DRONE JOURNALISM: GENERATING IMMERSIVE EXPERIENCES

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ABSTRACT

During the past, few years, the journalistic community were expecting the time that the use of drones in their day to day job would be a common place. Due to ethics and privacy considerations, as well as regulation restrictions that are applied in most countries, this moment has yet to come. However, the use of drones during conflicts, civil unrests and environmental disasters is a proof that drone-generated content can be a valuable tool to tell a story. Their cost effectiveness and data gathering capabilities let them integrate and extend existing technologies.

The current study aims at outlining the wanted/upcoming Drone Journalism services and the new potentials in the various forms of Journalism. Practical considerations regarding technical expertise and know-how in operating the new equipment, ethical issues and privacy implications that are related both to the profession of Journalism and the associated regulatory framework are also investigated.

Keywords: Drone, Journalism, Regulations, Framework, Immersive, Content, Video.

INTRODUCTION

Undoubtedly, the rapid evolution of Information and Communication Technologies (ICTs) has changed the ways that mass communication services are deployed, thus shaping and offering new forms of Digital Journalism. The flourishing of social media and the proliferation of User-Generated Content (UGC) have significantly affected the way that news, infotainment services, multimedia content and generally digital information are produced and shared through multiple-channels over the Internet and

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other Social Networking Sites (SNSs). Among others, this effect has been propelled by the exponential growth in the use of smart devices and the associated capabilities of the mobile computing technology. Most of these devices (smart-phones, tablets, etc.) inherently offer networking capabilities along with increased multimedia capturing, editing and sharing utilities. They also embed sensors (GPS, clocks, device owner data, etc.) that can offer context- and location-aware information and services (Dimoulas et al. 2014; Dimoulas & Symeonidis 2015; Papadopoulos et al., 2015). The same way that the aforementioned achievements have changed the role of journalists and overall the journalistic profession, the same impact is expected by new technologies, focusing on extending audience engagement through immersive experiences.

In particular, new media coverage and dissemination technologies have already been launched, with more characteristic the Drone Journalism paradigm. Various types of Unmanned Aerial Vehicles (UAV) have started to be utilized by both professional media organizations and freelancers, including UGC-producers. New potentials appear, offering timely and geographically-boundless coverage (i.e. catching breaking news without location restrictions), new shooting capabilities (i.e. aerial view), remote-operation services (i.e. in hazardous environments), immersive storytelling and others (Chamberlain 2017; Chapa 2013; Cooke et al. 2017; Corcoran 2012, 2015; Culver 2014; Goldberg et al. 2013; Gynnild 2014; Tremayne & Clark 2014). At the same time, new technical expertise and know-how in operating the new technology are demanded. These difficulties are further deteriorated by the appearance of various ethical issues and privacy considerations, which are related both to the journalistic profession and the associated regulatory framework (Jarvis 2014; Holton et al. 2015; Whitaker 2016). The present research attempts to outline the upcoming services and forms of Drone Journalism, associating their progress (and advantages) with social and legal implications, technical, economic and other practical concerns. The rest of the paper is organized as follows. Related background is presented in the next section, focusing on operational, technological and cost issues, along with ethical and regulatory considerations. The main thrust of the paper comes next, where, besides basic definitions and journalistic perspectives of Drone Journalism, a new computational model is presented, purposing to enhance audience engagement through collaborative immersive experiences. Future expectation and challenges are also evaluated through a focused SWOT analysis. Conclusion and future research remarks are drawn at the last section.

BACKGROUND

It is well known than UAVs have been originally implemented to serve the defense industry, for gathering information about opponent armies and generally for remotely operating military missions. The technology of unmanned aircrafts that are similar to today’s drones is dated at the end of the World War II, while entering to the cold war between the USA and the Soviets. However, the initial idea of using UAV in the battlefield was originated during the American Civil War and World War I, where balloons where used as “as training tools (targets) and eventually as delivery systems for bombs” (Tremayne & Clark 2014). Tremendous progress was conducted during the intensive cold war period (at 60s’), where the UAV program of USA was prioritized, resulting to the development of aircrafts resembling modern military drones, which were used for espionage (i.e. capturing a “photographic inventory of Soviet missiles”) (Tremayne & Clark 2014). Today, there are various names /acronyms that are used as synonyms of
what we call drones: “unmanned aircrafts (UA), unmanned aircraft systems (UAS), unmanned aerial systems (another UAS), remotely piloted aircrafts (RPAs), remotely piloted vehicles (RPVs), unmanned aerial vehicles (UAVs), uninhabited aircraft, drone aircraft, and drones” (Tremayne & Clark 2014). Regardless their names, these systems feature similar capabilities and purposes: they are relatively small in size and self-powered aerial vehicles, they do not carry human operators so that are usually controlled remotely by the Pilot in Command (PIC), while they can also fly autonomously (Tremayne & Clark 2014). Given these attributes, drones are very useful in other applications besides military missions, such as in flight-transportation of lightweight objects (i.e. books, food, medicines, etc.) and, mostly, in aerial surveillance/coverage of various events that can be part of newsgathering and mass communication services. These latter cases led to the formation of Drone Journalism, which actually launched and started evolving within the last decade (Chamberlain, 2017; Chapa, 2013; Cooke et al., 2017; Corcoran, 2012, 2015; Culver, 2014; Goldberg et al., 2013; Gynnild 2014; Tremayne & Clark 2014). However, there is a variety of operational, technological and economic issues, along with multiple ethical and legal implications, whose settlement is considered a serious prerequisite, before Drone Journalism could be widely and safely deployed.

**OPERATIONAL, TECHNOLOGICAL AND ECONOMIC ASPECTS**

Operational, technological and economic issues outline the practical dimensions of Drone Journalism that are considered very important for all professional media organization, freelancers drone hobbyist and citizen journalists. First of all, immediacy and cost in obtaining and deploying the necessary equipment plays a very significant role in the practical adoption of the technology. While the cost of some primitive drone equipment might be kept at low levels (i.e. 300-500€), the spent amount is directly proportional to the offered surveillance capabilities. While the practical use of the aforementioned lowest-budgeted UAVs is very limited in real-word newsgathering services, drones with costs starting at 2,000€ can operate for over an hour in quite demanding scenarios (e.g. breaking news reporting, environmental journalism, sports coverage, dissemination storytelling in tourism and broader commercial actions, focused documentaries and others) (Corcoran, 2015). Reliability is a very crucial parameter that is depended on many related factors, such as weather conditions, Wi-Fi status and reliance, remote operation range, accuracy of the data provided by the embedded sensors and other unexpected situations, thus requiring for more sophisticated design and manufacture. Furthermore, the drone flying autonomy is linked to the technology and weight of the associated batteries (or fuel tanks), as well as the involved lifting motors. Likewise, high quality capturing of photos and videos require larger, heavier and more expensive optical lenses (and overall electronics). As weight increases, the safety precautions become more important for all the operating users, the public and the drone equipment itself. Therefore, dedicated know-how is needed for controlling UAVs in real newsgathering situations, for carefully scheduling proper operation and maintenance of all the involved systems before, during and after the flight. This technical, procedural and operational expertise is necessary to the new journalists that will play the roles of drone commanders (PIC) and observers (Culver 2014; Corcoran 2012, 2015; Tremayne & Clark 2014).
On the other hand, in all of the above aspects, drones (and UAVs in general) feature certain advantages when compared to other aerial means, such as helicopters. For decades, news media corporations depended heavily on “hiring helicopters, planes, and professional aerial photographers for specific events” (Gynnild 2014). Technological evolution of UAV technology, result in significant reduction of aerial imagery and videos costs. Undoubtedly, the cost of piloted helicopters is much higher, while related newsgathering missions require for certified pilots and trained professionals. The same applies for the safety aspects, where drones are considered advantageous, especially for operating in hazardous and /or hostile environments. Thus, journalists can enjoy safer conditions when working under unpredictable occasions, where expected eyewitness account is replaced by the “robot eye-witnessing” of “UAVs-vision” (Gynnild 2014). Furthermore, drones seem to be beneficial in terms of portability and rapid deployment, which is also facilitated by the light-weighted and less complex nature of the associated regulatory obligations (i.e. flight-plans submission to the corresponding authorities). Due to these features and the underlying adventure in remotely flying and observing through unmanned aircrafts, the number of drone amateurs is steadily rising. Hence, media organizations could exploit these drone enthusiasts through the paradigm of citizen’s journalism (Gynnild 2014). At the same time, a large number of websites, blogs, instructional forums or even academic study programs are created, aiming at supporting users and settling the “degree of complexity” of the Drone Journalism innovation, which is also considered an important factor for its successful deployment (Gynnild 2014; Waite & Kreimer 2016; Whitaker 2016). Overall, drone advantages can be synopsized in the expected improvements in a) the existed business models, b) the journalistic working conditions and c) the quality of the offered journalism services and products (Gynnild 2014; Tremayne & Clark 2014).

**ETHICAL AND REGULATORY CONSIDERATIONS**

As already explained, two major drone advantages, especially when compared to helicopters in urban newsgathering scenarios, is convenience and low-cost (Corcoran, 2015). This is very important considering that the new technology is still maturing and, in no case, it can be considered at the same maturity level with the news helicopters. Among the issues that haven’t been properly settled yet it can be considered the moral implications that are related to journalism ethics, the privacy and security concerns, as well as their accommodation into an integrated regulatory framework. While a single worldwide-adopted regulatory framework is missing, there is observed a systematic effort for many states /countries to settle legal issues related with Drone Journalism, by following some ground rules. For instance, by Jan 22, 2014 only forty-three states of USA allowed drones use, while just nine of them have enacted related legislation (Jarvis, 2014). Experts, academic /researches and practitioners that are actively involved in the field insist that number one priority of operating UAVs is safety, which should not be compromised at no time or reason (Waite & Kreimer 2016). Security and safety concern all the people and surrounding objects near the taking-off /landing zone and the areas neighbouring the flight plan (in ground or air). It is very important for both the safety of the PIC and the used equipment that the flight will terminate properly, with the UAV returning intact to its base. Hence, all the flight operations are controlled by the PIC, who has the ultimate authority, so that is entirely responsible for submitting and executing the proposed flight plan. For this reason, a related certification by the corresponding authorities is necessary to verify that a person has the knowledge and
skills for acting as a PIC. The roles of the Observer and Journalist have also been foreseen, although the same individual can fulfil all the three positions (Waite & Kreimer 2016). The former (Observer) monitors the operation area and examines for potential hazards, case that is obliged to immediately notify the PIC. The latter (Journalist) determines the flight purposes with respect to the needs of media capturing and storytelling but, again, all the final decision is entirely up to the PIC (Waite & Kreimer 2016).

The Professional Society of Drone Journalists (PSDJ, http://www.dronejournalism.org/) has been created, aiming at providing some ground rules for journalists in operating drones. While most PSDJ members admit that drones can invade privacy and rise security concerns, they also criticise lawmakers and those who object Drone Journalism for overreaction. At the same time, PSDJ tries to form its own “ethical code” that drone journalist should follow. For instance, a generic guideline is to use drones only in cases that no other newsgathering mean is available/applicable and in case of a newsworthy story. On the other hand, it is obvious that drones, besides eye-witnessing, can also offer rich media experience (i.e. aerial view/footage, immersion, etc.), so that rising of content-/theme-related constrains is not such helpful, or even fair and deontological. Otherwise, such types of “when, where, what, why, who” restrictions would have been applied on traditional journalism as well, deteriorating the access of reporters and photographers to private areas (Gynnild 2014; Chapa 2013). In addition, drone journalists should avoid conflict of interest with respect to the independency of the used newsgathering source, or in terms of intentionally sabotaging their colleagues, issues that have both moral and security (safety) dimensions (Culver 2014; Waite & Kreimer 2016). Besides the privacy and ethical implications, emphasis is also given on the wanted drone aviation rules. Considering their importance, such regulation frameworks apply to many countries. For example, in the US a drone has to be registered ($5 cost) if it is heavier than 25Kg and lighter than 25Kg, in case of no professional use. Among the requirements to fly a UAS commercially include flying below 400 feet, only during daytime and less than 100 miles per hour. But the standout requirement is that commercial drone operators will need to take a written, in-person, drone-specific, aeronautical knowledge test (Part 107 certification) (Chapa, 2013; Goldberg et al. 2013; Gynnild 2014; Waite & Kreimer, 2016; Whitaker 2016).

DRONES AND DRONE JOURNALISM BASIC DEFINITIONS AND JOURNALISTIC PERSPECTIVES

Drone Journalism refers to the utilization of drones as newsgathering mean in a wide range of journalism and mass communication services. A simpler and stricter definition has been provided by Matt Waite, who runs the Drone Journalism Lab: “It’s using a small unmanned aircraft to gather photo, video, and data for journalism” (Whitaker, 2016). While the definitions describe the typical uses of drones in journalism, there are also some not such obvious cases. Hence, UAVs can collect additional data offered by the embedded sensors (i.e. invisible/infrared light cameras, atmospheric pollution measures, smoke detection, location and geographical information, and others), so they can be utilized in Data Journalism and associated news/story validation processes. Also, they can be programmed to capture multiple high-resolution photographs from different angles, which can be combined to create photorealistic 3D models through the principles of photogrammetry. These graphical models can be then exploited in immersive stories
and virtual /augmented reality services (VR/AR) that are considered as the next big thing in Journalism. Apparently, these innovative services trigger active audience collaboration and enhancement and they have been used for raising public awareness in various circumstance. Characteristic examples are the (civil war) Syria Project (http://www.immersivejournalism.com/project-syria-premieres-at-the-world-economic-forum/), the Dandora Dumpsite in Nairobi, Kenya (https://ejatlas.org/conflict/dandora-landfill-in-nairobi-kenya), and others (Corcoran, 2015; Ogleby & Joshi 2016; Tremayne & Clark 2014; Whitaker 2016).

In terms of technological and functional characteristics, UAVs can be classified into four main categories, having different cost, weight and operational capabilities (Figure 1). Most UAVs are guided through GPS, especially in outdoor scenarios. News gathering drones would probably have battery life of about 20 min flights, with lower costs machines (~1,000€) being sensitive to wind and rain (Chapa 2013; Corcoran 2015). Typical drone uses that are both “technologically feasible and journalistic advantageous” involve capturing of aerial images and analytic data (e.g. wind speed, atmospheric pressure etc.), live video streaming, digital mapping and topographic modelling (Culver 2014). As it happens with all robots /machines, accuracy and context of the data supplementing a story are not such self-evident, as long as empathy and human perception are missing (i.e. in contrast to news-helicopters, where the human element exists). However, semantic processing technologies are rapidly evolving thus offering new potentials in improving the accuracy and extracting thematic concepts /semantics of the provided multimodal information (Corcoran 2015; Chapa 2013; Culver 2014; Goldberg et al. 2013; Papadopoulos et al. 2015; Tremayne & Clark 2014).

Figure 1: Four broad categories of UAVs based on cost, physical dimensions and operational capabilities (Corcoran, 2015)
Among the most popular Drone Journalism use case scenarios it can be listed the nuclear disaster of Fukushima Daiichi, Japan, in March 2011. For evident reasons, the hazardous environment could not be directly accessed from ground or air, the same time that questions were arisen regarding the validity of the radiation level measurements, which were taken and announced by the Japanese government. Hence, news organizations had no other choice in validating the given data but to compare them with those of other official agencies, reporting important deviations when observed. A year later, drone technology was applied in the Fukushima, gathering images and associated information, thus providing a much more sophisticated and accurate solution to the above reporting problem. Likewise, drone journalism could be the ideal tool for reporting physical disasters (e.g. an earthquake or hurricane, etc.), while offering valuable civil protection informing services to the public (Culver 2014). We are not far from the moment that drones would become a common news reporting tool and/or an indispensable item of most media organization or freelancer’s backpack (Corcoran 2015). Drones are very useful on newsgathering, where immediate and geographically unconstrained coverage is valuable (i.e. major conflicts, civil unrests, disaster coverage and relief: floods, fires, earthquakes, etc.). Additional cases include environmental journalism, aerial surveillance, nature monitoring, wildlife protection, sports coverage
and retrieval, investigation and documentation of crimes and generally illegal activities, where, besides immediacy and mobility, multiple viewpoints are essential. As already mentioned, drones are very important in hostile and hazardous environments, where human approach is considered dangerous and unsafe, and/or when ground coverage is not feasible; there is also the “disposable drone scenario”, where it is expected that UAVs might not return to the land zone (Corcoran 2015; Ogleby & Joshi 2016). Featured documentaries have also been created using drone footage, like the “Auschwitz: Drone video of Nazi concentration camp” (https://youtu.be/449ZOWbUkf0) and the “Postcards from Pripyat, Chernobyl” (https://vimeo.com/112681885). Related drone footage of the above examples is presented in Figure 2.

**Drones, Immersive Journalism and Audience Engagement: A collaborative model**

The motivation of the proposed model stems from the particularities residing in contemporary digital storytelling and media coverage, where multiple users and publication channels are involved in capturing and sharing events, experiences and places. It is very common for professional media organizations to utilize UGC content in their broadcasting/streaming program. Besides the streams that are captured and shared through mobile devices, drone footage from both journalists and hobbyist is usually involved. Moreover, terrestrial audiovisual surveillance modules (including UGVs – Unmanned Ground Vehicles) and integrated monitoring networks can be part of such multi-channel media coverage systems. Given that exploitation of the various content versions may lead to significant content enhancement, difficulties regarding their detection and synchronization have to be overcome. Hence, some events can be initially identified based only on audio features, thus performing a coarse /cost-effective annotation. Refinement is possible through motion analysis and image-matching (i.e. near-duplicate detection and other similar techniques), while GPS and time-related information can be further utilized along with user-provided metadata. In general, different users will focus on the part of the story they find interesting (in any context), so practically they capture different parts and/or views of the same event (Dimoulas & Symeonidis 2016). This plurality of streams offers the wanted multiple viewpoints, which can be combined and enhanced, augmenting audience interaction and engagement through immersive storytelling experiences (i.e. multi-view selection, AR projection, location and language adaptation, channel- and terminal-oriented playback, 3D-reproduction, panoramic and time-lapse virtual navigation, etc.). Specifically, in the newsgathering case, reporters (professional journalists and/or UGC-users) impose their own subjective point of view, either unintentionally or purposely (this is usually reflected on the involved audiovisual captures, but also on the textual comments and reportages). Hence, a wider, more complete and versatile view of the event can be offered, purposing to meet audience demands in a more personalized manner. Apparently, advanced machine learning (i.e. deep learning) and multimodal semantic processing algorithms are required for both synchronizing and documenting all the footage of the associated
events, as well as for adapting the storytelling to the personalized needs of the audience (Dimoulas & Symeonidis 2016; Papadopoulos et al., 2015).

The architecture of the proposed collaborative model is presented in Figure 3, where it is also depicted the key role of UAVs. In particular, the journalistic needs for timely and geographically unconstrained news coverage can be sufficiently satisfied through the associated immediacy and mobility advantage of drones. The model anticipates human and media resources allocation and collaboration in an integrated manner, so that the captured multimodal information could be exploited in compound added-value services for joint informing /infotainment, communication and storytelling, fulfilling multiple aspects (i.e. news, entertainment, education, culture, tourism, social awareness, etc.). For instance, a footage that is capture for environmental surveillance purposes (i.e. observe long-term environmental changes and analyze their impact to our life), can also be exploited for arising related public awareness and/or for civil protection. The same material can demonstrate the area as a touristic destination, boosting digital economy through dissemination actions, while it can provide important information to targeted agricultural producers. Besides the completeness in end-uses, different parts of the media network can fulfill the missing viewpoints, confronting weakness of one technology with advantages of the others. Hence, drones will offer the aerial view benefits in case that ground view is not feasible, although additional audio tracks would be probably required due to the drone noises. Equally important is considered the implementation of a decision-making system for suggesting and selecting media resources. Given the guideline of using drones only if necessary and in newsworthy stories, the system would be able to scan social media through proper topic detection mechanisms, deciding drone engagement when it is actually needed. On the other hand, the provided drone footage and its synchronization with the remaining media assets would validate the importance and authenticity of the initial triggering information, while it will also offer feedback for further improving the alerting mechanisms. The proposed model requires both technological sophistication and human effort, but once constructed it can be applied in almost all forms of journalism (i.e. environmental, sports, news, documentaries etc.).
CONCLUSIONS: Future expectations and challenges

Many researches support that the rush of Drone Journalism has been started and cannot be undone. This is expected to decrease the human resources that are required in a typical newsgathering team. In any case, as it happened with the transformation of journalism during the social media era, it is unlikely that the journalistic practice will be radically changed. Still, the role of the human element will remain important for editorial decision, storytelling methodologies and overall mass communication policies. Similarly, it is not expected that drones will entirely substitute news-helicopters. However, there are many cases where the low cost and the fast deployment of UAVs are preferred (i.e. traffic /jam monitoring, protests, etc.). In the long-term, it is expected that drones will add another newsgathering tool for journalists that would be combined with all the other contemporary media technologies (Corcoran 2015; Chapa 2013; Jarvis 2014; Mancosu 2016). This expectation is also reflected in the proposed collaborative model, but also on associated SWOT analyses, pointing out Strengths, Weaknesses, Opportunities and Threads. Apparently, most of the advantages that have been presented so far are listed in the strengths of Drone Journalism. Equally significant is the fact that newsgathering UAV technology is rapidly evolving and hasn’t reached its maturity roof, yet. On the other hand, there are certain weaknesses coming from technological and socioeconomic limitations. For instance, battery operated drones have short-duration autonomy, while the adoption of stronger gas-operated motors will create other problems (i.e. cost increase, noise and annoyance to the surrounding areas, increased risk of accident and safety compromises, etc.). Undoubtedly, the most important weakness is related to the need of an applicable regulatory framework that will offer to the drone journalists the
wanted freedom, settling all legal and operational aspects, but without violating ethical, privacy, safety and generally security implications. These latest concerns can also be listed in the associated Threads (Corcoran 2015; Chapa 2013; Waite & Kreimer 2016).

The most important advantages of the future of Drone Journalism stem from the innumerable challenges that we have in sight. For instance, environmental issues and better management of earth resources is considered very critical for the upcoming decades. Journalists and news media are obliged to inform people, so that understanding of what is really happening will lead to the most effective solutions. UAV surveillance allows for long-term environmental monitoring, which could be very useful in the above directions. New technologies (i.e. multispectral imaging) would allow the monitoring of invisible changes, which can be conducted on a regular basis (due to the low cost of the flight). While the technology of multispectral imaging is expensive at the moment (and rather not fully compatible with drone at UAVs, yet) it is more than certain that such monitoring tools will be commonly available in the not-so-far future (Dorroh 2015; Whitaker, 2016). In the same context, based on the foreseen technological advances a research was conducted on media experts asking them about the top opportunities of drones in Journalism (Mancosu 2016). Most of them agreed to the following top-listed opportunities: “extended storytelling options”, “cost effectiveness /affordability”, “data gathering”, “integration with emerging innovative technologies”, “human life saving/safety for journalists & operators”. They also verified all of the challenges that have been already discussed in this paper: “legal/regulatory framework”, “operational safety risks /hazards”, “negative public perception”, “privacy violation risks”, “quality of training of operators on aerial visual grammar” (Mancosu 2016). As it is also reflected in the proposed model, the progress of related technologies, like Data and Immersive Journalism, as well the acquisition of the wanted know-how and the constructive collaboration between all the involved parties will determine the success and the future of Drone Journalism.
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