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13

AUGMENTED REALITY AS NEWS

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If you are building complex, expensive VR today for the limited number of people, who get VR headsets, and [are] willing to scratch up on their heads to have the experience, experimentation is great, nice, but [...] I think augmented reality is actually more interesting and has more potential for news.

A manager of a big tech company 2016

This quotation is from an expert interviewed during the Global Editors Network's summit in Vienna in June 2016. A management-level employee of a big tech company, who asked for anonymity, criticized the hype around virtual reality (VR) and predicted that actually augmented reality might serve journalism better than VR. Indeed, following the VR chapters in this volume, it is time to direct our attention to the implications of augmented reality (AR). In this chapter we introduce the AR concept, provide a brief history, and finally focus on the use of AR in journalism and other productions.

In AR, virtual information or objects are added to the otherwise real environment. Comparing VR, AR, and mixed reality displays, Milgram and Kishino (1994, 4) defined AR as “any case in which an otherwise real environment is ‘augmented’ by means of virtual (computer graphic) objects”. Ronald Azuma added the attribute of real time to the definition, requiring that AR combines real and virtual, is interactive in real time, and is registered in three dimensions (Azuma 1997).

AR history goes way beyond Snapchat filters from 2015 and the worldwide success of *Pokémon Go* in 2016. One groundbreaking experiment in the field included “The Sword of Damocles” from 1968, the first-known head-mounted display (HMD), created by Ivan Sutherland and Bob Sproull (Kipper & Rampolla 2013). The history of AR research in the United States (US) also stretches back to the 1970s and 1980s (Feiner 2002).

In 1990 Boeing engineers Tom Caudell and David Mizell designed an HMD system that provided wiring instructions for airplanes (Berryman 2012). More

importantly, they later coined the term Augmented Reality in a 1992 conference paper (Caudell & Mizell 1992).

By 1997 AR had been applied or tested at least in medical visualization, maintenance and repair, annotation, robot path-planning, entertainment, and military aircraft navigation and targeting (Azuma 1997). Furthermore, by 2012, Kipper and Rampolla (2013) also listed advertising, task support, navigation, home, industry, art, sightseeing, gaming, social networking, education, and translation as areas of use for AR.

The superimposed virtual elements can be viewed and interacted with 1) wearable HMDs such as AR glasses, 2) a smartphone, tablet, or personal computer with a webcam, or 3) via a spatial display such as a window, projector, or a specially designed room (Kipper & Rampolla 2013). AR applications can either add more information to the user's perception of the current physical reality (e.g. cafeteria recommendations when walking in the city) or create an artificial environment where the user is (e.g. virtual furniture in the user's home). AR can base its tracking on markers, such as shapes and images, or a location, e.g. the Global Positioning System (GPS) (Kipper & Rampolla 2013).

The technology: smartphones, smart glasses, and authoring tools

The user of one of today's visual displays can easily make solid objects transparent – he can “see through matter!”

Ivan Sutherland 1965

Currently in 2019 smartphones are by far the most popular means of using AR, although AR was not originally designed for mobile phone use (Pavlik & Bridges 2013). HMD and smart glasses also have AR storytelling potential.

The first AR product to generate massive hype was Google Glass, prototyped in 2013 and publicly released in 2014. The sales of the much-criticized glasses were halted in 2015 (Langley 2018). In other words, it flopped. There were particularly serious privacy concerns (Cave 2015; Levy 2017). Since 2017, the company X (a subsidiary of Alphabet Inc.) has been selling Glass Enterprise Edition for its partners (Kothari 2017). Microsoft released HoloLens in 2016 and HoloLens 2 in 2019 (Bohn 2019). Many other companies are introducing their own products (see e.g. eMacula 2019; Heaney 2019; Statt 2019). For example, since August 2018, consumers have been able to acquire the much-hyped Magic Leap One glasses (Swider & Fitzsimmons 2019). In recent years smart glasses' prices have come down, and one can acquire the cheapest ones for a few hundred US dollars, whereas the enterprise version of HoloLens 2 was priced at around \$3,500 in 2019 (Bohn 2019).

Producers need an authoring tool to create AR applications. Tools are made for both programmers and non-programmers (Schmalstieg, Langlotz & Billinghurst 2011). Wikitude, the first web browser for AR, was launched in 2008 (Hauser

2010). Early AR tools used by media companies included Junaio (later purchased by Apple) and Aurasma (Pavlik & Bridges 2013). Both Google (ARCore) and Apple (ARKit) released their own platforms for building AR experiences in 2017 (Allum et al. 2018), and they are being used, for example, by *The New York Times* (*The New York Times* 2019). Facebook has its own AR platform called Spark AR (previously Camera Effects Platform) that helps developers build apps for the social networking platform (Spark AR 2018).

The evolution of AR in journalism

Azuma (2015) sees storytelling as one of the most important ways to utilize augmented and mixed reality. John Pavlik and Frank Bridges see AR as serving the same function as news: “it augments the user’s experience with the real-world, natural environment” (Pavlik & Bridges 2013, 6).

One can argue that sports broadcasts paved the way for AR in journalism. AR has been used in sports at least since 1998, when Sportvision broadcast the first virtual yellow first down marker during a live American football National Football League (NFL) game (Augment.com 2016). These real-time virtual lines, visible to TV audiences, have been used since then in many other sports events, such as athletics and swimming, to indicate record times or target levels.

Newsrooms started experimenting around 2010 with AR technology using printed paper extensions and Quick Response (QR) codes. *Esquire* magazine created a cover and a few articles for their November 2009 issue that could be augmented with a mobile app (*Esquire* magazine 2009; Pavlik & Bridges 2013). In a similar vein, augmenting *Süddeutsche Zeitung’s* SZ magazine in 2010, users could watch videos using the mobile app Metaio (O’Hear 2010). *The New York Times Magazine* used a QR code on its 10th anniversary special cover in 2010 to link users to short video clips (Pavlik & Bridges 2013). Some early examples were various companies that targeted children (*The Hamilton Spectator* 2016; Baluja 2013), experimented with AR advertising (*The Guardian* 2012), and created a location-based experience (Valcarce, Bolós, & Recio 2017). Similar extensions to print products have been produced around the world. Table 13.1 lists early print AR extensions from different countries.

Smaller news outlets have rarely tried out AR. In a 2017 survey for local newsrooms in the US, none of the respondents reported using AR (Radcliffe, Ali & Donald 2017), despite the fact that researchers had found some evidence of AR productions. For example, *The Herald and News* in Klamath Falls, Oregon, has experimented with AR since 2015 (Radcliffe, Ali & Donald 2017). The same report hinted at newsrooms’ modest interest in learning about AR technology.

From 2016 onwards, AR journalism applications have mostly used 3D models, location-based stories, and augmented studios. Big media outlets in the US have led this development. In some rare cases, smart glasses have been utilized, and AR has occasionally been also used as a reporting tool. We now look at some of the most prominent examples.

TABLE 13.1 Examples of printed paper AR extensions from different countries.

Country	Publisher/magazine/newspaper & year of publication	Reference
Canada	<i>Glacier Media</i> : 12 newspapers in 2013 <i>Toronto Star</i> 2013 <i>Winnipeg Free Press</i> 2013 <i>The Hamilton Spectator</i> 2016	(Layar 2013) (Emrich 2013; Baluja 2013) (<i>Hamilton Spectator</i> 2016)
Germany	<i>SZ</i> magazine 2010 <i>Stern</i> 2011 <i>Welt der Wunder</i> 2011 <i>Auto Bild</i> 2015 <i>Rheinische Post</i> 2015	(O’Hear 2010) (Raso et al. 2016)
India	<i>Mid-Day</i> : QR code 2010 <i>Times of India</i> 2012 <i>Dainik Bhaskar</i> 2016	(Pahwa 2010) (Chaudhary 2012) (Goyal 2016)
Japan	<i>Tokyo Shimbun</i> 2013	(Baluja 2013)
Malaysia	<i>The Star</i> : iSnap 2012	(Mahpar & Mahalingam 2012)
Spain	<i>Fotogramas</i> magazine: QR code 2010	(Valcarce, Bolós & Recio 2017)
United Kingdom	<i>The Guardian</i> : AR advertising 2012 <i>The Times</i> 2013 <i>The Telegraph</i> 2013 <i>The Independent</i> 2013 <i>Talk About Local</i> 2013	(<i>The Guardian</i> 2012) (Witkin 2013) (<i>Press Gazette</i> 2013)
United States	<i>Esquire</i> magazine 2009 <i>The New York Times Magazine</i> : QR code 2010 <i>Boston Globe Winter Arts Guide</i> 2011	(<i>Esquire</i> magazine 2009) (Pavlik & Bridges 2013) (Kieslow 2011)

When using 3D models for AR, graphics are superimposed over the user’s real environment via a smartphone app. *The Washington Post* first used AR in May 2016, when they published a story on the arrest and death of Freddie Gray in Baltimore, using narrated scenes with 3D models for their app (*WashPostPR* 2016). They continued with a series on architecture (Moses 2017). Quartz updated their iPhone app with AR capabilities in September 2017, bringing to life, for example, the Cassini-Huygens spacecraft, the Roland TR-808 drum machine and the Berlin Wall (Southern 2017). *The New York Times* released their first AR production for mobile phone in February 2018, centered on the PyeongChang Winter Olympics and sponsored by Ralph Lauren (Branch 2018). A different perspective was given by the Tham Luang Cave story, also at *The New York Times*: it brought to the user’s environment models of the small openings of the cave where 13 members of a youth soccer team were trapped in 2018 (Beech 2018). Australian Broadcasting Company (ABC) introduced a Space Discovery app in May 2018 (Bazley 2018).

Applications for AR glasses remain rare, as the technology has not yet become more common. CNN (Roettgers 2019) and Cheddar (Strange 2018) have released news applications for the Magic Leap One AR glasses, allowing users to pin regular 2D news videos to the walls and ceilings of their real environment.

Similarly to how sports broadcasts have employed AR, television studios can be augmented too. In May 2018, ABC News in the United States produced an augmented news report on air about the British royal wedding with 3D models brought to the studio (ABC News 2018), and they had an AR studio for the US midterm elections (Jacobson 2018). Al Jazeera has also built AR studios to cover the Winter Olympics 2018 (Hill 2018a) and provide a tour of Jerusalem (Hill 2018b), among other topics.

One of the most active news outlets to augment studios has been The Weather Channel (together with the Future Group). They have used AR in weather forecasts since summer 2018 (LaForme 2018). The company has planned to produce 80 percent of its programming using AR and VR by 2020, according to their Director of Weather Presentation in a *Washington Post* interview (Cappucci 2018). Their weather forecasts from 2018 and 2019 have portrayed a tornado that also seems to enter the studio and break it apart, a hurricane with rising water levels with the meteorologist standing next to the flood, and an ice storm that causes a bus to almost crash into the meteorologist situated in the middle of the scene.

These fact-based but obviously made-up animations bring about some ethical considerations. It should be considered how the forceful visualizations affect attention and whether they interfere with or direct viewers' attention toward the storms' facts and impacts. In addition, the relation between factual information and visual speculation calls for ethical discussion.

Besides speculative animations, AR does raise more general ethical issues in journalism. Fundamental public values, such as privacy (e.g. issues related to recording, face-recognition technology, and ownership of AR information) and balance of power (who sets the standards for technology?) touch upon AR (Royakkers et al. 2018). The physical appearance of technology can affect social situations, and sensor-based reality has an effect on privacy, security, and trust. Ethics should therefore be considered in the design and applied to the possible interventions needed, researchers argue (Mann et al. 2018). Use of smart glasses creates concerns about privacy, identity, autonomy, and ownership (Wolf, Grodzinsky, & Miller 2016). AR also poses legal challenges (Lemley & Voloch 2017) that relate to privacy, marketing, intellectual property, real property, torts, personal injury, and criminal acts (Wassom 2014). Another ethical consideration is what topics are even suitable for AR (Kunova 2019).

What about harnessing AR technology as a reporting tool? The *Hindustan Times* employed Snapchat filters when Yusuf Omar interviewed underage survivors of rape. The filters, used during the interviews, helped to create anonymity and give a sense of security to the interviewees on the extremely sensitive topic (Scott 2016).

AR could also be used for crowdsourcing. One research paper found that AR could be applied in crowdsourcing processes to support its planning and

crowdworkers' activity and for sharing and consuming location-based user-generated content (Väättäjä et al. 2013).

News organizations continue experimenting with AR. Google News Initiative, the Knight Foundation and the Online Journalism Association gave out Journalism 360 Awards in December 2018. Three of the 11 winners included AR in their project descriptions: these relate to 3D assets, a spatialized audio editor, and AR prototypes for health and science news (Knight Foundation 2018).

Future inspiration: other kinds of AR stories

Overall, a huge selection of AR experiences and applications exists for devices accessible by ordinary consumers. As the examples in this chapter show, the technology itself holds many unexplored options for journalistic use. Creating location-based features, crowdsourcing, and utilizing social networking in AR remain as such possibilities (Pavlik & Bridges 2013).

Interestingly, research on user experiences of AR storytelling is still almost non-existent. In one example, Fedorovskaya and Yu (2015) studied the preferences of 32 participants reading a short story (print or digital) with or without video augmentation. In their study, AR was found to enhance the overall experience. Overall, AR user experience has been studied in many contexts, however (see e.g. Dirin & Laine 2018; Ko, Chang, & Ji 2013; Siriborvornratanakul 2018; Zhou 2018).

Experimenting with augmenting another medium, Billingham, Kato, and Poupyrev introduced the augmented book, *MagicBook*, in 2000 (Billinghurst, Kato, & Poupyrev 2001). It was a combined AR and VR experience, with the users holding a hand-held display, allowing for a simultaneous multi-user experience. Many augmented books have been seen since, for example the graphic novel *Priya's Shakti* from 2004 (Bosworth & Sarah 2018).

The 2019 book by Melissa Bosworth and Lakshmi Sarah offers an excellent review of VR, mixed reality, and AR storytelling cases from recent years (Bosworth & Sarah 2018). In addition, the Optimist issue of *Time* magazine in 2018 was augmented with videos, infographics, and animations, including narration from Bono and Bill Gates. Outthink Hidden, a production of *The New York Times'* T Brand Studio, offered location-based stories of remarkable but relatively unknown scientists. The user could place virtual statues in ten cities around the US and learn about the scientists' stories. Three of the experiences mentioned in Bosworth and Sarah's book were based on an exact location. "Hello, We're from the Internet" was an independent "guerilla" AR museum experience in 2018. Users could point their phones at paintings in the Museum of Modern Art in New York to see other artworks. "New Dimensions in Testimony" at Illinois Holocaust Museum (2017) is a very ambitious project in which holocaust survivors answered around 1,250 pre-recorded questions. Viewers who see a hologram of the survivor in the museum theater can ask them any questions, while a natural-language processing system determines which answer the hologram will use. In "Terminal 3" (2018), created by Asad Malik, users put on Microsoft's HoloLens and saw an airport interview of a

person selected based on racial screening. When finishing this experience, the users were instructed to go to the next room, where they met in real life the person they had just seen virtually (Bosworth & Sarah 2018).

Robert Azuma has stressed the utility of location-based experiences, observing that they could make users view the world in a different way (Azuma 2015). Some early situated experiences offered an opportunity to experience narratives from different points of view. “Three Angry Men” from 2003 did this in a fictional setting, whereas “You Get Me” from 2008 used authentic stories of real people in London, and it was playable at the Royal Opera House in London. In “MR Sea Creatures” from 2005, a museum interior was transformed to be underneath the sea, with virtual ancient sea creatures brought to life. “The Westwood Experience” from 2010 combined a variety of MR effects with live actors and an authentic environment related to the story (Azuma 2015).

AR storytelling types for journalism

By reading through the AR academic literature and browsing news media websites, we have identified 11 different types of storytelling with AR (Table 13.2). The list is not a comprehensive account of AR cases around the world, but it gives an idea of what has been done in recent years.

Overall, the volume of AR productions has remained low, and smaller or medium-sized newsrooms have mostly stayed out of the whole business. Breaking and hard news may not be the optimal areas for producing AR journalism, whereas sports and travel might be more easily suited for it (Pavlik & Bridges 2013).

We can argue that weather predictions and live sports events have led the way in the adaptation of AR in journalism globally. For example, sports programs in Finland focusing on the Winter Olympics and national ice hockey series have been at the forefront in adapting AR technologies. Both public broadcasters, such as the Finnish Broadcasting Company in 2018, and commercial broadcasting/telecom companies, such as Telia TV in 2019, have utilized AR with live athlete holograms, bringing them to the TV studio from the sports event hundreds of kilometers away.

Producing AR usually requires careful planning, more time, and a bigger team than regular reporting. Use of the technology in TV began with colored lines augmented to sports broadcasts. Media organizations and newsrooms experimented with mobile AR at the beginning of the 2010s. Around the year 2018, applications using 3D models and studio augmentations became more frequent, many of these as collaborations with brands (see e.g. Moses 2017).

Conclusion: still waiting for the AR breakthrough

Nic Newman’s study (2018) for the Reuters Institute for the Study of Journalism predicted a breakthrough year for mobile AR in 2018, but “killer apps” in AR journalism are still to be seen.

TABLE 13.2 Types of AR storytelling for journalism.

<i>Type of AR storytelling</i>	<i>Platforms/devices used</i>	<i>Physical environment</i>	<i>Examples</i>
Situated documentary	Backpack, a head-mounted display, and a tablet as part of a user interface (early examples) Smartphone Head-mounted display	In a specific location	Columbia University campus Touring Machine (Höllner, Feiner & Pavlik 1999) 110stories (110stories 2019)
Localized guides	Smartphone app	In a specific location	<i>Stella Artois: Le Bar Guide</i> (Hannaford 2009)
Localized news	Smartphone app	In a specific location	<i>Talk About Local</i> (Witkin 2013)
Augmented elements in a TV studio or broadcast	TV/web	Studio	The Weather Channel (LaForme 2018) CNN: Super Bowl (Egripment 2018) ABC News: Royal Wedding (ABC News 2018)
Augmented live event	Smartphone app	In a specific event	Black Eyed Peas concert (CNN 2018)
Printed paper QR code link	Smartphone app	Anywhere	<i>New York Times Magazine</i> QR code cover (Pavlik & Bridges 2013)
Printed paper AR extension providing images, video and links	Printed newspaper/magazine and a smartphone app	Anywhere	<i>Esquire</i> magazine AR issue (Esquire magazine 2009) <i>Time</i> magazine <i>Optimism</i> issue (Bosworth & Sarah 2018)
Virtual objects superimposed on the user's environment	Smartphone app	Anywhere	<i>New York Times</i> : Statue of Liberty (Stapinski 2018) <i>New York Times</i> : Four of the Best Olympians (Branch 2018) ABC: Space Discovery (Bazley 2018)
A story with virtual objects superimposed on the user's environment	Smartphone app	Anywhere	<i>Washington Post</i> : Freddie Gray's case (WashPostPR 2016)

TABLE 13.2 (Cont.)

<i>Type of AR storytelling</i>	<i>Platforms/devices used</i>	<i>Physical environment</i>	<i>Examples</i>
News video inside augmented reality	AR glasses	Anywhere	CNN app in Magic Leap (Roettgers 2019) Cheddar app in Magic Leap (Strange 2018)
AR as a reporting tool			<i>Hindustan Times</i> : Using Snapchat filters for anonymizing interviewees (Scott 2016)

According to our findings, the main implications of AR for journalism can be seen in smartphone apps and TV broadcasts. As smartphones have become ubiquitous and mobile AR technology is developing, content providers can easily reach a vast number of users all over the world: there were about 990 million ARKit- and ARCore-compatible smartphones at the end of 2018, with 129 million monthly active users (Boland 2018). The same report predicts that these numbers will double in 2019. When compared to the problem of the low penetration percentage of VR gadgets like HMDs in the mass market, AR will soon be available for all smartphone users.

At the turn of the 2020s, we argue that the most powerful AR experiences so far have been focused on weather predictions, especially by The Weather Channel, and live sports events. As climate change has become one of the most urgent news topics of our times, it is easy to predict that other news producers, especially those with a decent budget for testing new technologies and innovations, will probably follow suit. The big sports broadcasters have also always been at the forefront of journalistic innovations globally due to their enormous budgets and intensive competition.

Over the last ten years, the potential of AR for storytelling and journalism has grown. However, as our interviewee mentioned at the start of this chapter, it remains to be seen when the use of AR will be as ubiquitous as smartphones are nowadays.

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