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SECURITY OF SMART CITY

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ABSTRACT

If the topic is Smart City, we can talk about independent and several combined systems. Such systems may be for example energy saving and environment friendly vehicles, control system of traffic or up to date traffic information. Each system is in itself an important system, but if we connect them to a common network it can reduce significantly the operation time of tasks. What kind of events requires complex operation or a system? Unfortunately, the increasing number of terrorist attacks can be heard in the news. Most attacks occurred against civilians in a place of mass occupancy. The perpetrators use cars and bombs to hit, blow up people. The article's aim is to review main problems of attacks and to describe a decision support system for coordination.

KEYWORDS

"Prophet" system, terrorist, map, security, coordination

CLASSIFICATION

JEL: F50

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INTRODUCTION

What is a smart city? Government decree 56/2017 (III. 20.) On the amendment of certain government decrees on the definition of the notion of 'smart city' and 'smart city methodology' " defines smart city as follows: "It is a settlement which plans and implements its integrated settlement development plan on the basis of the smart city methodology" [1; §5a], while smart city methodology is interpreted as follows: "The development methodology of settlements or groups of settlements, which advances the natural and man-made environment, digital infrastructure, the quality and economic efficiency of services with the use of modern and innovative information technologies in a sustainable fashion with the enhanced involvement of the population" [1, §5b].

In a city where the integration of systems of different functions operating fundamentally in an independent way is in focus and IT solutions are particularly highlighted. Such systems are, for example, BKK futár, Ch4llenge, Civitas Eccentric, Elliptic, Empower, Flow, Opticities, Smartlab etc. [2].

The construction and development of a smart city is a challenge not only in the field of technology but also in building and sustaining security. The mentioned systems contain data and information whose management must meet the requirements of the CIA (confidentiality, integrity, availability) and they must not be accessed by any unauthorised person. Unfortunately, an increasing number of terrorist attacks are carried out. In these cases, the number of attacks aimed at natural people is extremely high and this trend is further growing. Recently it is the series of vehicle-ramming attacks that can be recalled on the basis of the news. Browsing the databases of terrorist attacks, it can be seen that the number of cases registered annually was below 8 between 1970 and 2013 while this value is between 25 and 50 in the years 2014 to 2016 [3].

What can be the consequences of a vehicle-ramming attack?

In July 2016 a cargo truck was driven into the crowd celebrating Bastille Day on Promenade des Anglais in Nice, resulting in the death of 86 people and the injury of hundreds [4]. In August 2017 a Fiat van was driven into the crowd in a pedestrian street of Barcelona La Rambla, frequented by tourists. The damaged van moved along the street for 530 metres. The casualty list is: 1 killed and 88 injured [5].

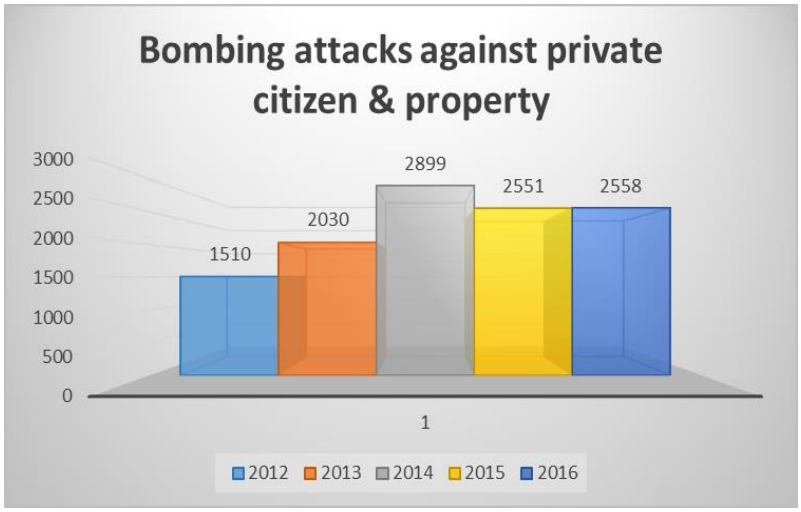

Figure 1. Bombing attacks against private citizen & property between 2012 and 2016 [6].

Defence against bomb attacks comprises a special branch of property protection, requiring continuous development and renewal. Its special features are clearly illustrated by the fact that the organisation and installation of the defence are aimed at the preparation for an atypical, unusual event or series of events. An explosion or the impacts of a blast fall into the category of extreme incidents whose severity is further aggravated by the intentional nature of the committed act, and the fact that such acts may be targeting either pre-selected people or objects, or randomly chosen people or objects anywhere in the world and at any time [7]. "The estimation of the risk of a particular terrorist act requires the coordinated work of a lot of fields of expertise. The cooperation of the experts of several independent areas (security policy experts, intelligence officers, engineers, mathematicians, etc.), and a sufficient amount of information are needed for estimating the risks related to one particular threat" [8].

The identification of risks is only the first step of planning the defence because it does not provide efficient defence. Effective defence is provided with the combined use of active and passive mechanical devices, electronic signalling systems (and protection systems), action plans, and regulation strategies. There is no doubt that the determination of action plans and regulation strategies requires a significant planning capacity, especially when there is a need for the concerted cooperation of several organisations. In the case of a bomb attack the coordinated cooperation of disaster management, national defence, civil protection, ambulance, and law enforcement agencies should be continuously provided during the prevention, countering, and the damage elimination. For professional planning and timing of the tasks the multi-faceted analysis of the dangers (intention to attack, methodology; used devices, materials, preparations, damage assessment of momentary dangers and further risks, the methods of their prevention and elimination, etc.) and the seamless and continuous information exchange among organisations with different responsibilities and philosophies are inevitable. Below the author partially presents a map-based system planned by him, which facilitates the cooperation of the services and agencies responsible for countering the above-mentioned threats as the execution of their tasks may be timed and tracked, independently of the local knowledge of the person coordinating the variety of agencies.

THE "PROPHET" SYSTEM

To determine the requirements and structures of a decision support system proved to be an extremely complex task. The first step was the identification of the exact goal of the system, the range of its application, and the requirements of its structure. What made the task very difficult was the fact that the knowledge from each field of expertise had to be integrated. They were mostly interrelated or even complemented each other although in some other cases there was no relation amongst them. In the author's opinion the transparency of the "Prophet" system requires knowledge in the following special fields: safety science, blasting technology, fire protection, labour safety, architecture, disaster management, law enforcement; IT, telecommunications, electrical engineering, cartography, law and psychology [9].

PREVENTIVE MEASURES

What measures are to be taken? What should be the order of steps in situation management? The system I planned includes the following. As the first step, significant data and information related to the area should be clearly seen. If they are at our disposal, the system can provide a comprehensive picture of what is endangered and of the possible losses. Second, a thorough study of the region and local crime statistics is necessary. These data are supposed to show the number and type of attacks and also the time of the day and the most common targets and additional special details. From these data the most potential threat may

be determined. Upon performing this study, a vulnerability assessment of the facility or building is to draw; then the estimate of the risk of attack must be made. The security plan should be made on the basis of the vulnerability assessment and it is to assure that security plans are appropriate and suitable for the protection of the area.

It is extremely important, that the plan has to be regularly updated. A formal security plan review should be performed once a year. The security plan should be modified if a significant change is introduced in the organization or if an attack occurs [7]. Past incidents and standards help in choosing the right methods. In most situations the goals are unattainable, though.

After the assessment of the data, information, dangers, and risks relating to an area, the planning of prevention, protection, and damage control activities can be launched.

Imagine a crowded city where schools, hotels, supermarkets, residential buildings, car parks are close to each other. In most cases the old buildings are built on very narrow lanes, and there is no or hardly any space between them. Another problem arises due to roads and means of public transport. Roads and electric wires are similarly close to the buildings.

One can see in Fig.2 three buses and two trams which are close to buildings of mass occupancy. A well-parked vehicle carrying hundreds, or thousands of pounds of explosive can strongly increase the vulnerability of the area. Why is space so important? Table 1 includes the main reasons.

Figure 2. Insufficient separations among the education institute, apartment buildings and means of public transport.

An exploding car bomb or truck bomb also known as a Vehicle Borne Improvised Explosive Device (VBIED) kills people inside the building, outside in the street and may collapse nearby buildings by blast wave and fragmentation.

THE OBJECTIVES OF THE *PROPHET* SYSTEM

The brief summary of the objectives of the system:

- primarily to provide support to decisions made about the management of explosion threats, and to increase the efficacy of the execution of tasks (including those conducted in mission areas),
- the identification of the potential location of a bomb attack in the most precise way possible,
- estimation of relating risks,
- estimation of the (human and technical) resources of the involved organisations in relation to the particular task (intelligence, prevention, defence, counteractions, damage control),

Table 1. Bomb threat stand-off distances [7].

Threat Description		Explosives Capacity (TNT Equivalent)	Mandatory Evacuation Distance*	Preferred Evacuation Distance**
	Pipe Bomb	5 lbs/ 2,3 kg	70 ft/ 21 m	1 200 ft/ 366 m
	Suicide Vest	20 lbs/ 9,2 kg	110 ft/ 34 m	1 750 ft/ 518 m
	Briefcase/ Suitcase Bomb	50 lbs/ 23 kg	150 ft/ 46 m	1 850 ft/ 564 m
	Sedan	500 lbs/ 227 kg	320 ft/ 98 m	1 900 ft/ 580 m
	SUV/Van	1 000 lbs/ 454 kg	400 ft/ 122 m	2 400 ft/ 732 m
	Small Delivery Truck	4 000 lbs/ 1 814 kg	640 ft/ 195 m	3 800 ft/ 1 159 m
	Container/ Water Truck	10 000 lbs/ 4 536 kg	860 ft/ 263 m	5 100 ft/ 1555 m
	Semi-Trailer	60 000 lbs/ 27 216 kg	1 570 ft/ 479 m	9 300 ft/ 2 835 m

*Governed by the ability of typical US commercial construction to resist severe damage or collapse following a blast. Performances can vary significantly, however, and buildings should be analysed by qualified parties when possible.

**Governed by the greater of fragment throw distance or glass breakage/falling glass hazard distance. Note that pipe and briefcase bombs assume cased charges that throw fragments farther than vehicle bombs.

- coordination and the streamlining of the coordination of the work (intelligence, prevention, defence, counteractions, damage control) of the relevant organisations,
- synchronisation of the activities of service-providers in coordination with the special services,
- as a secondary tier: to provide support to decisions relating to the management of any other threat or disaster, and the increase of the efficacy of the execution of tasks.

The estimation of the destructive effect of an explosive device in a precisely determined location. This article provides the description of the estimation of the destructive effect of an explosive device planted or positioned in a precisely determined location [10].

THE ESTIMATION OF THE DESTRUCTIVE EFFECT OF AN EXPLOSIVE DEVICE IN A PRECISELY DETERMINED LOCATION

The location of the explosive device (VBIED) planted by a bomber is precisely known. It may be disclosed on the basis of the information provided by the bomber or another person – a passer-by, security guard, etc. The advantage of the situation is that it is easier to estimate the extent of the danger zone. In the simulated attack the vehicle in question falls into the van category, the relating values in the security table are 120 m and 730 m. As the next step the perimeter of the danger zone can be determined through the comparison of the two parameters follows with the location scheme. The damage assessment of installations is based on determined building classifications, people inside, evacuation time, and other dangers. The map section below illustrates various object classifications. Apart from objects vehicles, means of transportation, public services, telecommunication networks, and other infrastructures other on surface and underground should also be taken into consideration. If the necessary data are arranged into a data table, a complex system takes shape which almost immediately provides the necessary information (Fig. 3).

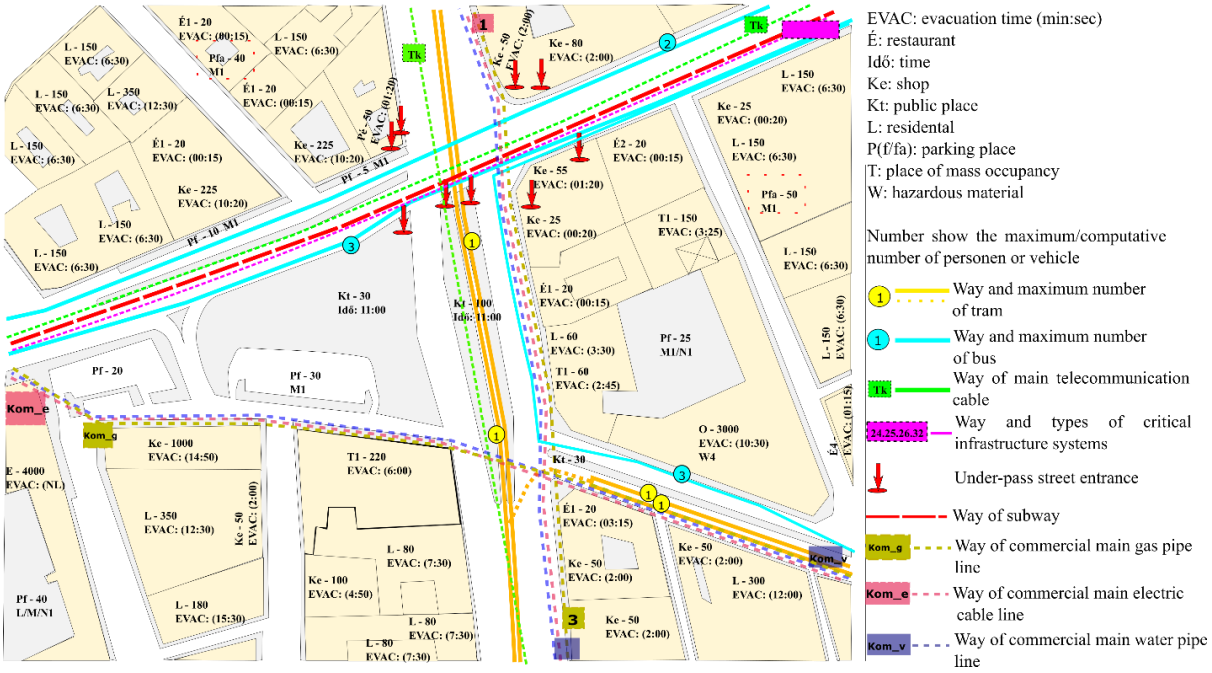

Figure 3. The scheme of all data of the *Prophet* system.

When all the necessary information is available damage assessment will follow. It involves the comparison of the given scheme of the scene – with all information displayed – and the perimeter of the danger zone. For damage assessment purposes the areas within the circles are to be analysed. The completed analysis will clearly indicate which organisation or service provider is to be alerted for the prevention or elimination of the damage or loss in the case of injuries. The efficacy of the measures taken is further increased by simulated and elaborated scenarios.

CONCLUSION

Any explosive device may cause huge destruction in the split of a second. This is particularly true for VBIEDs. The more densely populated an area is or the larger temporary population it has, the more developed infrastructure it has, the bigger the caused damage, and the larger the number of injured and the losses of lives are. Perhaps one of the best-known bomb attacks was committed against the USA Embassy, located along a busy road in the centre of Nairobi, the capital city of Kenya. The seven-story building next to the Embassy collapsed and the

Embassy buildings turned unusable although remained intact. The terrorist attack committed with the use of an explosive device planted in a Toyota Dyna van claimed more than 200 lives and more than 4 000 people were injured by the blast. The described *Prophet* decision system may significantly help discovering bombing incidents against population. Even if detection has not been successful it may assist to process of precedence, prevent and recovery. Factories need to have own security and emergency plans in case of accidents and terror attacks. Factories also need to cross-check with the competent Police Authority and National Directorate General for Disaster Management. The "Prophet" system complements other decision support systems and makes more efficient and resilient [11] those performance of management processes between population, authorities and company.

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