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SPACIAL ANALYSIS OF VIDEO SURVEILLANCE AS A TACTICAL RESPONSE TO TERRORISM AND ORGANISED CRIME TRENDS: CASE STUDY OF MADRID

Abstract

Terrorism and organised crime are two of the most pressing threats that our societies must combat. Urban areas in western countries form the perfect environment for their growth and penetration. In this research paper, we analyse the pros and cons of CCTV systems and the role that they should play as part of a national security response. The central district of Madrid has been chosen as a laboratory for this analysis, given both its unfortunate history of terrorist acts and the continued proliferation of organised crime cells operating within the city. As a result, we have endeavoured to develop a method that guarantees the tracking of any subject/object within a predefined perimeter, using only existing infrastructure.

KeyWords

Terrorism, Organised Crime, CCTV Systems, National Security.

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INTRODUCTION: VIDEO SURVEILLANCE AS AN INSTRUMENT

Terrorism, and likewise organised crime, have been evolving as our societies themselves have evolved,[1] adapting both to the population upon which they act and also to the geographical context within which they proliferate:[2] thereby allowing for the identification of spatial and temporal patterns of behaviour[3] that assist us in the neutralisation of their networks.

The emergence of jihadist terrorism, first as an international and then a global force, represents the logical and de facto progression of a trend that first surfaced in Spain in the mid-1980s. From this point onwards, national and international terrorism have continued to operate side by side. Even though Islamist terrorism had set its own agenda in the decade prior to this, it was the dawn of a new decade that marked a turning point. The set of networks established in the 1980s began to be fully operational in the last decade of the 20th century.

In 1991, on the occasion of the Middle East Peace Conference in Madrid,[4] an effort on the part of the Spanish government to reconcile the positions of Israel, Palestine, Syria, Lebanon and Jordan, an attack was planned that would have seen a hijacked plane crash into the Royal Palace.[5]

This plan, which could have resulted in the Spanish version of the 9/11 attacks, did not seem to generate the institutional interest required for evaluation, diagnosis and prognosis –which, from an applied perspective, entails police work ahead of

1 GONZÁLEZ CALLEJA, Eduardo. El laboratorio del miedo: una historia general del terrorismo. [The Laboratory of Fear: A General History of Terrorism] Barcelona, Ed. Crítica. 2013. Pp 870.

2 BURLEIGH, Michael. Blood and Rage: A Cultural History of Terrorism. Here: Madrid, Ed. Taurus. 2008. p. 736.

3 NÁJERA BAILÓN, Samuel. Terrorismo y piratería en el Índico: una visión geopolítica. [Terrorism and Piracy in the Indian Ocean: A Geopolitical View] Madrid. E-prints UCM. 2012

4 Madrid, 30 October to 1 November 1991.

5 JORDAN, Javier. El terrorismo Yihadista en España. [Jihadist Terrorism in Spain] University of Granada. Web Resource. http://www.ugr.es/~terris/Terrorismo%20islamista%20en%20Espana.pdf> [6 March 2014,10:00]. 2005, p. 4.

any attacks– of those groups that could potentially foster irregular activities that run counter to national and civil interests.

This state of affairs leads us to question an inescapable duality, which in absolute terms, but essentially applied to national and citizens' interests, is evident in security; at least in our country. The dispersal of the two fundamental cornerstones that it comprises (perception and practice) highlight the vulnerabilities endured by our society in the face of contemporary global risks.

Human security,[6] or more appropriately understood by any Weberian state in its application as security of perception, was defined for the first time in a human rights report dated 1994. In this document, it is defined in the following way: "the sense/sentiment of security without the presence of any fear or deficiency".

The intention behind this new conceptual approach was to break the mould of the traditional notion held as part of the security paradigm.[7] After the above-mentioned report in 1994, the defence of those concerned by a sense of security or insecurity became more significant.[8] With this backdrop in mind, K. Kampová divides this perception into two causes: a) chronic elements (famines, disease, and poverty) and b) trends that may accidentally affect stability within society. We will focus our attention on the second typology, given the phenomenology that envelops it.

Although some authors believe carrying out an attack to be straightforward, they nonetheless concede that its likelihood of success is more limited.[9] Attacks carried out by the insurrectionist cell Mateo Morral[10] (a subversive group of a markedly terrorist nature whose technical-logistical potential must be classed as in an initial phase) in strategic locations in Madrid and satisfactory activation of explosive devices brings to light the ease with which any organisation or individual may unleash the psychology of terror.

This fact confirms the kind of optical illusion we come across when we objectively, specifically and pragmatically analyse the vulnerabilities of our state when faced with

6 Direct translation of the Human Security concept.

7 This being the physical defence of a geographical area defined by a set of borders..

8 KAMPOVÁ, K. The concept of social risks perception. WIT Transactions on Information and Communication Technologies. Slovakia. 2010, p.128. Vol 43. Pp 127 – 136.

9 JORDAN, Javier. La evolución del terrorismo yihadista global después del 11-S: repercusiones sobre la seguridad europea y española. [The Evolution of Global Jihadist Terrorism since 9/11: Repercussions on European and Spanish Security.] Chapter of the book. Terrorismo sin fronteras: Actores, escenarios, y respuestas en un mundo global. [Terrorism without Borders: Actors, Stages and Responses in a Global World.] Ed. Thomson Reuters. 2010. Madrid. Pp. 237.

10 NÁJERA BAILÓN, Samuel. Tras la huella de "Mateo Morral". [On the trail of "Mateo Morral"] Press, 2015.

the threats of terrorism and organised crime. Given present economic circumstances, we should wonder what lurks behind this smokescreen in practice. This can be particularly noted in the analysis made by the media and experts following the attacks carried out in Boston, London or Paris, to cite but a few examples.

We therefore address a series of issues inherent to the circumstances surrounding the sense of security that prevails in our societies, a result of the traditional lack of transparency and communication.

Within the complex system of perceptions, CCTV is understood from three perspectives. The first is for those within public or private institutions who deem the presence of a permanent system of control to be an appropriate way of producing evidence or countering potential unlawful acts. As part of an exercise in political responsibility, Boston Borough Council assures that:

"The Boston Borough Councils CCTV System has been developed in response to the growth of crime and fear of crime in the town and surrounding villages. The sole purpose of the Boston Borough CCTV System is to make the town a safer and more welcoming place at any time of the day or night, allowing all citizens and visitors, regardless of age, gender or race, the opportunity to participate fully and without fear in the life of the town".[11]

In turn, this perspective has consequences that concern the second perspective.

This is notably the case for those who consider the level of security to be a notch higher when video surveillance is in operation due to the presence of these audio-visual recording devices. In an analysis entitled *The Effectiveness of Public Space CCTV*[12] concerning society's perception of the installation of video surveillance systems in urban centres, published by the Scottish government based on research carried out by authors such as MITCHELL,[13 y 14] GILL. *et al.*,[15] and HENDERSON[16] amongst others,

11 BOSTON CCTV CODE OF PRACTICE. 2010. Document can be downloaded at http://www.boston.gov.uk/index.aspx?articleid=3922 [6 March 2014, 10:00]. Emphasis added by author..

12 EFFECTIVENESS OF PUBLIC SPACE CCTV. A Review of Recent Published Evidence Regarding the Impact of CCTV on Crime. Justice Analytical Service. Police and Community Safety Directorate Scottish Government. Edinburgh. 2009, p.21 http://www.scotland.gov.uk/Resource/Doc/294462/0090979.pdf>[6 March 2014, 10:00]

13 MITCHELL, T. (a). Maybole Town Centre CCTV Evaluation. Community Safety Partnership. South Ayrshire. 2004.

14 MITCHELL, T. (b). Prestwick Town Centre CCTV Evaluation. Community Safety Partnership. South Ayrshire. 2004.

15 GILL, Martin.; SPRIGGS, Angela. Home Office Research Study 292: Assessing the Impact of CCTV. Home Office Research, Development and Statistics Directorate. 2005.

16 HENDERSON, R. CCTV Awareness Opinionmeter Survey 2006. South Lanarkshire Community Safety Partnership. 2006.

the conclusion drawn is that the installation of systems currently available generates a clear increase in public feelings of safety.

A third perspective is that of those who believe that the presence of CCTV cameras enables complete control of society as well as intentional repression of individual freedoms.[17] Associations such as BIG BROTHER WATCH[18] are unequivocal advocates of this vision opposing the existence of a panopticon model conceived and managed by the state; whether this be due to objective ignorance regarding the functioning and integration of these systems or because they are conditioned to defend an ideology that opposes the introduction of such control measures.

For the sake of objectivity, *After Boston: The pros and cons of surveillance cameras*[19] demonstrates the reasons underpinning the inconsistency observed among those who support the existence of a panopticon system. Their main argument is that after the attacks in London in the summer of 2005, it took several weeks and thousands of agents in order to identify those involved. In the case of Boston, the FBI required only three days to obtain a clear image that could be disseminated in order to identify the suspects.

Although it is true, as the author points out, that software has improved considerably since 2005, it cannot be claimed that CCTV installed on our streets, whether held in public or private hands, has the capacity required to generate relevant intelligence in real time. Taking the same viewpoint, Bauman[20] refers to the use of video surveillance as a tool for espionage and defence and reveals the current infeasibility of a real-time panopticon system:

"Since 9/11, the number of hours needed by Air Force employees in order to recycle the intelligence supplied by the drones went up by 3,100 per cent — and each day 1,500 more hours of videos are added to the volume of information clamouring to be processed. Once the limited 'soda straw' view of drone sensors [the type of reduced vision obtained with the single camera systems of the Predators] is replaced with a 'Gorgon stare' [video capture

17 SEQUERA FERNÁNDEZ, Jorge. Prácticas distintivas y control urbano como mecanismos de gestión de las conductas: el caso de Lavapiés (Madrid). [Distinguishing Practices and Urban Control as Behavioural Management Mechanisms: The Case of Lavapiés]. Chapter from the book: La ciudad como ecosistema urbano. [The City as an Urban Ecosystem] 2010. http://uam.academia.edu/JORGESEQUERA [6 March 2014,10:00]

18 BIG BROTHER WATCH. The Price of Privacy: How local authorities spent 515m on CCTV in four years. 2012. <www.bigbrotherwatch.org.uk/files/priceofprivacy/Price_of_privacy_2012.pdf>[6 March 2014, 10:00]

19 HEATHER, Kelly. After Boston: The pros and cons of surveillance cameras. CNN. 2013 <http://edition.cnn.com/2013/04/26/tech/innovation/security-cameras-boston-bombings/ > [6 March 2014,10:00].

20 BAUMAN, Zygmunt; LYON, David. Liquid Surveillance. Barcelona Ed. Paidos. 2013, p. 29.

technology formed by nine cameras] able to embrace a whole city in one go (an imminent development) 2,000 analysts will be required to cope with the feeds of just one drone instead of the nineteen analysts doing the job today."

If we address the dilemma of the potential of CCTV systems in urban areas we are able to consider them as passive instruments, (taking an opposing viewpoint to that of other systems whose purpose is the so-called targeted killing common to a certain type of drone), some of which are equipped with software integrated within the capture system, which are labelled smart cameras (that nearly always depend on external software not integrated into the camera itself), rendering real-time analysis impossible. Video surveillance systems must thus be considered innocuous. In fact, they acquire a certain degree of added value when they are used as part of a network and with a specific purpose in mind.

TOWARDS A TACTICAL CLASSIFICATION OF CCTV

The objective proposed in this paper is to evaluate and diagnose the state of CCTV systems in the district Madrid Centre by addressing their geographical distribution and visual potential, as well as their tactical and strategic capacity as a response to terrorism and organised crime. Ultimately, our intention is to propose the operative and temporary use of a passive system, whereby the intended aim is always one of public interest. Moreover, a secondary objective is to generate an approach with a tactical, coordinated response that would enable the closure or opening of a specific area by means of the combination of CCTV systems, native traffic systems and the appropriate security forces.

The selection of the area of analysis, the district Madrid Centre (5.24 km^2; 0.87% of the area of the municipality, 150,000 registered inhabitants), is essentially due to two reasons, which are intertwined:

a) The first pertains to the political-administrative nature of the city, whereby it serves as a nerve centre and constitutes an attractive target for those who wish to express a show of force against state power. Simultaneously, this current urban niche provides organised crime with an ecosystem where it finds those elements essential to its survival and the proliferation of its networks: a) a market at which to target a particular product; b) an environment in which they as individuals, as well as their activities, do not stand out; c) a high level of connectivity (internal and external); d) diversification of target groups allowing for the opening up of new markets.

b) The second relates to a space-time correlation. Historically, the Centre district has fallen victim to an extremely high proportion of the acts of terrorism that have occurred over the last 150 years. Several that stand out have had a major

impact on society and on various state institutions. Consequently, these must be considered as an active focal point.

Subsequent to defining the scope of analysis, a further step was to determine whether or not a census of installed systems existed. This would exclusively consider cameras of interest to the current study as those directed at public highways, or those that serve as inter- or intraurban connection points, irrespective of whether these were of a public or private nature. After having taken this into consideration, three spatial levels were defined:

a) *Subterranean domain:* this is understood as any public form of infrastructure below ground allowing for the transit of people or vehicles. This essentially boils down to Metro services as well as the tunnels pertaining to the urban road network. It is worth mentioning the existence of car parks of a magnitude large enough to generate small-scale suburban distribution networks. Since it is clearly impossible to access Metro network control systems, modelling this environment from a systemic perspective calls for this to be deemed a closed element due to its potential capacity for complete shutdown. In fact, this would make it impossible to access or escape via this means.

b) *Public domain at ground level:* understood as conventional public areas, i.e. streets. It is at this level that practically all public and private CCTV systems are to be found.

c) *Subaerial domain:* this is defined as the upper part of any structure or installation existing above ground level in the public domain for which the access route is either public or private property. Systems installed in this domain tend to serve two basic purposes: peripheral control, of a strategic nature, or control of access to the location in question. Given the inability to access these sites, as well as the infeasibility of registering them by means of any other medium (high resolution imagery, photographic flights, etc.), this has been classed as a domain not to be significantly evaluated.

After defining the spatial scope, a classification system was selected. *Crime Prevention Through Environmental Design,*[21] based on a logic of functionality, aims to redesign those areas where there is a high sense of insecurity. As part of a classification system that is easily extrapolated to the use of CCTV systems, it defines four categories: a) natural surveillance b) natural access control c) territorial reinforcement d) maintenance and space management. Müller and Boss,[22] underscoring this functional logic, consider a

21 CPTED. Crime Prevention Through Environmental Design Guidebook. National Crime Prevention Council. Singapore. 2003.

22 MÜLLER, Christoph.; BOOS, Daniel. Zurich Main Railway Station: A typology of Public CCTV Systems. Surveillance & Society. Ed. Norris. 2004. Pp.161-176.

system of classification based on four typologies: a) access control; b) conduct control; c) registering evidence; d) flow control and planning of deployment.

Although it is true that these classifications are ideal from an academic perspective, a tactical approach to such systems requires express planning. For this reason, it has been determined that from a strategic perspective they must be classified into three levels:

- *Preference Interest View (PIV):* this refers to those cameras that, due to their location, allow for control of Level 1 reporting lines. This has been attributed to several omnidirectional cameras found at a height of at least 2 metres above ground level, whose purpose is an overall view of the surrounding area. The combination of these devices in a strategic constellation permits visual control of the access and exit points along a predefined urban perimeter.
- *Secondary Interest View (SIV):* within this classification we consider those cameras that serve to support PIV systems with a view to closing off perimeters; as well as those that enable strategic control within those areas where coverage of fields of vision is poor.
- *Regular Interest View (RIV):* this category includes the remaining cameras, which, from a strategic perspective, supply information of little interest.

The identification of those who breach delimitations is just as important as delimiting an area itself. By reason of this maxim, it has been considered necessary, from an intelligence perspective or for the sake of seeking judicial proof, to classify installed systems based on their potential functional use. The result is the following:

- *Facial Recognition Capability (FRC)*: defined as the combination of the quality of the sensor and the focus in use. This, in turn, may be fixed or variable, whereby zoom is used. This allows for a sharp image of a supposed subject.
- *Subject Recognition Capability (SRC):* the group of systems that enable us to determine the traceability of a subject in an urban environment once the subject has been identified (by clothing, build, etc.). At a specific point in time, supposing that the subject passes such a system at a minimal distance, the cameras above can take on a FRC function.
- *Tracking Recognition Capability (TRC):* these are cameras that due to their potential low quality, allow neither for FRC nor SRC functions; nonetheless, once the subject has been defined, images captured can determine whether he or she has entered into a protected field of vision.
- *Plate Recognition Capability (PRC):* such cameras have been equipped with the requisite capacity for the identification of a vehicle's number plate. We have also included mobile systems installed within police force patrol vehicles in this section.

From a coordination perspective, or even with regard to the installation of common command and control, these can be classed according to their level of technology; a distinction may be drawn between those that already offer digital output and those that still currently only provide analogue output. In turn, cameras equipped with digital technology can be subdivided into those with (a) a closed connection within an internal system –often seen in surveillance systems for isolated sole buildings– (b) connection to a central switchboard via IP or mobile networks –common in private systems. Here, in order to avoid potential disconnection of telephone lines, mobile data transmission networks are used; (c) connection to a central switchboard by means of a fibre optic network –this is especially used in installed CCTV systems.

SPATIAL ANALYSIS OF SYSTEMS

On the basis of the tactical classification proposed, where we have combined the functional, strategic and technological functions, a census of all the available systems has been drawn up, with due consideration taken of all systems located within the administrative boundaries of the Centre district. While it is true that certain systems located in adjacent sites may also be capable of providing relevant strategic information, they have not been classified within the census, although we have included them in the maps that we have drawn up. The following grounds explain our decision since an exponential increase in the area subject to analysis generates an area of influence with respect to the district perimeter that is not able to be encompassed within the scope of this research.[23]

Coming back to address the spatial component, the changeable nature of CCTV systems has also been indicated. This fluctuation in the census may be explained by (a) an update of systems; (b) their maintenance; (c) disuse of the area subject to control (for instance, shops closing or institutional buildings that are no longer in use). As a result, it is necessary to ensure recurrent updating and it proves difficult to determine an exact number of cameras at any given time.

23 Despite the fact that, and that this has been communicated to the appropriate law and order authorities, it is not merely my wish to generate such a catalogue, but that objectively there exists an urgent need to do so in order to obtain baseline data able to be transformed into a tactical response when this is needed, the lack of interest shown both by the National Police Corps (except for those in the middle echelons who recognised the potential use of this research) as well as by the Municipal Police of Madrid is devoid of all logic in current circumstances in which we institutionally see calls for a culture of intelligence to be fostered, yet where in practice this seems to once more be nothing but a smokescreen. It seems to be that the saying "security is everyone's concern and a concern for everybody" falls on deaf ears when those from academic circles endeavour to carry out applied research aimed at safeguarding citizens' and the administration's interests.

In sum, it has been considered that a total of 1,147 cameras are stable, with an average density of 218 cameras per square kilometre, that there are 8.54 cameras per thousand inhabitants (according to data from the municipal population register from January 2014) and that there exists a ratio of 0.044 cameras per inhabitant and square kilometre. These figures vary depending on the neighbourhood in question, displaying the following configuration:

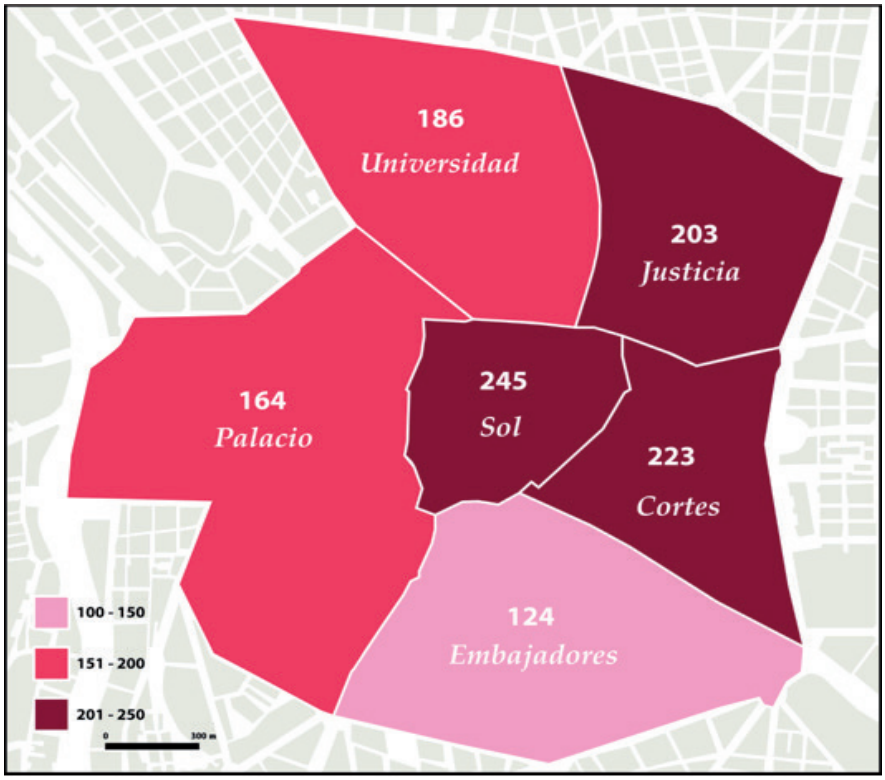


Figure 1. Administrative statistical representation of the number of CCTV systems by neighbourhood within the central district of Madrid. Source: prepared by the author

The distribution observed along these lines is seen for diverse reasons, in particular social, urban, tourism, economic, political and criminal causes. Although great interest lies in the analysis of multi-criteria correlations, which are able to be extracted from the factors that underpin the choice to install CCTV systems in certain areas, this does not fall within the purpose of this article. In this respect, we must highlight the contribution made by Felipe Javier Hernando.[24]

24 (a) HERNANDO SANZ, Felipe Javier. Espacio y delincuencia. Atlas criminológico de Madrid [Space and Delinquency. Criminological Atlas of Madrid] (1983-1997). Ed. Consejo económico y social. Madrid. 2000; (b) HERNANDO SANZ, Felipe Javier. Análisis de la oferta y el tráfico de drogas en el municipio de Madrid desde una perspectiva espacial. [Analysis of drugs supply and demand within the municipality of Madrid from a spatial perspective.] Universidad of Complutense Geography Annals. Madrid. 2002 pp 281-292.; (c) HERANDO SANZ, Felipe Javier. Atlas de la seguridad de Madrid. [Madrid Security Atlas.] CISEM. Observatorio de la Seguridad Madrid. 2007.

If we continue to analyse the distribution of CCTV systems from a strictly spatial perspective (and not an administrative one), the density configuration adopts a multifarious nature. This being defined as a hierarchical nodal system wherein the displacement of the centroids reminds us of a system of diaspora, in which the administrative boundaries no longer serve a functional purpose, which instead is acquired by the internal urban dynamic. This thereby generates a 'continuous' space in which one essential factor emerges: the discordance that arises between the administration and the internal dynamic. To a certain degree, this discrepancy could be the reason why certain corrective measures have been put into place.

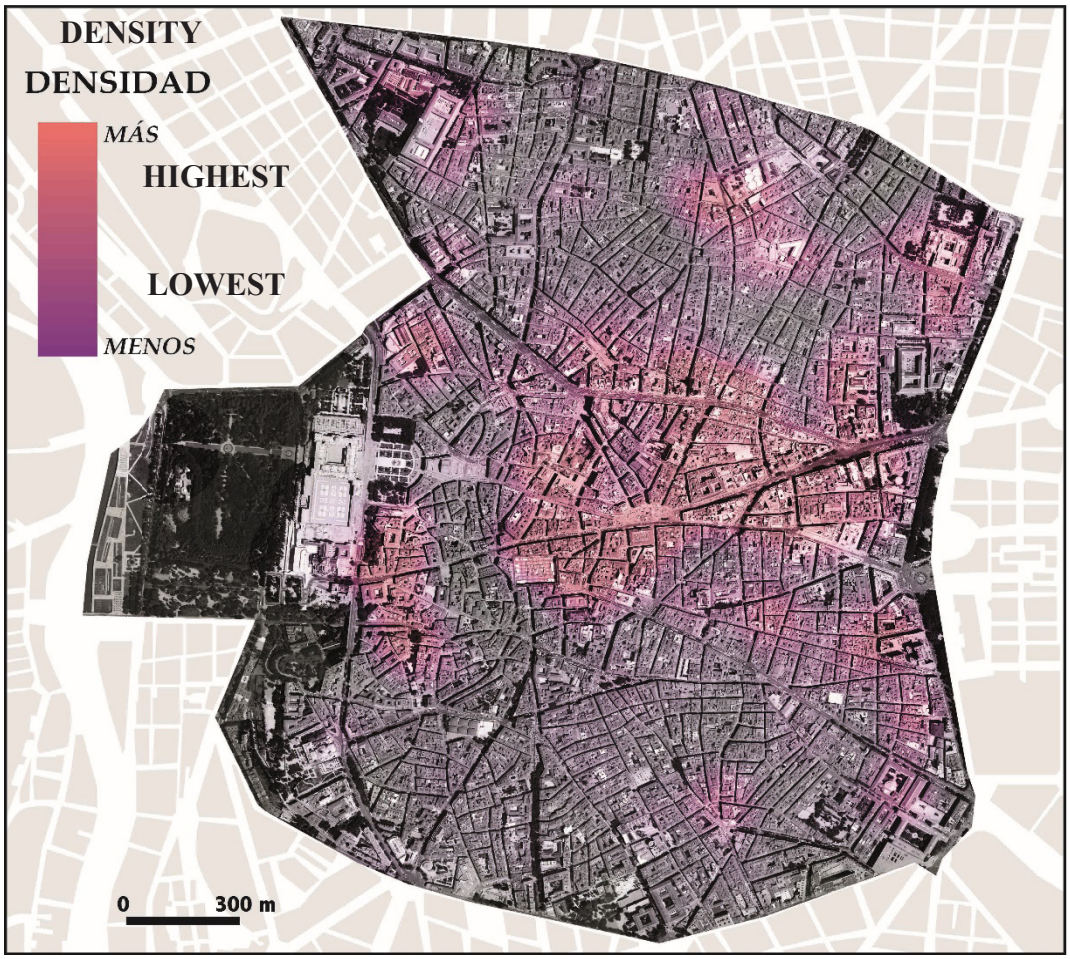


Figure 2. Representation by means of quadratic interpolation of the camera density in the central district.
Source: Prepared by the author

Nonetheless, it must be borne in mind that the functionality par excellence, portrayed in the image above, makes reference to the spaces used by public administration (although these do not mirror administrative boundaries), relegating other aspects to second place (social, economic and criminal aspects) if we take the percentage distribution of public systems installed and their potential use into account. In the census, 514 CCTV systems were identified as associated with public or administrative

bodies; of which 60[25] are operated by the Municipal Police of Madrid, with a focus (according to the report) on two locations: Plaza Mayor (26) and Montera-Ballesta (34; figure obtained by differentiation).

On the other hand, this research has identified a total of 134 cameras in the space defined as the street level public domain and an estimation of 200 over the whole area below ground (tunnels, excluding the Metro network), above ground and also subaerial cameras, which are controlled by CISEM. As a result, 380 cameras pertaining to the public administration are being used for perimeter defence of buildings and access routes (understood as physical entry points or points in proximity to highways). Within this group, 123 (32.3%) could be automatically adopted for use by means of signal duplication.

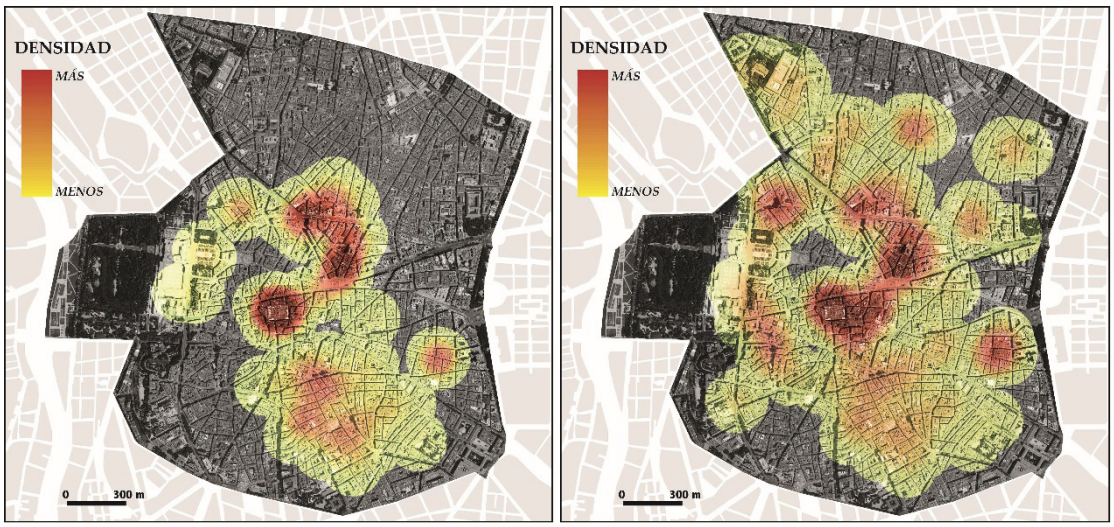


Figure 3. Representation by means of quadratic interpolation of the camera density in the central district. The image to the left shows the cameras assigned to CISEM except for traffic cameras. The image to the right reflects the distribution of all cameras were there to be a coupling of the 123 systems that have been proposed. Source: prepared by the author.

The resulting configuration does not, however, entail an exclusive extension of the area subject to analysis by the law enforcement authorities; rather, in a simultaneous fashion, the tactical response potential increases exponentially in so far as it allows control to be exercised over areas within and beyond the perimeters of the Centre district of the city of Madrid.

This second trait is characteristic of the CCTV used for road traffic. While it is true that the proposed public network, formed by 323 nodes (using minimum example

25 CISEM. Sistemas de Videovigilancia en la vía Pública. [CCTV Systems on Public Highways]. Municipal Police. http://www.madrid.es/UnidadesDescentralizadas/Policia/PoliciaMunicipal/NProyTecn/FICHEROS/Presentaciónvideovigilanciaviapublica.pdf [6 March 2014, 10:00] 2011.

values), is a level that both the administration and the state must reach, we must try to tap into the potential of these installed systems as far as is possible by achieving symbiosis that interlinks public and private components.

A rethink of the social, national and international commitments made by Spain regarding the monitoring of terrorist cells is inescapable. These cells could potentially plan attacks within our borders or plan to act beyond national territory. Consequently, we find ourselves not only facing a national and civil security exercise, but also before the embodiment of an internationally acquired responsibility. The penurious attitudes exhibited by the administrations of the US,[26] Germany[27] and Spain gave rise to those fateful attacks on US and European soil.

Though it is true that the proliferation of private CCTV services has begged a legal and practical question for various years now, the legislation in force, Instruction 1/2006 (which we subsequently refer to), affords twofold protection regarding the temporary employment of these systems in terms of national security. Even so, and given that we understand the interpretation of legislation as something that may exceptionally change course in order to resolve state vulnerabilities, it has been considered appropriate to include all private devices with a view to achieving a "Gorgon's perspective".

It is precisely for this reason that the scope of our analysis should be seen as all of the 1147 systems already installed grouped together. Both public and private hands make use of the two main types of camera: focused and omnidirectional or domed cameras. It should be noted, moreover, that on average, the latter offer a superior strategic component. We thus proceed to the following analysis.

26 COMMISSION REPORT, 9/11. Report of the 9/11 Commission. United States, 2004. www.9-11commission.gov/report/911Report.pdf[6 March 2014, 10:00]

27 ROBERTSON, Nic; CRUICKSHANK, Paul. Hamburg cell at heart of terrorist plot against Europe. CNN web service. 2010 http://edition.cnn.com/2010/WORLD/europe/10/04/europe.terror.plot/ [6 March 2014,10:00]

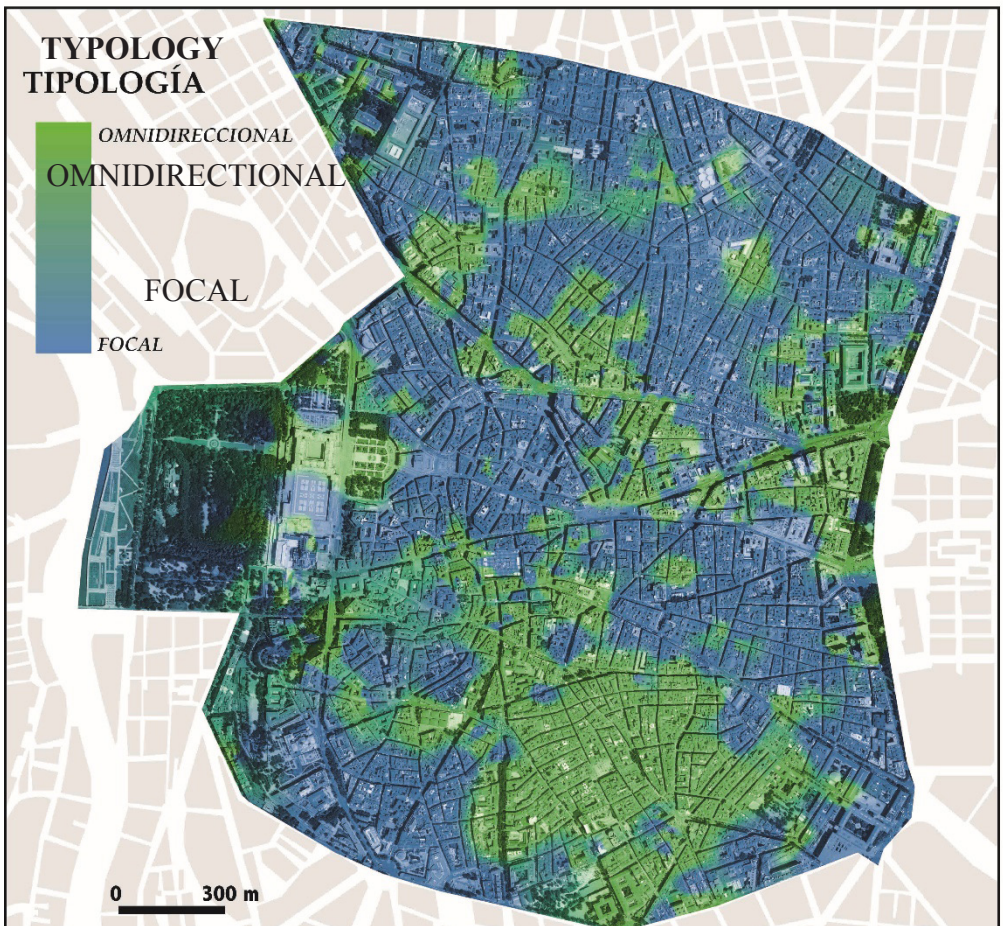


Figure 4. Representation by means of quadratic interpolation of the camera density in the central district accounting for typology. Source: prepared by the author.

The green shaded parts show the location of systems that use some form of domed and/or omnidirectional camera (irrespective of whether they are publicly or privately managed). Spatial distribution reveals an accumulation of these cameras in the Embajadores neighbourhood.

Within its limits, its internal urban dynamic (crime, delinquency, civil insecurity) led to a decision to install this type of camera instead of relying on focal systems. It is a situation akin to that surrounding the Plaza de la Luna (officially known as Soledad Torres Acosta) where omnidirectional systems dominate. We find that a third space is defined by our typology of systems as a strategic triangle delimited by the Calle Alcalá to the north, the Paseo del Prado to the east and the Carrera de San Jerónimo to the south. Fourthly, the axis Royal Palace-Ópera stands out for its unique position. It is a crossed system, outlined by the street Calle Bailén.

These are the spaces within which CCTV represents a major intraurban strategic element. As far as the distribution of focal systems is concerned, we observe a generalised preference towards use for traffic control, both inside of and along perimeters.

Regardless of whether the system pertains to either of the typologies described, the use made of it at any given time may vary. For this reason, and accounting for an ever so relevant factor, that is current strategic potential (as supposed to potential reorientation in order to gain a comparative advantage), it has been considered that they may have an "open" use; on the assumption that they focus on the whole road network, without particularly aiming their attention at a strategic point. A category adopted, with a certain degree of similarity, within the proposal put forward by Müller[28] and which is related to flow control. Secondly, "closed" systems are deemed to be those that focus their image within an area of little interest, thereby losing perspective. By following Müller's classification[29], I will group together the cases of access and behaviour control.

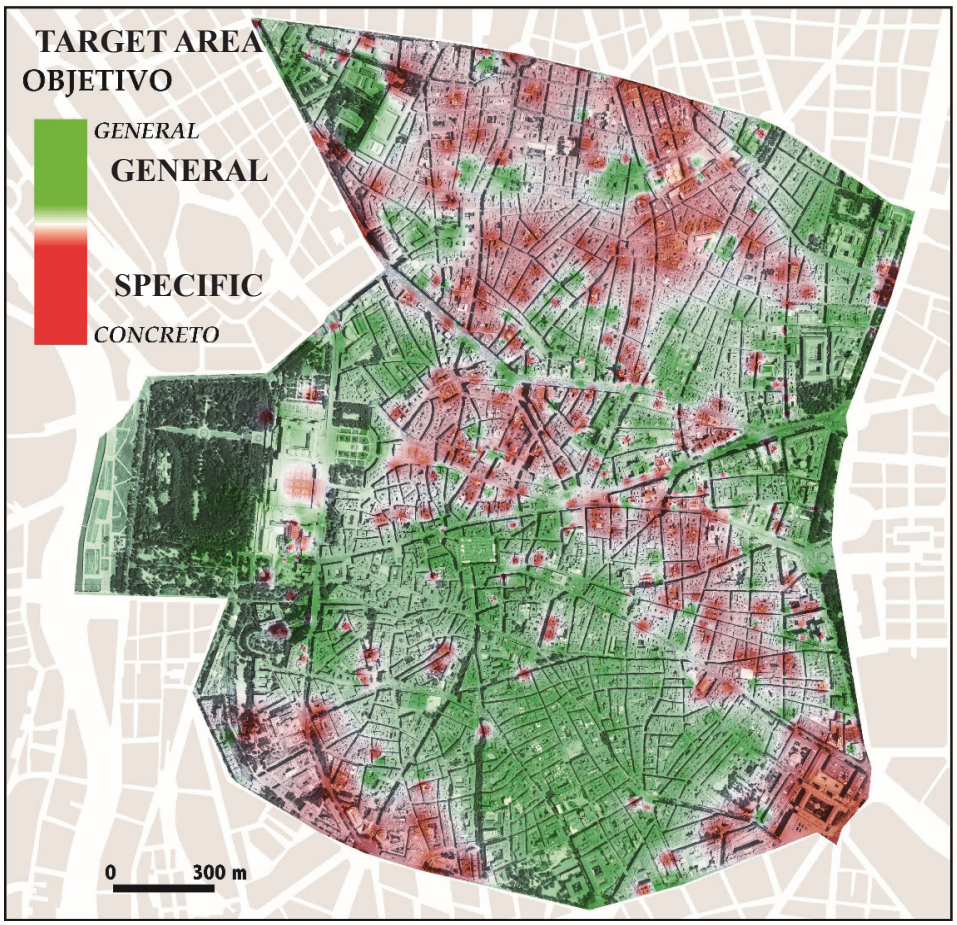


Figure 5. Representation using quadratic interpolation of the distribution of open and closed uses of CCTV systems. Source: prepared by the author.

28 MÜLLER, Christoph.; BOOS, Daniel. Zurich Main Railway Station: A typology of Public CCTV Systems. Surveillance & Society. Ed. Norris. 2004. Pp.161-176..

29 Ibid.

The systems in red are those with closed projection whereas those in green exhibit an open component. There seems to be a positive correlation between the use focus and the camera typology, which is more than decisive when seeking to carry out strategic planning. Notwithstanding this aspect, focal systems gain a comparative advantage with respect to omnidirectional cameras by virtue of the potential integration of analysis software. The changeable nature of the grounds for object recognition procedures, common to omnidirectional systems with systematic rotation, makes a stronger correlation impossible.

Relatively appropriate protocols for action may be generated on the basis of the analysis gleaned from SIG. All in all, it has been considered necessary to draw up a detailed thematic map. This will allow the user, either from a mobile platform or from a control centre, to execute the tactical response originating from their technical command or to collect the information required in order to generate the necessary intelligence at any given moment. Given that the thematic map is created using a system of geographical information based on the land registry, its integration with the "isolated incident" platform, operated by CISEM, is perfectly viable. This also goes for integration within any other platform based on SIG, such as for additional information for the gathering of legal proof and evidence for ordinary crime or any other incident of interest to the police. This mapping scenario, with a printed output at a scale of 1:10000, drawn up based on a land register at a scale of 1:500 and in a vector format, represents the following elements:

- *Typology of CCTV system:* with differentiation between focused and omnidirectional cameras, these have been represented with as little oversizing as possible, illustrating their location and the direction they point on plane x.
- *System ID:* an ID number corresponding to the database is given alongside every CCTV system depicted; this enables instantaneous consultation of crucial information relating to ownership, potential, resolution, strategic use, etc.
- *Potential field of vision:* using a process of estimation, potential fields of vision have been generated for each system. This does not mean that the coverage represented here reflects real or usual coverage –in reference to those systems for which the field of vision fluctuates relatively frequently. This coverage, i.e. real coverage, will not be made public for obvious security reasons.
- *Network of traffic lights:* With a view to generating closure and opening models both within and beyond perimeters, existing traffic lights on public highways were mapped. These would allow a specific area to be sealed off or evacuated for a certain amount of time, a move that could prove vital from a strategic perspective.
- *Suburban access points:* this basically refers to the Metro network. However, other access points that prove strategically relevant as regards the traceability of subject and objects have also been taken into consideration.

- *Public interest installations:* buildings that, as a result of their functional purpose, may be of interest to criminals have been identified and the law enforcement authority responsible for them has been indicated.
- *Vehicle flow:* representing a system of unidirectional arrows that show the direction of road traffic. This is an element, which, combined with traffic light identification, is key from a strategic perspective.
- *PIV and SIV systems:* icons reflect these forms of CCTV systems, based on their strategic interest.

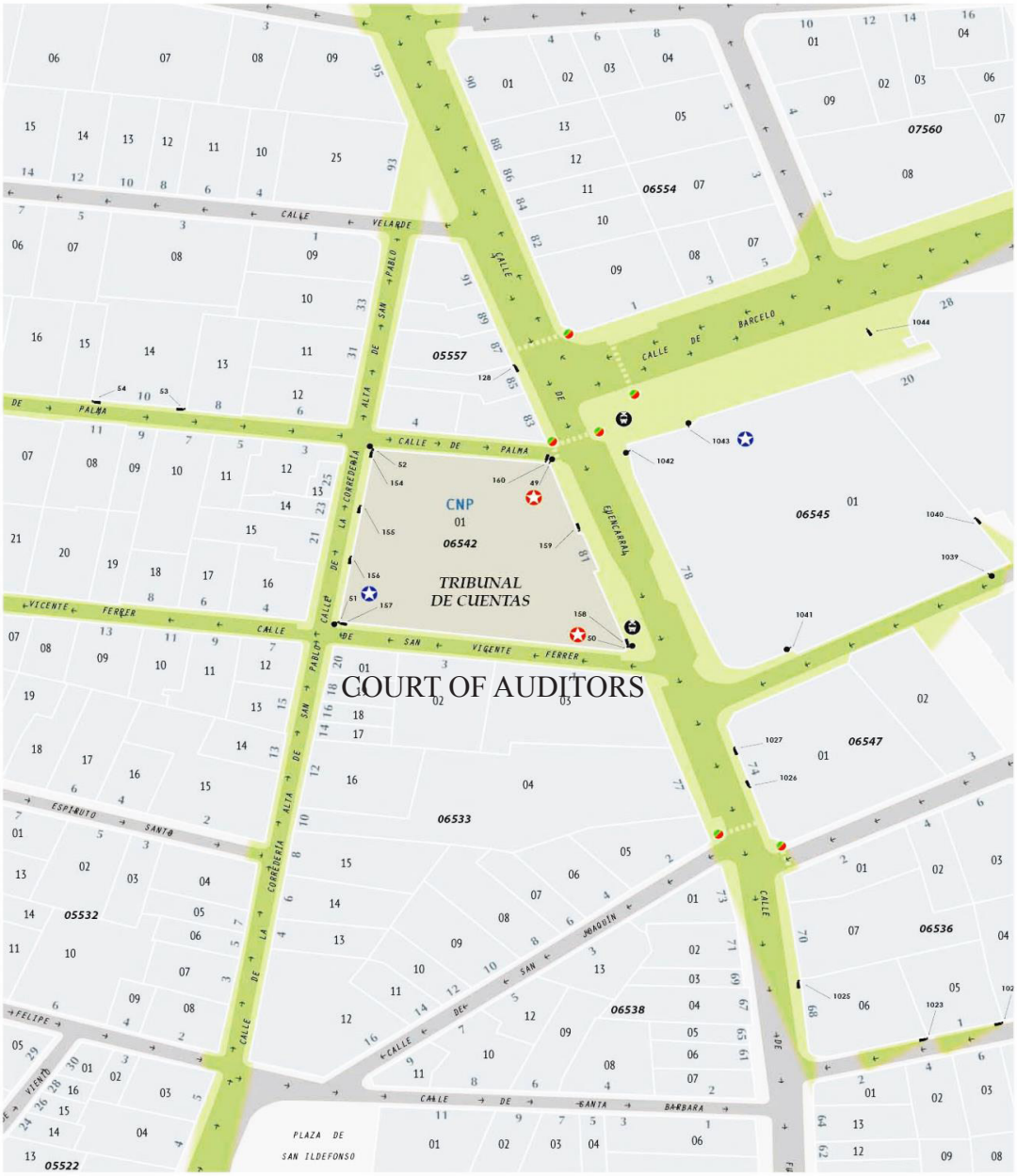


Figure 6. Thematic mapping drawn at a scale of 1:10000. Potential coverage is marked in green. Source: prepared by the author

TACTICAL-OPERATIONAL APPLICATION OF SYSTEMS

We understand intelligence to be the result of perfect symbiosis between three factors: quality, quantity and interpretation of information. Nevertheless, the objective of this article is not exclusively to generate a detailed database (quality), nor a generalised one (quantity), but instead we propose that we provide this information with tactical and operative capacity (interpretation) that allows it to be used in both ordinary and extraordinary situations. This is made possible thanks to analysis of the information from a strategic perspective (intelligence). This approach is underpinned by two principles, as follows: (a) the traceability of subjects and objects and (b) perimetrical lockdown or evacuation.

The traceability of a subject may be the result of tedious work, which may even become a task too great to undertake as explained by Heather[30] above. Consequently, the greater the knowledge of the environment accumulated from a systematic perspective, the more a shorter response time becomes necessary. Such action is vital to avoid destruction of evidence or subjects escaping. The effectiveness of the proposed system is considered in the following diagram:

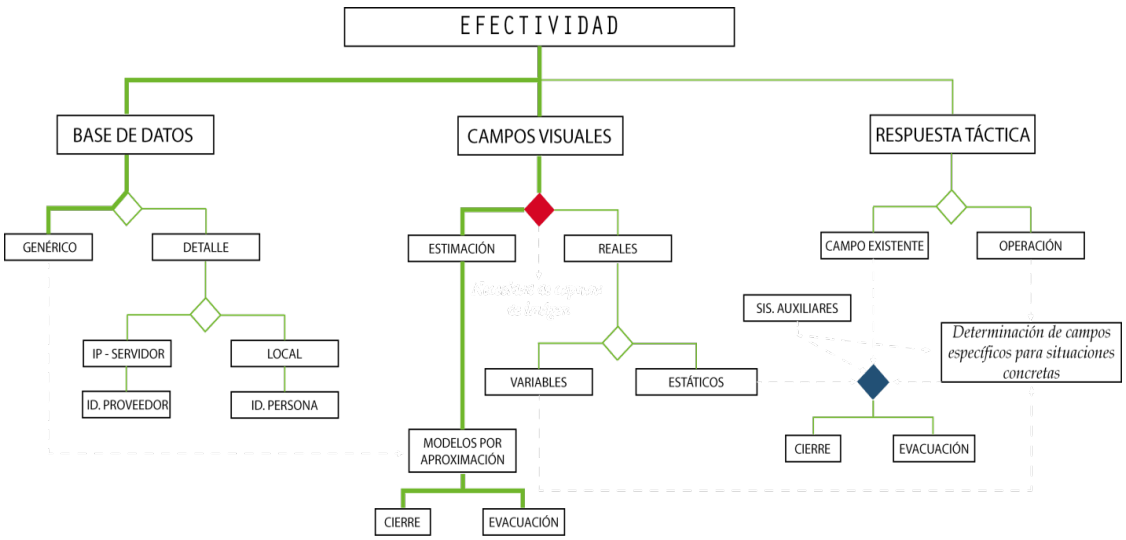
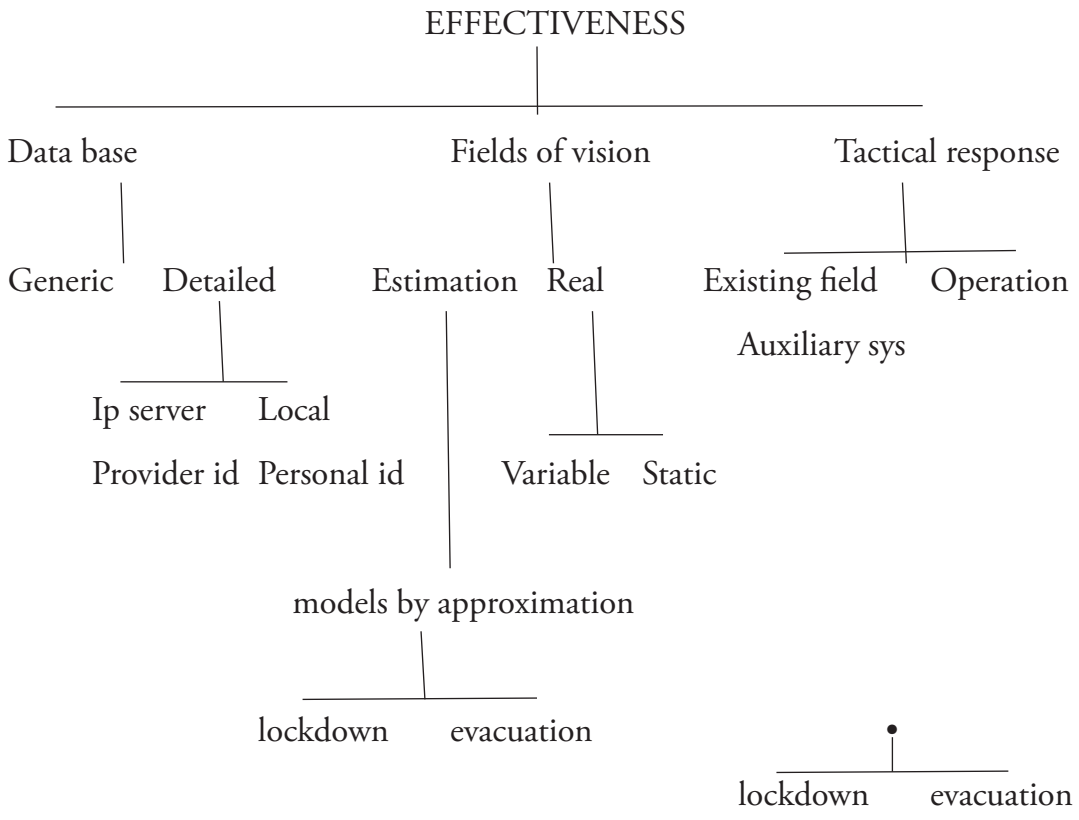


Figure 7. Logical structure underpinning tactical analysis of traceability. Source: prepared by the author.

30 HEATHER, Kelly. After Boston: The pros and cons of surveillance cameras. CNN. 2013 <http://edition.cnn.com/2013/04/26/tech/innovation/security-cameras-boston-bombings/ > [6 March 2014, 10:00].



Determination of specific fields for specific situations

Since we have considered (a) databases, (b) fields of vision and (c) a tactical response to be fundamental fields, their dovetailed interconnection can only be encouraged. Whilst they are currently perceived to be three separate isolated systems, their synthesis would bring about an exponential reduction in terms of time. Nonetheless, in order to make the model suggested more pragmatic, a further step is required. The thickest line illustrates the route taken by this study, while the thinner line shows the route that should be taken. A route, the current one, which without nominal information (information that may be accessed exclusively by judicial or institutional means) means that the present strategic component is insufficient. Thus, in order to complete the model, collaboration between law enforcement bodies is required.

By accounting for complete provision of the requisite nominal information and the express desire for collaboration amongst the parties involved, the estimated time for the traceability of a subject/object is estimated on the basis of a nodal system by way of exclusion. For the area to be analysed, this should not exceed the proportionality ratio of 1:5 (5 minutes of searching for every minute that the subject remains on public highways), whereas the current reality is closer to 1:72 or higher. This ratio can be considered to be 1:48 for Boston and estimated at 1:160 for London. This therefore represents a significant improvement compared with the current situation.

As regards the second tactical approach, that of perimeter lock-down or evacuation, the situation converges with that set out above. In order to achieve this objective, it has been considered that the combination of law enforcement bodies (National Police, Civil Guard, Municipal Police, Traffic Police and Military Police), CCTV systems and native traffic components is the configuration with the highest likelihood of success. Once again, the exchange of information is vital in this situation. A list of native traffic systems has been drawn up on the basis of this research. Nonetheless, this differs from the one generated by those who control these systems.

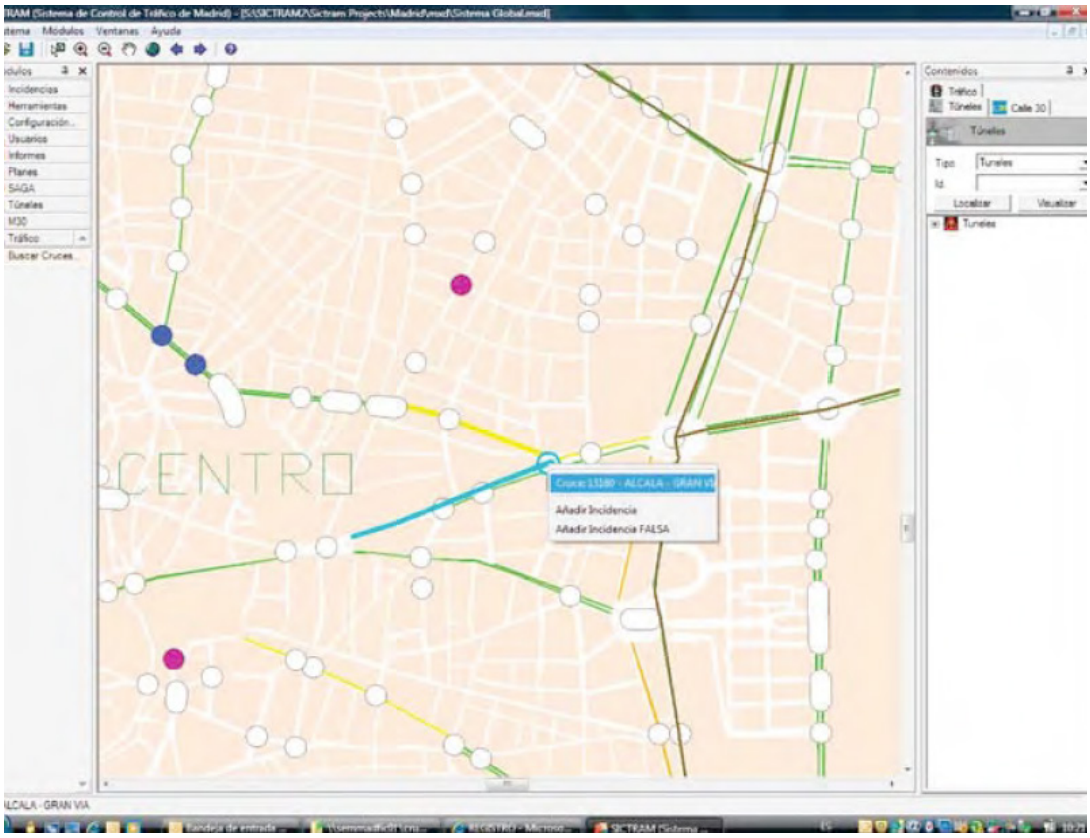


Figure 8. Screenshot of the application responsible for traffic management in Madrid. Source: http://www.astic.es/sites/default/files/articulosboletic/mono_8.pdf.

If we suppose that ideal synchronisation exists, then given the current locations of police units, video surveillance systems and traffic lights and with medium density flow, it is estimated that the central district would be closed off in no more than 4 minutes. A lockdown would need to be imposed both on the surface and on subterranean highways. This amount of time could prove to be too long depending on the position of the subject or object to be enclosed.

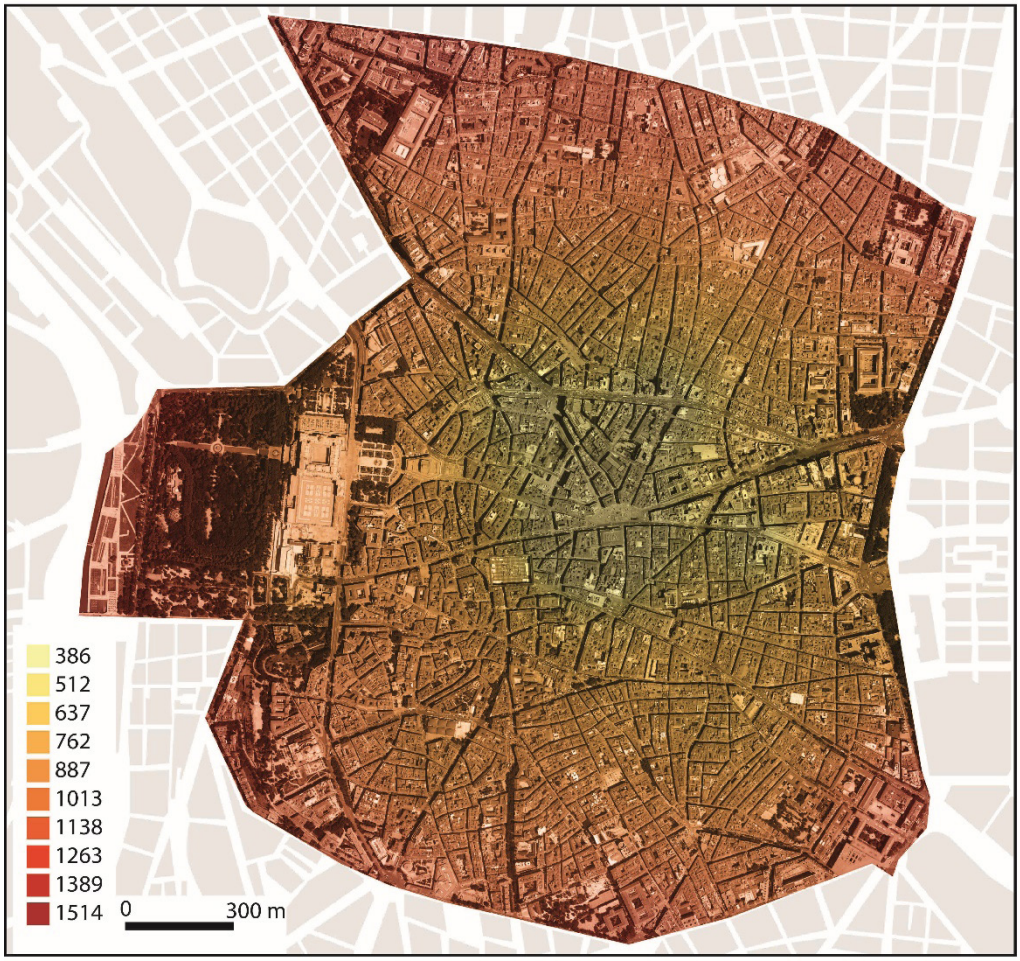


Figure 9. Isochronal representation of the dispersion achieved by a subject within seconds of leaving the Plaza de Sol at an average pace of 4 km/h. Source: prepared by the author.

Many simulations of different movements have been carried out with a view to determining the maximum reaction threshold, in terms of time, that law enforcement bodies can afford to take. By way of example, movement on foot at a speed of 4 km/h, a pace that does not jar with the passive crowd as a whole, is seen to generate the following dispersion.

On the basis of this mapping, we are able to obtain a set of conclusions concerning the geographical area subject to perimeter control. Firstly, the temporal centroid of the central district is located slightly towards the east. Heading this way, the subject would be outside the perimeter within less than 600 seconds after having left the Puerta del Sol. This contrasts with times for other directions where we see 1400 seconds for a northwards direction, 1200 seconds for southwards and 1500 seconds for westwards. This is all assuming that transit is unhindered.

On the other hand, the direction that is most likely to be used as an escape route is that with the highest density of strategic surveillance CCTV cameras. This characteristic tactically provides a comparative advantage as the first step in the protocol for action

would be redirecting certain CCTV systems to ensure the monitoring of the passive crowd along this stretch.

With regard to the suburban component, the automatic suspension of service in a variable area of interest extending from the location of the event ensures that any underground channels are no longer valid escape routes. In the same vein, it is considered necessary to order the immediate closure of exits where an access point is located within the perimeter and provides access to the exterior.

Although one must admit that a response time below 300 seconds (estimated based on supposed coordination between multiple systems) is relatively acceptable, work is underway on new models that allow for closure within less than a minute after an alert is issued.

CONCLUSIONS

Analysing security from a tactical perspective in urban settings is unquestionably a complex task, essentially due to two aspects. Firstly, we are faced with a huge quantity of variables within this field. Such a circumstance obliges us to resort to simplification and, for that matter, to an incomprehensive understanding of the system. Theoretically, in-depth analysis falls to the state's law enforcement bodies, as laid down in Article 104.1 of the Spanish Constitution. Secondly, and closely linked to the first point, the complexity of research like this highlights the lack of collaboration and institutional transparency. As previous pages demonstrate, this circumstance forces us to generate classifications or methodologies that are mutually incompatible.

From a practical point of view and building upon the fieldwork we have undertaken, as well as the documentation analysed, the following conclusions have been drawn:

- Video surveillance systems prove to be innocuous faced with de facto, non-preventive security when these are dealt with in an isolated and non-synchronised manner.
- The combination of public and private CCTV systems would allow for a control area required in cases of national interest.
- It would be vital to integrate the information provided by tactical systems in patrol vehicles, with a view to enhancing the combat of criminal activities.
- Given that security of perception may contribute to real situations of vulnerability, we call for the systematic development of procedures that allow for the traceability of any subject/object.
- Moreover, analysis of the location and the quantity of police video surveillance systems is required in order to thereby afford greater tactical coverage than is currently the case.

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