

CONFERENCE
PROCEEDINGS

**3RD INTERNATIONAL
ACADEMIC CONFERENCE ON
PLACES AND TECHNOLOGIES**

EDITORS
EVA VANIŠTA LAZAREVIĆ
MILENA VUKMIROVIĆ
ALEKSANDRA KRSTIĆ-FURUNDŽIĆ
AND ALEKSANDRA ĐUKIĆ

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Eva VaništaLazarević, Milena Vukmirović, Aleksandra Krstić-Furundžić, Aleksandra Đukić

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PLACES AND TECHNOLOGIES 2016

KEEPING UP WITH TECHNOLOGIES TO CREATE COGNITIVE CITY
BY HIGHLIGHTING ITS SAFETY, SUSTAINABILITY, EFFICIENCY,
IMAGEABILITY AND LIVEABILITY

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VULNERABILITY OF PUBLIC SPACE AND THE ROLE OF SOCIAL NETWORKS IN THE CRISIS

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ABSTRACT

Tragic events, such as terrorist attacks and related crisis, puts the spotlight on safety and security of public spaces as well as on the new ways of behaviour and spending time in these spaces. While spending time in potentially vulnerable public spaces, an ordinary user becomes a soft target. On the other hand, this change in behaviour can also influence the ways in which social networks are used to distribute information, including call for help or safety check. Drawing on social network analysis, this paper presents the use of hashtags in emergency situations in the context of major events as case studies. This work examines the tweets of top trending topics, resulting as a social discussion on headline news, based on the user participation, topic diffusion with retweets and their effect on other users. Of particular interest is to analyse how development of a certain event can be followed through the frequency and temporal behaviour of Twitter conversations. Such analysis will point out how cyber space forms a community in emergency events and how mutual support can be facilitated through social media.

Keywords: public space, safety, crisis, social networks, Twitter

INTRODUCTION

Safety and security are the most important features of public spaces. "Not only are such places well-designed, attractive environments to live and work in, but they are also places where freedom from crime, and from the fear of crime, improves the quality of life" (Office of the Deputy Prime Minister and Home Office 2004). This is supported by the several urban design frameworks² that define sets of criteria, aspects, principles and requests that need to be fulfilled in regard to creation of a quality public space. By analysing them³, it was concluded that the most of them recognise safety and security as a precondition for the achievement of other values of public space, like comfort, attractiveness and liveability. Nevertheless, the aim of all these measures is the increase of the number of users of public space, which is also considered as the quantitative indicator of its quality. By achieving that, it is considered (Gehl 2010) that the safety of the city

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² Defined on the basis of normative theories in urban design

³ Allan Jacobs (1995), Martinichigh (2002), Project PROMT (2003), Bazik (2008), NYC DoT (2009), Gehl (2010), Gerlach (2010), Vukmirovic (2013)

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could be generally increased when a large number of people are moving around and spending their time in public space.

However, urban terrorism targets urban areas in order to cause the most death, injury and property damage, by targeting places that can maximise the effects of the attack. In counter-terrorism literature these places are referred to as *crowded places* – “an attractive target for international terrorists because of their ease of access, little protective security and the prospect for high casualty rates and political impact in the event of a successful attack” (Royal Institute of British Architects 2010). By definition, a crowded place “is a location or environment to which members of the public have access that may be considered potentially liable to terrorist attack by virtue of its crowd density” (Home Office in partnership with the Department for Communities and Local Government 2012). Crowded places can represent places such as sports stadia, pubs, clubs, bars, shopping centres, visitor attractions, cinemas, theatres and commercial centres, as well as open public spaces such parks and squares. In accordance with their physical attributes, crowd places are divided into two categories: permanent and temporary places (Table 1).

Table 1: Categories of crowded places according to their physical attributes (Royal Institute of British Architects 2010)

PERMAMENT PLACES	Outdoor venues	Stadia, Racecourses, Spectator sports complexes
	Indoor venues	Transport hubs, Arenas, Theatres, Concert halls, Exhibition and convention centres, Shopping centres, Nightclubs, Places of worship
TEMPORARY PLACES	Ticketed event venues	Festivals, Annual shows, Exhibition events
	Open access event venues	Parades, Road races, Exhibition events

It is important to say, that unlike the previous terrorist practices which were in most part directed against economic, military and symbolic targets, with the primary aim of inflicting disruption and winning media coverage rather than causing large numbers of casualties (Royal Institute of British Architects 2010), recent events show that the crowded places are rapidly becoming the target for terrorists. Accordingly, “the task of countering the threat against such ‘everyday’ urban spaces is subsequently embracing and ‘responsibilising’ a range of non-state and civil society actors” (Coaffee, O’Hare and Hawkesworth 2009, 491), which states that the counter terrorism in the built environment is complex, involving many different players and agencies (Home Office in partnership with the Department for Communities and Local Government 2012). On the other hand, this includes two forms of intervention - one that will lead to defend the places from the attack and other that will mitigate the effect of a successful strike. Following the stated objectives, this paper will focus on the counter strategies that could contribute in reduction of the consequences shortly after the terrorist attack by analysing the role of social networks in that kind of crisis.

EMERGENCY SITUATION AWARENESS

Weaver uses term “communication” in a broad sense and in his definition communication includes all procedures by which one mind can affect another (Weaver 1949). According to him communication process has three levels: 1) technical, 2) semantic, and 3) influential. Technical level is concerned with the accurate transfer of information (i.e. radio transmission, written speech), semantic level usually represents approximation of ideas that are understandable when phrased in language that has previously been made reasonably clear, while influential level presumes meaningful structured data and it impacts behaviour of the society as a whole.

When coordinating emergency events under a crisis, it is important to distribute messages to the wider communities, while using all three levels of communication. As information needs to be

accurate, its interpretation needs to make sense and needs to quickly reach society and impacted communities. Information that is usually vital during crisis is the impact of the incident and the word should be spread to achieve awareness on the developing situation. Events that surround managing the crisis also include gathering, processing, compiling, recording, and reporting of information from various sources (Cameron, et al. 2012). Raising awareness during crisis presumes that the set emergency coordination system can operate on multiple levels: from the Perception of events in raw data streams, to Comprehension of situations, through to Projection (or prediction) of likely futures (Laudy, Mattioli and Museux 2006). Furthermore, raising the awareness, communicating to society and coordinating events in the crisis also assumes that perception of society cues and their comprehension can ultimately lead to forecasting of what might happen next. If this can be achieved, emergency response team can anticipate and manage different requests more effectively and in a timely manner. Social media can help in these efforts, as data generation, collection, recording and reporting can be done in the real time. In some cases, first reports about the disaster can be read on social networks such as Twitter. Moreover, sharing the information about the organized emergency relief and on-going assistance efforts can be quickly and effectively disseminated through social networks.

Tracking and analysing Twitter data

Harvesting of Twitter data can be done through Application Programming Interface (API). API is a software component that allows third party system to connect to another system or an application. In a case of Twitter, there are two types of APIs that are of interest for this paper: streaming API and search API. The streaming APIs give developers access to Twitter's global stream of tweet data with low latency (Twitter n.d.). The search API allows searching for recent and popular tweets, while focusing on relevance and not completeness (Twitter n.d.). The search API is focused on the past content and can retrieve only limited amount of data. On the other hand, streaming API allows for collection of continues stream of newly received tweets. For this API limitations also exist in terms of number of users and keywords. In addition, Twitter limits number of requests per user (Twitter n.d.) and reaches back to historical data only 6-9 days (Twitter n.d.). Given these restrictions, when collecting Twitter data for analysis, one should be aware that data should be almost instantly collected, in order to have a comprehensive set of data. Otherwise, first tweets can be easily missed, as later they will not be easily retrievable.

Access to twitter data and usage of its APIs is possible only with an application, either pre-existing or custom-made, which is able to handle Twitter database requests. Unfortunately, many tools for data collection are either custom-made by other researchers and are unavailable for other, while others are commercial tools. Even though researchers have given their systematic outline on the capabilities of different tools (Burns and Yuxian 2012), large data collection and analysis remain a continuous work.

Detailed discussion of Twitter data analysis is not a scope of this paper; here we will mention some of the activity metrics that can be used to analyse Twitter data:

- Temporal analysis (volume of tweets/keywords over time, number of active users during a given interval, average number of tweets over certain time)
- Geographical analysis (volume of tweets related to one location or region)
- Topical analysis (most prominent keywords or URLs, correlation between certain keywords/hashtags)
- User activity analysis (activity of specific user or user groups, distribution of activity of a user group).

When analysing Twitter data during crisis, the challenge is to collect representable data. This is typically done through tracking of topical hashtags. During these crises, multiple relevant hashtags can rise, and all data should be collected, in order to have relevant research. Capturing of topical hashtags allows us to capture and analyse most visible tweets. In the time of the crisis,

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this is typically what we are looking for. However, it is possible that user is not aware of the central hashtag, and is using some variant of it. Due to this reason, it is recommendable to trace a set of related hashtags, in order to collect comprehensive set of data. Some of the existing solutions for tracking hashtags and other keywords on Twitter are: yourTwrapperkeeper, nodeXL, The Digital Methods Initiative Twitter Capture and Analysis Toolset (DMI-TCAT), Netlytic, TAGS, Foller.me, Truthy, Tweet Archivist, Flocker, etc.

In accordance with the objectives of the paper, the review of the social network activities during the recently held terrorist attack in Paris will be given. Special attention will be paid on the activities of Twitter users during and day or two after the tragic event and hashtags that have emerged in that period. The aim of the research was to determine the specific use of particular hashtag during and after the attack, which were the related hashtags and who were the influencers. The first part of the research covers the review of the collected data from Twitter during and immediately after the attack, as well as the review of the hashtag research provided by Jonathan Trajkovic. On the other side, the hashtag relationships and major influencers' analysis of the selected hashtags was performed by using the Hashtagify.me search engine.

PARIS ATTACK

On the evening of 13th November 2015, Paris terrorist attack covered a series of coordinated terrorists activities occurred in Paris and its northern suburb Saint Denis. In 23 minutes, 6 locations were attacked (Figure 1). All of the locations, including restaurants, music hall and national football stadium, can be categorised as crowded places.

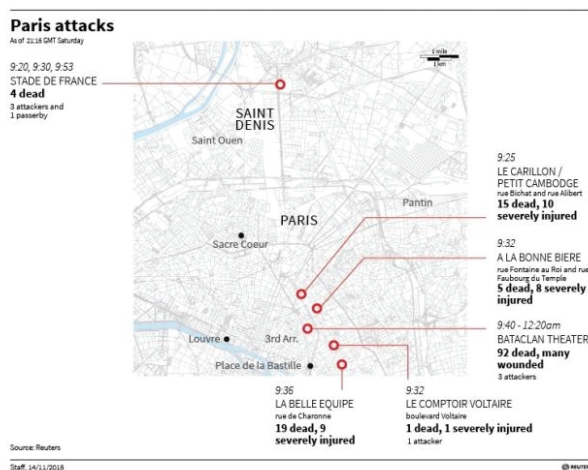


Figure 1: Timeline and locations of Paris attacks according to public prosecutor. Source: Reuters

The targeted locations belong to the category of “everyday” urban spaces, where people usually go to relax and enjoy. *Le Stade de France* is the French largest stadium with the capacity of more than 80000 seats. The building is located at the Saint Denis Quarter, situated “outside Paris Proper beyond the Boulevard Périphérique Beltway, in a lightly populated quarter dominated by major roads” (O’Sullivan 2015). This part of the Paris is characterised by relatively “low-income population where over 35 per cent of residents were not born in France” (O’Sullivan 2015). *Le Bataclan* is an old, 19th century theatre building, which has been a “legendary” venue for rock music since the early 1970. It is situated in the 11th arrondissement of Paris, in “the densely populated neighbourhood full of bars, restaurants, and cafés” (O’Sullivan 2015). *Le Carillon* and *Le Petit Cambodge* are a café-bar and a Cambodian restaurant, located directly opposite the Hôpital

Saint-Louis. These places aren't especially fancy or controversial places, instead fairly typical of the area around the Canal Saint Martin, a traditionally working class area of Paris that has become fashionable in recent decades. *La Casa Nostra* is a usual pizzeria, while *La Belle Equipe* is brasserie, located at Rue de Charonne, one of the busier café and restaurant strips of Eastern Paris.

Following the Google trends on the topic "How the world search for the Paris attack" the first search⁴ about this event happened at 21.18 from Paris (Google Trends 2015). Until 22.34 on the whole world was largely spread the news about this event. One of the most searched topics was "What is *Pray for Paris*?" which was one of the most used hashtags through and after the event.

Hashtags and influence

During the night of 13th November 2015 and the next days⁵, several hashtag was used on twitter in order to point to the danger, to offer help, to show the support for victims, etc.

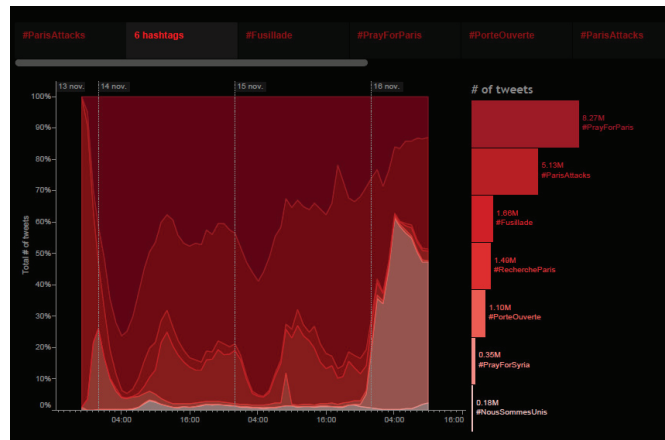


Figure 2: The most numerous hashtags used on Twitter from 13th to 16th November 2015 (Trajkovic 2015)

The first hashtag was **#fusillades**. This is French word that means shooting. It reached the highest number of tweets around 23.00h. The second and the most numerous hashtag was **#PrayForParis**. It was mostly used by people all around the world⁶ with the aim to express thoughts and prayers during the tragedy. It reaches 601360 tweets at 00:00 (Trajkovic, Analysis of Twitter Hashtags Following the Paris Attack 2015). **#PorteOuverte** (open door) was the third hashtag and it reached its maximum of 373990 tweets around midnight. That was a hashtag that aim to link the tweets with a purpose to help the people who were on the street during the attack to find a safe place in someone home in the neighbourhood. The fourth hashtag was **#ParisAttack**. Social network users used it to follow the information about the event. It reached its maximum of 270150 around 13.00 on 14th November 2015 and 102970 tweets around 18.00 on 15th November 2015 due to a panic caused by the false alarm during a march at Republic Square. Tweets with the **#RechercheParis** (FindParis) had a purpose to help people who were after the attack searching for their relatives, friends, etc. This was the fifth hashtag that reached 183440 tweets around 12.00 on 14th November. According to Trajkovic (2015) "it was a really strong and

⁴ Methodology: First minute searched is defined as the first minute where a related search to Paris attacks showed up, starting at 21:18 Central European Time (Google Trends 2015).

⁵ It covers the period between 13th November 2015 around 21.00 and 16th November 2015 around 12.00.

⁶ Some journalists called them "observers".

emotive movement with victims' pictures in a moment of joy, smiling, etc.". The final hashtag **#NousSommesUnis** (WeAreUnited) was used during the solidarity marches in several French cities. Its maximum it reached around 10.00 on 14th November.



Figure 3: Number of tweets and their distribution by hashtags (Trajkovic 2015)

In the observed time interval of 63 hours, there were 18.17 millions tweets published with some of the mentioned hashtags. Considering the total number of tweets the most numerous are tweets with **#PrayForParis** (8.27M), followed by tweets with **#ParisAttack** (5.13M), **#fusillade** (1.66M), **#RechercheParis** (1.49M), **#PorteOuverte** (1.10M) and **#NousSommesUnis** (0.18M). Besides this, it is important to mention that during the first three hours, when the attack was still going on, there were approximately 1.7 million published tweets with some of these hashtag in its content.

It should be noted that during the monitoring of selected hashtags that are directly related to the tragic events in Paris, it was observed the appearance of another hashtag - **#PrayForSyria** with 0.35M tweets. The aim of the tweets with that hashtag was to criticise the "world's silence over the on-going violations in Syria, Lebanon and Iraq in comparison with the outcry caused by Friday's attack in Paris" (The New Arab 2015).

In accordance with that, the focus of the next phase of the research is places on the related hashtags and the influencers of the six most numerous hashtags. The research was done two months after the terrorist attack. For this purpose *Hashtagify.me* search engine was used. An analysis of correlation between **#PrayForParis** and ten related hashtags was found that **#ParisAttack** (3.3%) on the fifth place and **#Fusillades** (1.7%) on eighth place by the criteria of correlation. First four places was reserved to hashtags: **#PrayForJapan** (10.2%), **#PrayForLebanon** (6.0%), **#PrayForMexico** (4.7) and **#PrayForBaghdad** (3.5%). The top 6 influencers are the world's most popular public persons like Justin Bieber, Katy Perry, Kendall Jenner and Justin Timberlake. Considering the **#ParisAttack**, its top 5 related hashtags are: **#Paris** (7.5%), **#PrayForParis** (5.2%), **#RechercheParis** (3.4%), **#Bataclan** (3.1%) and **#ISIS** (3.0%), while **#Fusillade** with 1.7% is on eight place. On the other side, the most influential twitter accounts in spreading the tweets with this hashtag were world's well-known media houses like BBC, CNN, Reuters, SkyNews and ABC. Hashtag **#Fusillade** was related to following top 5 correlated hashtags **#Paris** (11.5%), **#PrayForParis** (10.4%), **#Bataclan** (7.1%), **#ParisAttack** (6.7%) and **#RechrerParis** (5.4%), while **#PortOuverte** (2.2%) is on seventh and **#NousSommesUnis** (1.3%) is on tenth place. The top influencers for this hashtag were Le Figaro, Jeremstar, Agence France Presse and NRJ Radio speaker Cauet. The top related hashtags for

#RechercherParis are **#Bataclan** (19.2%), **#ParisAttack** (16.2), **#RechercherBataclan** (9.9%), **#Paris** (7.0%) and **#Fusillade** (6.5%). Bearing in mind the seriousness of these messages, it is not surprising that the most influential were CNN, Le Monde, Le Figaro and SOSParis. **#PorteOuverte** is related to **#Paris** (10.6%), **#PrayForParis** (5.2%), **#ParisAttack** (4.3%), **#Fusillade** (3.4%) and **#France** (2.1%), while the most influence to the tweets with this hashtag was given by actress Emma Watson and famous journals - TIME, El Pais, CNN and Le Monde. At the end **#NousSommesUnis** is in correlation with **#ParisAttack** (14%), **#Paris** (11.5%), **#PrayForParis** (11.4%), **#ANGFRA** (7.8%) and **#Fusillade** (6.5%). The top influencers for this hashtag were City of Paris, its Mayor Anne Hidalgo, TF1, French Football Team and its player Karim Benzema and official French State Twitter account. Based on these results, it can be concluded that each of the hashtags could contribute to achieving the objective for which it was designed, having in mind its related hashtags and its influencers.

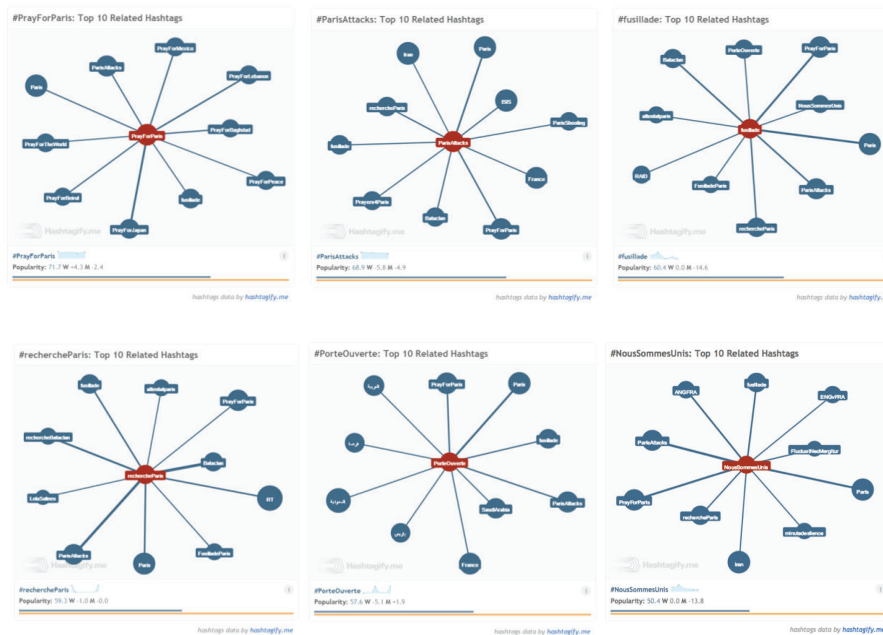


Figure 4: Diagrams of the most related hashtags: #PrayForParis, #ParisAttack, #Fusillades, #RechercherParis, #PorteOuverte and #NousSommesUnis.

Two months after the terrorist attacks, one of the key meeting places for Parisians, Republic Square, became a living memorial, as it was a nearby location where the terrorists attacked. The neighbourhood, which extends from Republic Square to the Bastille and near Bellville, full of restaurants and bars, was and still is a very popular among residents. But the situation is somewhat different now. "Residents are at once worried and combative, determined to go to rock concerts, to drink on the terraces of cafés, to meet sadness with camaraderie. The desire to be together is winning out over the fear of leaving one's house" (Byrne, et al. 2016).

With the aim to encourage more people to return to daily habits of enjoyment and relaxation in public space, new hashtags started to appear on social networks. The most important was **#resister** (to resist), "but it's taken on a new meaning: not being afraid to go out and have a drink" (Byrne, et al. 2016). It was followed by **#JeSuisEnTerrasse** (I'm out on the terrace), **#TousAuBistro** (Everyone to the bar) created and influenced by the cafés themselves. Having in mind that people

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were sad and scared after the attacks, this could be also considered as a contribution in reduction of the consequences of the terrorist attack.

CONCLUSIONS

This research has shown that social networks could give their contribution in the domain of managing the crisis after the terrorist attack and to build strong support for communities during the post attack times. Having in mind that there are two forms of intervention, one that will lead to defend the places from the attack and other that will mitigate the effect of a successful strike, the results have indicated that particular, orchestrated activities on social networks like hashtags could help in emergency situations. They can be created in order to point to the danger and alarm for help (#fusillade), to spread the news (#ParisAttach), to help people to find safe place during the attack (#PorteOuverture), to help people to find their relatives and friends who were impacted by the attack (#RechercheParis), to strengthen and encourage citizens (#NousSommesUnis) or to assist in returning to the everyday habits and places (#resister, #JeSuisEn Terrasse). In this way, social networks are considered as fine channels that contribute both in emergency situations, and in "making of a society more resilient in a way that does not destroy the way of life in the city" (Kricullen in Muggah 2016).

REFERENCES

- Burns, Axel, and Eugene Liang Yuxian. "Tools and methods for capturing Twitter data during natural disasters." *First Monday* 17, no. 4 (2012).
- Byrne, Mark, Sarah Dohrmann, Elisabeth Fourmont, Carl Swanson, and Alex Toledano. "Life in Paris's 10th and 11th Arrondissements, 3 Months After the Attacks." *New York Magazine*. 8 February 2016. <http://nymag.com/daily/intelligencer/2016/02/life-in-paris-3-months-after-the-attacks.html#> (accessed February 16, 2016).
- Cameron, Mark A., Robert Power, Bella Robinson, and Jie Yin. "Emergency situation awareness from twitter for crisis management." In *Proceedings of the 21st International Conference on World Wide Web (WWW '12 Companion)*. New York: ACM, 2012. 695-698.
- Coaffee, Jon, Paul O'Hare, and Marian Hawkesworth. "The visibility of (in)security: The aesthetics of urban defences against terrorism'." *Security Dialogue* 40, no. 4-5 (2009): 489-511.
- Gehl, Jan. *Cities for People*. Washington: Island Press, 2010.
- Google Trends. "How the world searched for Paris attacks." 2015. <https://googletrends.github.io/parisattacks/> (accessed January 10, 2016).
- Home Office in partnership with the Department for Communities and Local Government. *Crowded Places: The Planning System and Counter-Terrorism*. London: Home Office, 2012.
- Laudy, Claire, Juliette Mattioli, and Nicolas Museux. "Cognitive Situation Awareness for Information Superiority." *Information Fusion for Command Support (pp. 3-1 - 3-12), Meeting Proceedings RTO-MP-IST-055, Paper 3*. Neuilly-sur-Seine, 2006.
- Muggah, Robert. "Is Urban Terrorism the New Normal? Probably." *World Economic Forum*. Davos. 17 January 2016. <http://www.weforum.org/agenda/2016/01/is-urban-terrorism-is-the-new-normal-probably> (accessed February 10, 2016).
- Office of the Deputy Prime Minister and Home Office. *Safer Places: The Planning System and Crime Prevention*. London: Thomas Telfors Publishing, 2004.
- O'Sullivan, Feargus. "Paris Attacks: A Map of What's Been Confirmed." *The Atlantic CityLab*. 13 November 2015. <http://www.citylab.com/crime/2015/11/paris-attacks-a-map-of-whats-been-confirmed/415974/> (accessed November 13, 2015).
- Royal Institute of British Architects. *RIBA Guidance on Designing on Counter-terrorism*. London, 2010.
- Twitter. "API Rates Limits." *Twitter*. <https://dev.twitter.com/rest/public/rate-limiting> (accessed January 30, 2016).

- . "The Search API." *Twitter*. <https://dev.twitter.com/rest/public/search> (accessed January 30, 2016).
- . "The Streaming APIs." *Twitter*. <https://dev.twitter.com/streaming/overview> (accessed January 30, 2016).
- The New Arab. "Trending: #PrayForSyria." *The New Arab*. 16 November 2015. <http://www.alaraby.co.uk/english/blog/2015/11/16/trending-prayforsyria> (accessed January 19, 2016).
- Trajkovic, Jonathan. "Analysis of Twitter Hashtags Following the Paris Attack." *Tips & Viz*. 16 November 2015. <http://tipsandviz.blogspot.fr/2015/11/parisattacks-how-twitter-tells-story.html> (accessed January 30, 2016).
- . "Analysis of Twitter Hashtags Following the Paris Attack." *Tips & Viz*. <http://tipsandviz.blogspot.fr/2015/11/parisattacks-how-twitter-tells-story.html> (accessed January 30, 2016).
- Weaver, Warren. "The mathematics of communication." *Scientific American* 181, no. 1 (1949): 11-15.