Chapter

The Software to the Soft Target Assessment

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Abstract

The soft targets are closely related to the risk of attack to the group of people (to the lives). This problem can cause fatal consequences for the population. The current situation on the world reflects the fear of the attack in the soft targets. We can see the fear to lose life at these public places and in all types of access to free buildings. Each of us spends time in the shopping centers or the park every day, and our children spend time in schools where they can be threatened. The characteristics between the soft targets belong to a considerable number of persons at the same time in the same area, and the current state of the security measures is not adequate to the threats yet. The main aim of the software to the assessment of the soft target is to protect the people in the soft targets, minimize the impact to the people (visitors), and help to solve the problem at the moment. The methodology is based on the assessment of the object according to the features (according to the criteria).

Keywords: soft target assessment, analysis, security coefficient, object analysis

1. Introduction

The soft targets, the crowded places, and the objects of critical infrastructure are very vulnerable to the risk of the attack. These objects are identified as objects with a large number of visitors per day, and the situation is not as secure as the object requires [1]. These visitors are the aim of the potential attacker. The potential attacker is a man, who believes that the attack can solve the problem (problem with the political situation, the problem with the state system, the problem with the world). The attacker believes that the fear of death can solve the problem or can spread fear between other people. The attack on soft targets can disrupt the functionality of the state with fatal consequences [2].

The proposed methodology and the software tool can help us to the evaluation process of the soft targets and can help us to protect the life of the people. The main problem is that these places have open access to people all day. The open access can cause that the early detection of the attacker is difficult and a lot of people are at risk. If we can analyze the features of the object (in advance), then we will solve the problem effectively [3].

The current state of the research is described in this chapter. We have developed the static part of the assessment tool, and this static part was verified in the practice use (analyses of the soft targets in the Czech Republic). In Section 2, the attacks in the last years are described. The mathematical definition of the analysis of the soft targets is described in Section 3. Section 4 describes the case study of the shopping centers in the Czech and Slovak Republic. The case study of the train and bus station is described in Section 5. Finally, we describe the final comparison between the shopping center analyses and the train and bus station analyses in Section 6. Finally, we summarized the conclusion in the last section.

2. The attacks in the last year

In **Figure 1**, you can see the timeline of the last attacks from the 2019. This timeline is focused on the attacks to the civilians. These attacks were in the soft targets and crowded places realized.

As you can see in **Figure 1**, attacks on the soft targets killed 139 persons at least, and 301 people were injured. We can say that attacks on soft targets are very popular. On the other hand, a lot of attacks on the soft targets were revealed before the attacker will fulfill the attack. We can say that our system is more needed in the last years.

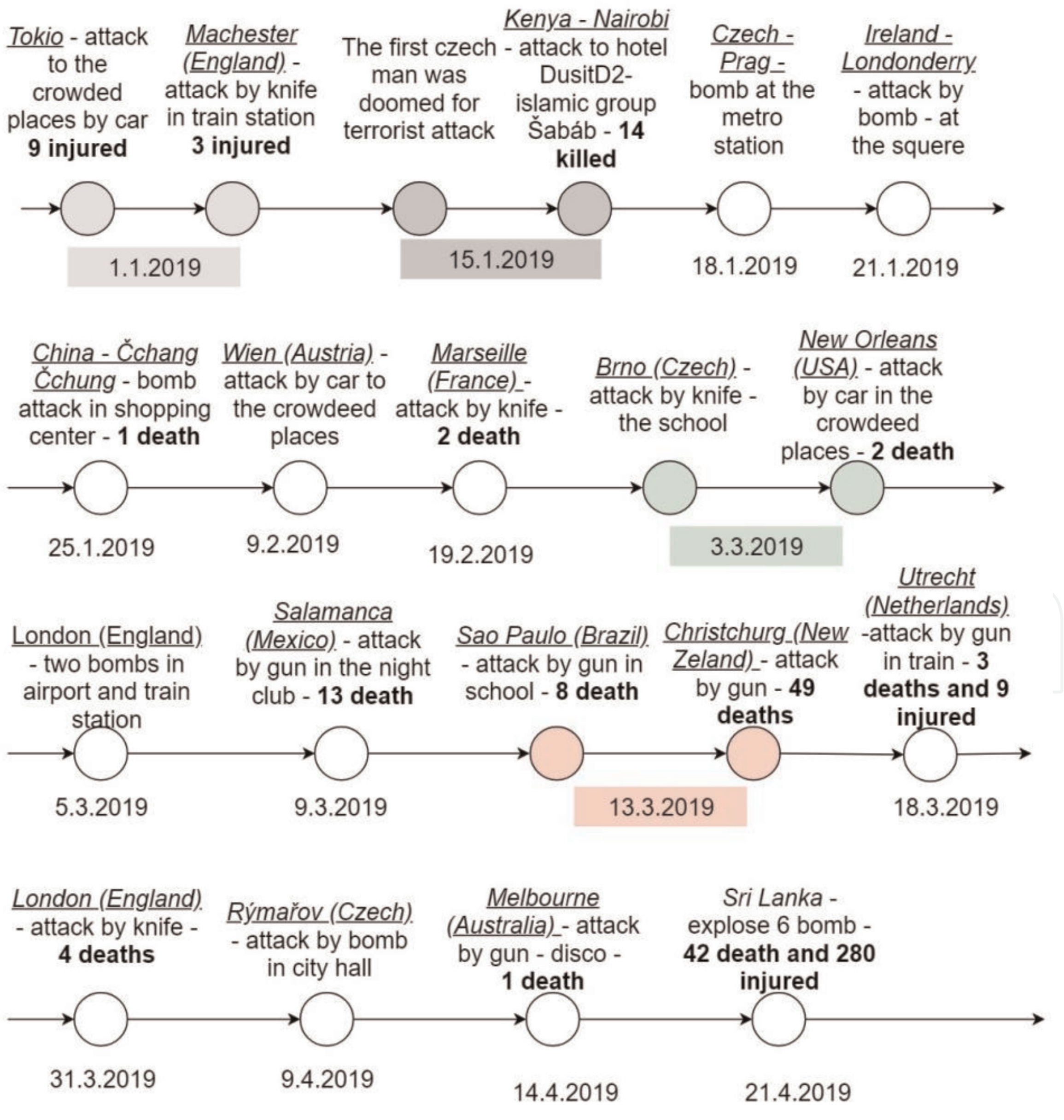

Figure 1.
The timeline of the attacks in 2019.

3. The mathematical definition of the analysis of the soft targets

The whole analysis of the features of the soft target is based on the relation between the question and the answer. The question analyzes the status of the features of the object. Each of the answers can define the level of the security, the level of the question, and level of the features too. This fact can be seen in **Figure 2**.

The level of the security can be influenced by the security measures. After the repeated assessment, we can see the higher level of the security.

The whole coefficient of the object is defined in the next equations:

$$K_S = \frac{L.W_1 + C_{EK}.W_2 + C_{PK}.W_3 + C_{IK}.W_3}{4} \quad (1)$$

K_S—the final security coefficient; Wn—weight of each coefficient; L—coefficient of the locality; C_{EK}—final coefficient of the exterior; C_{PK}—final coefficient of the processes; C_{IK}—final coefficient of the interior.

The weight (Wn) is set by the administrator of the software tool. We propose that these weights will be clarified after more case studies. In the current research, we evenly set these weights. The locality coefficient is defined by the map tool. The map tool has defined the risk of the locality by the administrator.

The coefficient of the interior is defined in Eq. (2). Each of the security attributes can be used in the object several times. The use of these security attributes is significant to the whole interior security. The security attributes define how many times the security attributes can be used:

$$I_K = \frac{1}{PB}\sum_{i=1}^{PB} B_i, \ (B_i \in <0, 100) \quad (2)$$

PB—the number of the security attributes; B_i—the security attributes; I_K—the criteria of the interior.

Eq. (3) defines the final interior criteria in the same category of the interior. The final interior criteria (category) are based on the sum of each of these categories of the interior criteria:

$$I_{KCi} = \frac{1}{PK}\sum_{i=1}^{PK} I_K \quad (3)$$

I_{KCi}—interior criteria (all); PK—the number of the criteria.

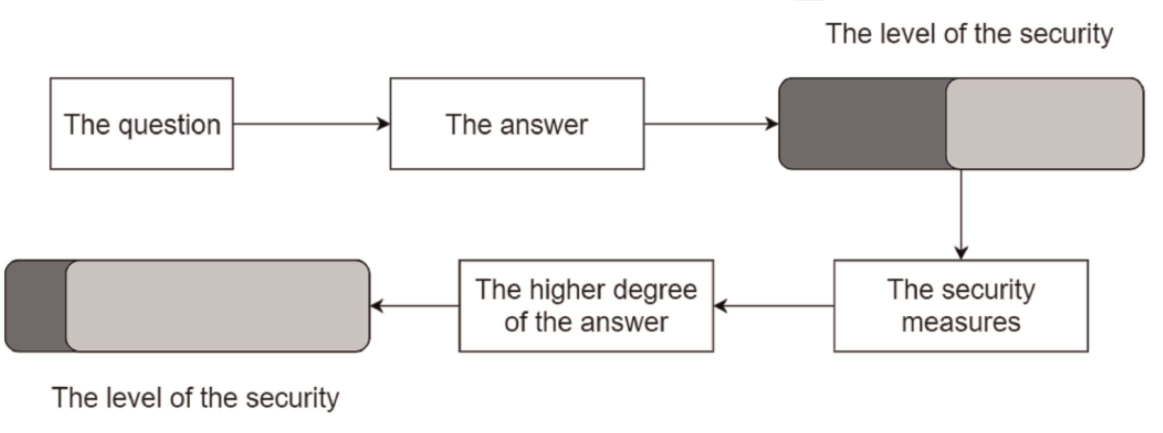

Figure 2.
The basics of the analysis of the soft targets.

The categories of the interior criteria are incorporated to the final coefficient of the interior. This equation is defined in Eq. (4):

$$C_{IK} = \frac{1}{P}\sum_{i=1}^{P} I_{KCi} \tag{4}$$

C_{IK}—the final coefficient of the interior; P—the number of up criteria.

The final coefficient of the interior is the sum of all the up criteria. The exterior coefficient is defined in Eq. (5):

$$E_K = \sum_{k_u=0}^{3} N * k_u = n * 0 + n * 1 + n * 2 + n * 3 \tag{5}$$

E_K—the calculation of the value of the exterior criteria; k_u—coefficient of the security level; N—the number of the attributes.

$$E_{KC} = \frac{\sum_{ku=0}^{3} n * k_u}{3 * \text{sum N}} \tag{6}$$

E_{KC}—all of the criteria of the exterior; Sum N—the number of all attributes.

$$\text{sum N} = \sum_{i=1}^{4} N_i \tag{7}$$

The final coefficient of the exterior is defined in Eq. (8).

$$C_{EK} = \left[\frac{10}{n}\sum_{j}^{n} E_{KCj}\right] * W \tag{8}$$

C_{EK}—the whole coefficient of the exterior.

Each of these equations is used in the next part of the paper (in the case study).

The process coefficient is defined in Eq. (9):

$$P_K = \sum_{k_u=1}^{3} n_k * k_u \tag{9}$$

P_K—coefficient of one process (the number of criteria); nk—the number of the criteria; k_u—the level of the criteria.

$$P_{KCj} = \frac{10}{3 * N}\sum_{i=1}^{n} P_{Ki} \tag{10}$$

P_{KCj}—the complete process coefficient of the all processes in one category (processes are divided into the categories); N—the number of the processes; n—the number of the upper level of the process; P_{Ki}—each of the coefficient of one process.

The complete process coefficient is defined in Eq. (11). Each category has defined the weight according to the threats, or we can evenly set the weight:

$$C_{PK} = \left[\frac{1}{N}\sum_{j=1}^{k} P_{KCj}\right] * W \tag{11}$$

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CPK—the whole coefficient of the processes; k—the criteria; W—the weight of the process.

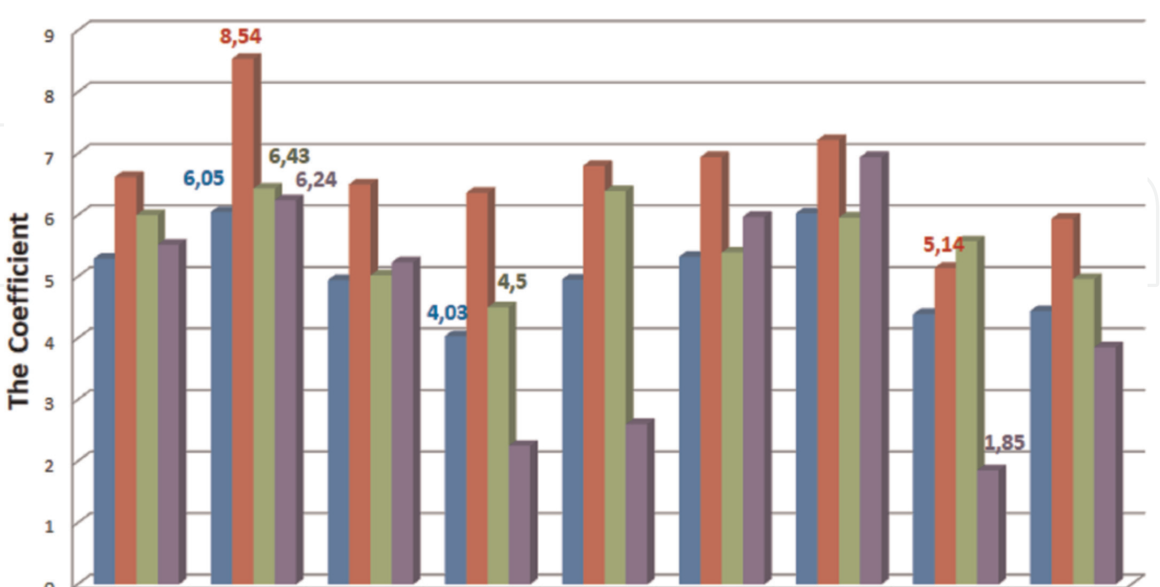
This part of the chapter defined the mathematical definitions of the whole process of the analysis. We have defined three types of concrete analysis (processes, internal, and external) and one type of outside analysis (locality coefficient). The locality coefficient is defined according to the situation in the nearest area of the object. We can say that the locality can be changed in time without the change in the object. For example, the public event can influence the security situation in the object (e.g., the Christmas market).

4. The case study of the analysis of the shopping center

The case study was done to 35 objects which are situated in the Czech Republic and Slovak Republic. The objects which were analyzed belong to the next types of the categories: shopping centers, schools and universities, authority offices, train and bus stations, multifunctional buildings, sports stadiums, hospitals, and theaters and cinemas. In this part of the chapter, we are talking about the analysis of the shopping centers.

In **Figure 3**, we can see the analysis of nine shopping centers. On the x-axis, the object number is defined. On the y-axis, the security coefficient is defined. Value 10 represents the best security situation in the object. On the other hand, value 0 or 1 represents the worst security situation in the object.

As you can see in **Figure 3**, the best security situation is object 2. The object has the highest final security coefficient (KS) with value 6.5 (CIK). The final coefficient of the interior has object 2 with value 8.54. This value is the best security interior coefficient from this case study too. Exterior and process coefficient is the best value from the case study in object 2 too. In the next part, we can see the characterization of object 2.



	1	2	7	9	15	19	20	30	31
KS	5,29	6,05	4,94	4,03	4,95	5,32	6,03	4,39	4,44
CIK	6,62	8,54	6,5	6,36	6,8	6,94	7,22	5,14	5,94
CPK	6	6,43	5,02	4,5	6,39	5,39	5,96	5,57	4,96
CEK	5,52	6,24	5,23	2,25	2,6	5,97	6,94	1,85	3,85

Figure 3.
The analysis of the shopping centers.

In **Figure 4**, we can see the locality of object 2. Object 2 is a relatively new shopping center. The locality is not in the center of the city, but the locality is very important for the visitors. Around the object is a river. The locality and the city are not so visited per day by visitors, and this fact can have a significant impact on the assessment of the locality and exterior. We need to say that this fact can be in the time variable. For example, the visit of the president can make the locality more unsafe, and the object will have a lower security coefficient.

In **Figure 5**, we can see antiterrorism pillars that are installed before entering into the object. Object 2 has integrated a lot of security measures because it is a relatively new object.

As you can see in **Figure 5**, these pillars can protect the enter to the object against the attack by car (drive the vehicle into the people).

On the other hand, the worst security situation is in object 9. This object can be seen in **Figure 6**. Object 9 is in the other city in the Czech Republic. This object is not in the center of the city, but this object is very close to the middle of the center. Object 9 is close to the main road, which is located across the parts of the city. Object 9 is located around the Rock café; in Rock café the rock concerts and the similar actions are organized too. This object can cause the risk of the violent attack to the object, however not to the people, because these actions are in the evening hours, when the shopping center is closed. This object has turnpike before its enter to the parking places.

As we can see in **Figure 3**, object 9 has a lower exterior coefficient. This fact can be caused by a close distance to the main road, the middle of the center, and the Rock café too.

This part of the chapter described the results of the case study in the shopping centers as a category. In the next part, we can describe the result of the train and bus

Figure 4.
The locality of object 2 (shopping center).

Figure 5.
The antiterrorism pillars before the enters.

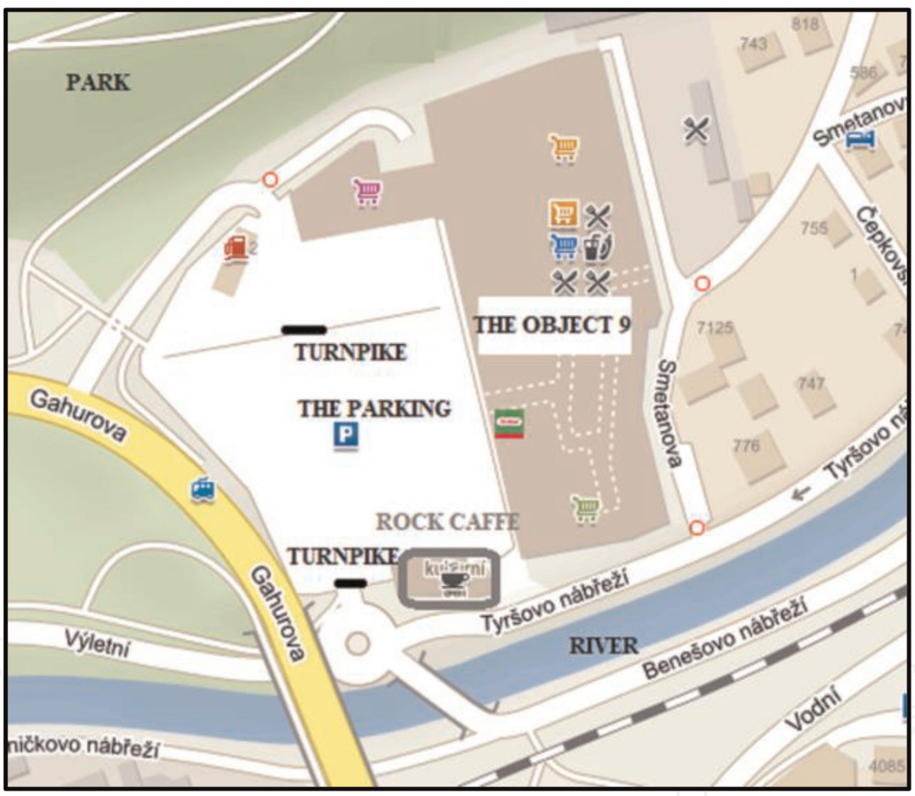


Figure 6.
The locality of object 9.

station. These objects are opened, and we can see the differences between two types of security coefficients which are caused by the different categories.

5. The case study of the analysis of the train and bus station

This chapter describes the analysis of the objects in the category train and bus station. We can expect that these objects will have the differences between the exterior coefficient and the shopping centers. If the case study confirms this theory, we can say that the proposed methodology to the analysis corresponds to the reality.

In **Figure 7** we can see the objects (train and bus stations) which are analyzed in this case study. The numbers in **Figure 6** mark the number of objects.

In **Figure 8**, we can see the data of the case study. The best security situation is object 14. This train and bus station is located in Frydek-Místek. This result is caused by the analysis. The analysis was realized only in the building of the bus station. The analytics did not analyze the train station, which shows that the final coefficient will be lower. On the other hand, the worst situation according to the final security coefficient is object 3. Object 3 is located in Zlin. This city is a country town. We can say that this object was analyzed correctly.

Object 3 is oriented in the middle of the center. The rail tracks are going across the middle of the town. On the other hand, we need to say that rail transport is not so used in Zlin. In **Figure 9**, we can see the localization of the train and bus station.

Finally, we can say that this analysis in the category train and bus station has some differences between assessments. This fact is caused by the aim of the analysis and software tool. The proposed software tool was developed for analyzing the buildings and not for analyzing open spaces. The second reason can be that the case study was done with more analytics.

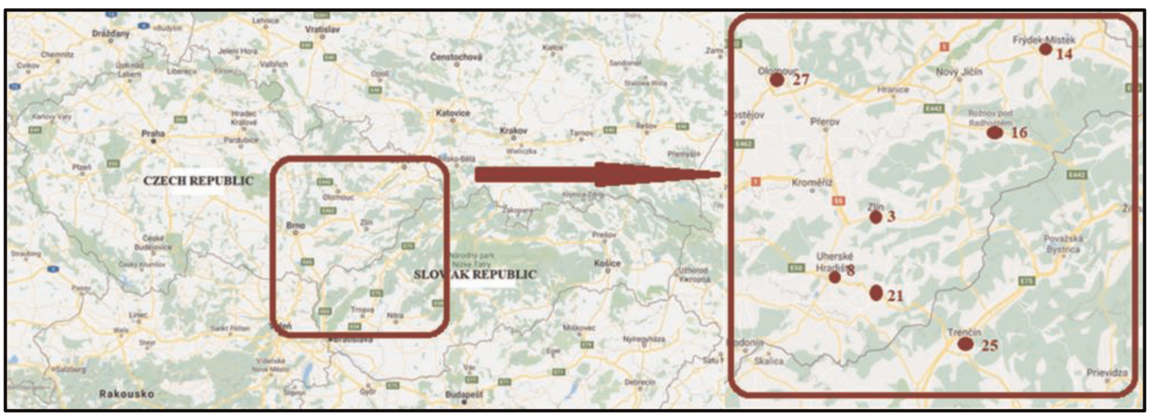
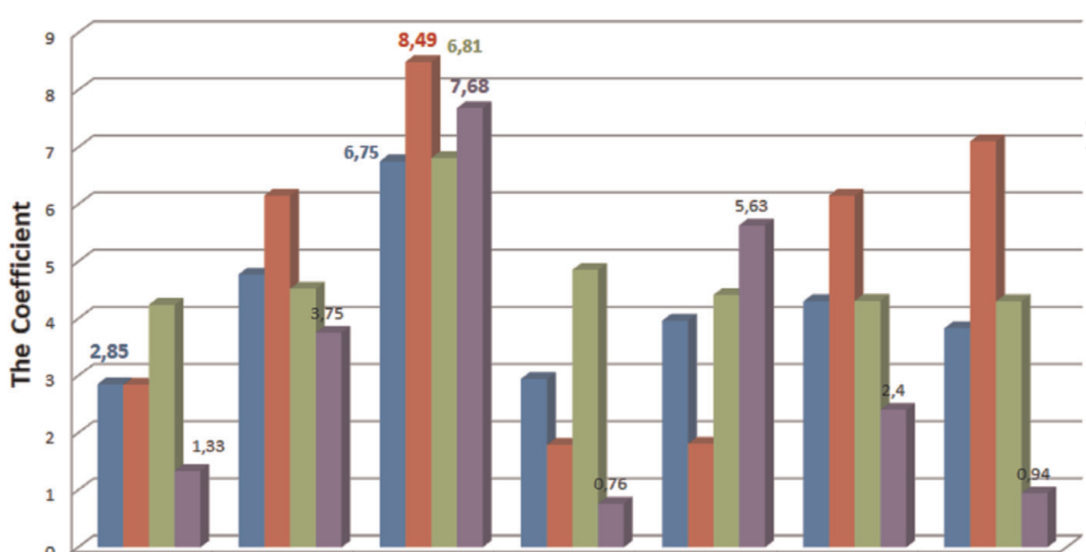


Figure 7.
The localization of the train and bus stations.



	3	8	14	16	21	25	27
KS	2,85	4,77	6,75	2,94	3,96	4,3	3,83
CIK	2,84	6,15	8,49	1,79	1,81	6,15	7,1
CPK	4,24	4,52	6,81	4,85	4,41	4,31	4,3
CEK	1,33	3,75	7,68	0,76	5,63	2,4	0,94

Figure 8.
The analysis of the train and bus station.

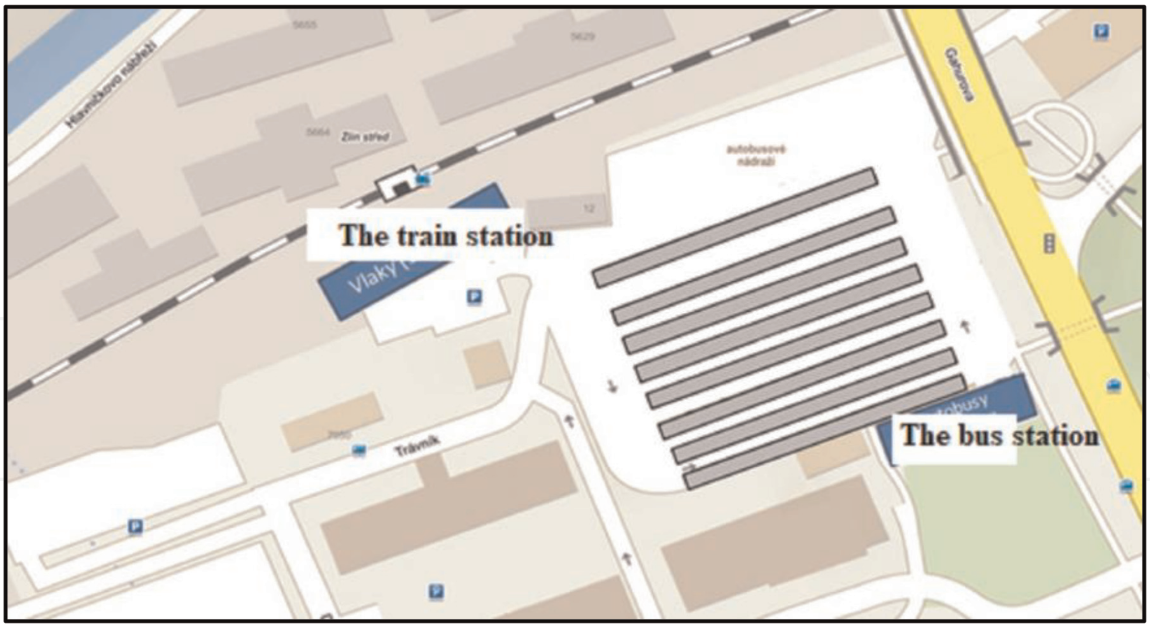


Figure 9.
The locality of the train and bus station in Zlin.

6. The final comparisons

We can constant that each of the objects (train and bus stations) has a different exterior security coefficient in contrast with the shopping centers. We can see this contrast in **Figure 9**.

As we can see in **Figure 10**, the difference between the average values is significant. The average value of the exterior coefficient in the shopping centers is 4.49. The average value of the exterior coefficient in the train and bus station is 1.75. As we can see on the right side of the figure, the train and bus station has significant differences in the two cases. Object 21 and object 14 are the objects that have not been analyzed correctly. The analyst analyzes only one part of the station. In these two cases, we do not use the average value. We can constant that each of the objects (train and bus stations) has the different exterior security coefficient in contrast with the shopping centers. We can see this contrast in **Figure 10**.

As we can see in the right side of **Figure 11**, object 14 (train and bus station in Frýdek-Místek) is not correctly analyzed. We cannot use these results as the correct

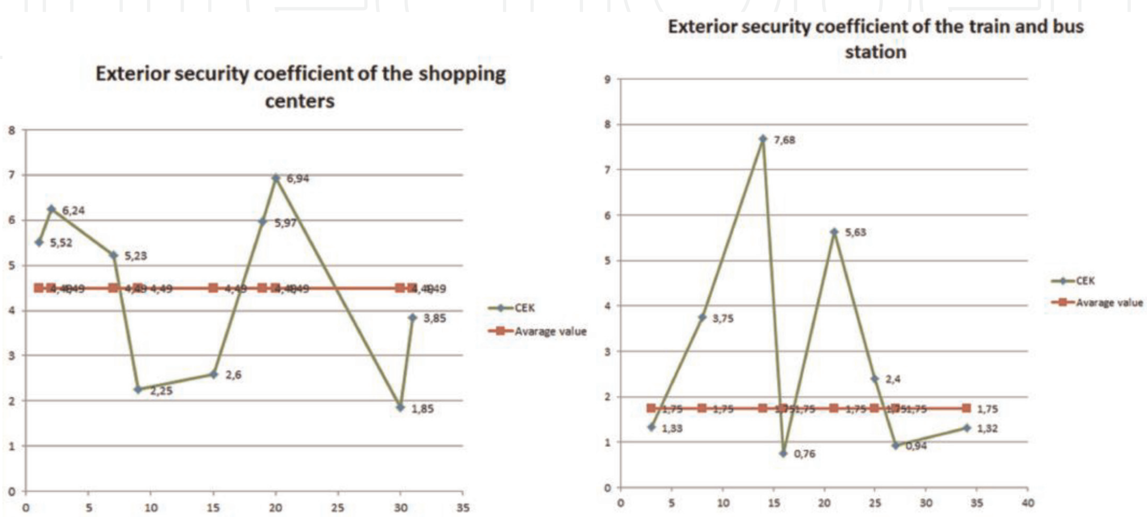


Figure 10.
The comparison between shopping center and bus and train station in exterior coefficient.

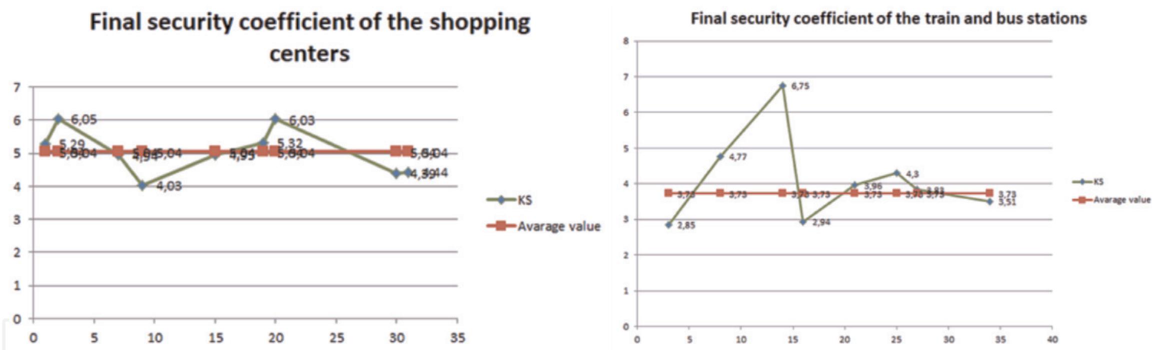


Figure 11.
The final comparison between the train and bus stations and shopping centers.

data. On the other hand, object 8 is the second best security coefficient. This object is correctly analyzed. We can see that the average value of this analysis is 3.73. On the other hand, the average value of the analysis of the shopping center is 5.04. We can say that the analysis corresponds to the reality because open-space objects will have a significant difference in security situations.

7. Conclusion

This chapter aimed to describe the proposed software tool which is realized on the website www.softtargets.eu. This methodology was developed as a doctoral thesis. In the first part of this chapter, the mathematical definitions of the proposed methodology were described. The second part of this chapter, the case study, was described. This case study was oriented to the comparison between shopping center analysis and the train and bus station analysis. The results of the shopping centers and the results of the train and bus station have significant differences. These differences were caused by exterior differences: the shopping center analyses (the building and close places) and the train and bus station analyses (the open spaces). We can constant that the proposed software can be used to the analysis of the open spaces too. However, we need to analyze all buildings and all aspects of the open spaces. We need to set more criteria for the open spaces. These criteria will be different from the criteria of the buildings because these criteria have to study the other features of the soft target.

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