latest high-tech gadgetry is useless if the public does not see a use for it or value in it. There are several ways in which the public may not see value in context-specific news, or see only limited or occasional value in it. If advertising becomes too obtrusive people may avoid using mobile wireless news serv-

ices. Likewise, content providers must constantly be aware of what types of content best suits context-specific formats and current limitations on display technologies. It is likely that adoption may occur in fits and starts, perhaps being used in very limited contexts initially while other contexts fail miserably. As the public becomes more comfortable with using wireless and wearable technologies, they will likely see more ways to utilize them.

News organizations have been particularly slow in adopting and fully utilizing digital tools and the Internet in their newsgathering and news production process. The changes in news consumption that can be achieved with wireless and wearable computing promises to be as radical, if not more so, than the changes the computer and Internet have brought to the relationship between audience and journalist.

Endnotes

1   Spratling, R. (December 3, 2002). Interview conducted via email.
2   The MJW includes a see-through head-worn display, an orientation tracker which uses a gyroscope to monitor the user's orientation in the environment (allowing the user to select interactive objects displayed in view simply by looking at them, or what is called gaze approximation), a wearable computer capable of processing three-dimensional graphics as well as a hand-held PC, a differential global positioning system (GPS) receiver accurate to within about 1.5 centimeters, and a spread spectrum radio communication link providing high-speed (11 megabits per second) wireless Internet access (http://www.cs.columbia.edu/graphics/projects/mars/mars.html). Prof. Feiner describes the technology making up his laboratory's mobile augmented reality system in an April 2002 Scientific American article (http://www.sciam.com/2002/0402issue/0402feiner.html).
3   More information on medical applications of augmented reality is available at www.cs.unc.edu/~us/; other AR research applications can be found at www.augmented-reality.org. Mobile augmented reality systems are emerging for a variety of applications, ranging from the military battlefield (http://www.popsci.com/popsci/computers/article/0,12543,190327-1,00.html) to the consumer marketplace. In addition to ours, some of the earliest trials have involved multimedia museum tours in which geographic range is limited.
4   In addition to the situated documentaries mentioned above, students in previous years also created two other situated documentaries. One was on the connecting tunnels under the Columbia University campus (used both by asylum inmates and rebellious students to escape inclement weather but now only accessible to maintenance personnel). Another was on the groundbreaking work done by physicist Enrico Fermi, who created the first atom smasher underneath the Columbia campus.
5   See: http://www.nycwireless.net/.

6   On February 14, 1972, investigative reporter David Burnham reported in *The New York Times* the first crime map of New York City broken down by police precinct. Burnham's innovative report provided data for the first time on crime by precinct as well as by type of crime, and was made possible by the then-unprecedented use of the computer as a tool to analyze public records.

7   See: www.iptc.org.

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