


A STUDY ON THE CREATION OF A CAMPUS EQUIPMENT INFORMATION SYSTEM (CUFIS)


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ABSTRACT. Nowadays, information has possessed an easily accessible status swiftly with the advancement of technology. The significance of education institutions and organizations in terms of sharing information cannot be ignored. In this respect, in order for the universities to help users make conscious decisions regarding possible planning and maintenance-renovation in the future, the campus equipment information system (CUFIS) which is formed to produce reliable information by providing that the data are connected to each other and presenting the users a deeper perspective will be used in many fields in the forthcoming years.

Within the scope of this study, a data base was created by adapting entity property information of 1434 urban furniture units available within Sehitler Campus of Kafkas University into GIS setting. The urban reinforcement elements within the scope of the database are as follows: lighting units include seating elements, garbage bins, signage and information boards, billboards, bus stops, water items and fountains, flower boxes and other items. Furthermore, identity cards were prepared for each equipment unit as a result of inventory works belonging to equipment units.

With the created data base, the statistical analyses were obtained. The type, number, physical and functional characteristics of the equipments found in the compound, such as damage status, have been identified. In addition, they were included in comparing the area of research to the distribution of equipping elements to structural units by splitting it into parcels. In conclusion, the activities of landscape design and planning are discussed in accordance with the analyses and findings and the attention was paid to the need for CUFIS by providing some suggestions.

Keywords: *Campus Equipment Information System (CUFIS), Geographical Information System (GIS), Campus Information System, Urban Reinforcement Elements, Kafkas University.*

INTRODUCTION

Today, problems such as poor environmental conditions that modern society is always facing, an unsystematically increasing population surge, and therefore a feeling of limitation caused by crowded populated cities, also increase the demand of equipment elements for urban residents. The planning and design studies carried out in accordance with this goal have become easily feasible with today's technology. Providing problem solutions, ensuring that corporate services perform their tasks fully, increasing the provided services efficiency, implementing time and economic attitudes, through quickly accessing current, accurate and healthy data in the decision-making process, makes information systems necessary and important. These systems have emerged due to the fact that there are products that information technologies serve us to achieve the desired information. The most influential organizations in development of societies are universities located in cities. Therefore, the importance of using data decisively in these organizations should not be underestimated. A reliable and convenient data source is required for planning and managing university campuses. A project that is

considered the work of the University during the planning and administrative structures in the area of educational information, green information, student, staff information, such as existing urban furniture it will be necessary to examine the information up to date [1].

It is necessary to produce a CUFIS Campus Reinforcement Information System by leveraging the capabilities offered by different information technologies to ensure that universities are managed with a more contemporary point of view and the variations created within the campus are quickly updated and smart steps can be taken in light of secure information [1].

Based on the need to create more rational solutions to the problems faced by cities by preparing them for futuristic long-term concepts, the concept of a smart city has emerged. This concept, which focuses on the human factor in the world that has become digital, offers a structure that is integrated with the concept of technology in order to be more sustainable cities, livable and productive [9].

University settlements have a role to play with outdoor spaces from a landscape designer's perspective to relax and take the learning process of young people out of the classroom. University campuses are very important for concepts such as personal and cultural development of young people, their behaviors, establishing friendship relationships and taking on certain social roles, their sense of community, and the relationship they establish with nature [28].

Urban reinforcement elements: they provide a comfort zone for the city and make life easier as well as make significant contributions to the identity of cities. In order for these elements to be more aesthetic and functional, it is crucial to consider scientific data in the design process. Urban reinforcement elements need to be regarded as design products and points of view that allow them to establish the right connections with each other and with the urban spaces they are in. Urban reinforcement elements are produced according to design principles, which not only have a high appreciation for and a more functional quality by users but also ensure that they are used with a more conscious approach. During the process of designing urban equipment elements; in addition to considering the design principles and the national/international standard conditions, it is necessary to align the university space with its cultural features, to appeal to everyone as it is universal and to take account of the users' needs. When designing urban reinforcement elements, scale, color, texture, materials, form, and so on design criteria such as massaging help users perceive them more easily [18].

In the study conducted by Çelik (2015), a Campus Equipment Information System (CUFIS) was created for urban equipment located within the legal campus located at Karadeniz Technical University. With this study, access to campus information has been made easier in a more effective and reliable way during a decision stage related to any planning, maintenance or renovation activities that may occur in the future [7].

In a study conducted by Geymen and his colleagues, a large number of structures were conveniently surrounded by a 3D application in the Erciyes University university campus Information System and transferred to the web platform. The University campus Information System is integrated with ArcGIS software to compile verbal and graphic information about the university, process, store, query and analyze it on a computer platform, and present it in the form of documents and reports for users. In addition, with the help of the ArcGIS SketchUp plugin and the SketchUp Pro program, the buildings were turned into 3D and a realistic coating process was applied for the structures allocated as a pilot zone. The revealed information system has been made available for publication on the web platform [10].

In order to investigate the application of three-dimensional GIS by design in detail with a study on the Ayazaga campus of Istanbul Technical University, the topological data of the campus and the actuality of the objective information of these topological data were reviewed and produced. A decisionable three-dimensional GIS was created by establishing a connection between this information generated, a path analysis was added to the project within the

boundaries of the campus, and relations were established with photographic support to make it efficient [5]. In another study conducted at the Technical University of Munich, it is possible to query through the search button to reserve rooms online, except for maps and plans within the university campus information system. In addition to maps of the Munich, Garching and Weihenstephan campuses, access to maps produced on behalf of different destinations such as bus stops, parking areas, room plans are also possible. In addition, it is possible to access the display of the general map thanks to the link to the Wikipedia production called OpenStreetMap.

In a study conducted at Harvard University, an interactive service is provided to users of the university campus information system and icons selected from the map, as well as queries made using search buttons. The zoom-in and zoom-out icon on the map provides access to the details in the requested region. In addition, a PDF version of the campus map can be viewed by simply registering via a link. In this version, a representation is provided that expresses whether closed regions and green areas belong to the campus by filling process created with different color scale [23].

In this research, a Campus Equipment Information System (CUFIS) was created and handled for the university by producing identity cards to identify the existing urban equipment elements located within the boundaries of the Kafkas University Sehitler Campus with the benefit of GIS support. A Campus Equipment Information System (CUFIS) module has been proposed that will allow effective, accurate and technical access to all requested data during decisions that need to be taken about future planning, improvement or repair and maintenance work. Thanks to this module, it has been made possible to analyze and query the attribute data of all the equipment units located on the university campus from the database of all urban furniture located on the campus by creating a database by accessing it with field studies and transferring this data to a computer platform. As a result of all these analyzes, mathematical data on the number, density, visual and aesthetic characteristics of the urban furniture examined, the placement model and the attribute were put forward. The connections between these data and the user, activity and other equipment of the equipment have been checked.

MATERIAL AND METHOD

The material of this study is the Campus of the Caucasian University of Sehitler (KAU) located at latitude 40.583359 and longitude 43.070713 in the central district of Kars province. The Sehitler Campus, which is the research area, has a closed area of 234,574.79 m² and the university is currently operating in 4 different campuses (Central campus, Dereiçi, Sarıkamış and Kağızman) [3].

The scope of the research; Faculties (economics and Administrative Sciences, Education, Arts and Sciences, Medicine, Health Sciences, dentistry, engineering, architecture, theology, and arts), institutes (Sciences, Health Sciences, and Social Sciences), School of foreign languages research and application centers around Vasfiye Eris sorority, sports fields and is built around (Figure 1). In terms of security measures, the KYK provincial directorate has not been included in the research limits. The urban equipment to be evaluated within the scope of the research consists of Seating Elements, Sign-Information Signs, Lighting Elements, Garbage Units and Containers, Billboards, Bus Stops, Flower Beds, Water Elements, Fountains, Security units, ATMs.

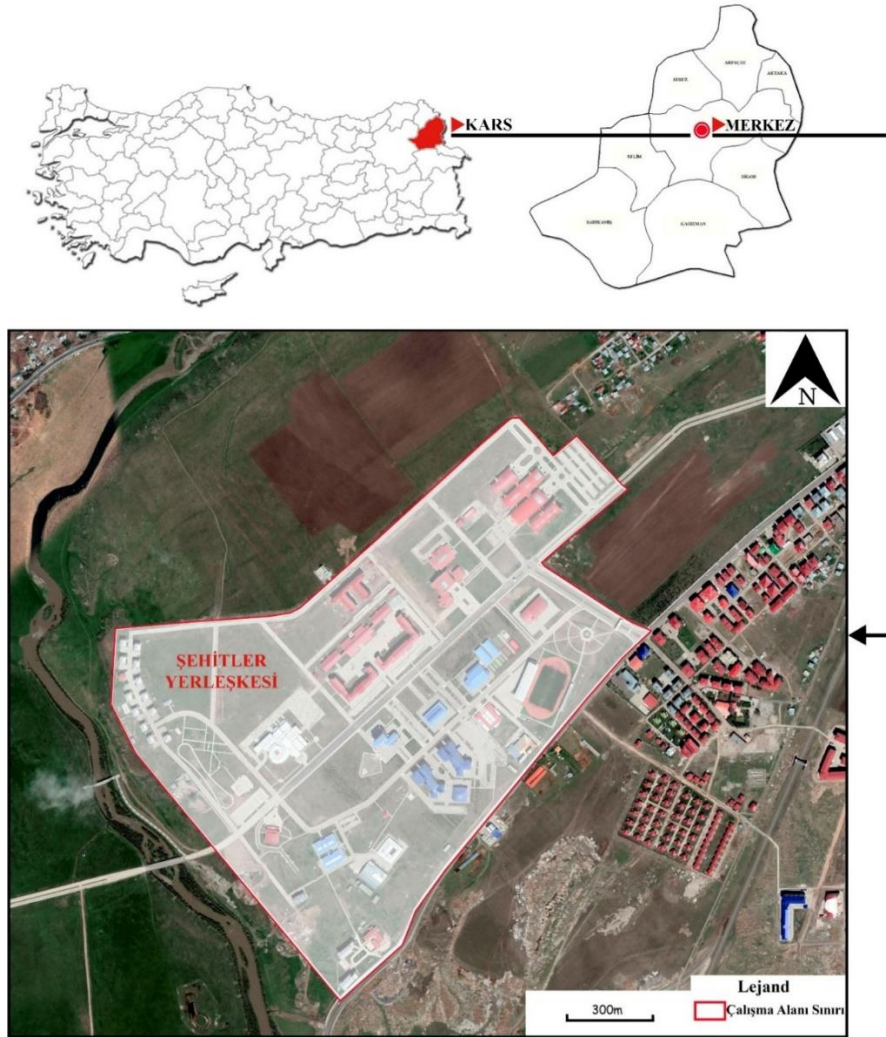


Fig. 1. Boundaries of the research area [1].

Method

In the method of this research, Sakal (2007) and; Bayrak et al., (2008) which are researches related to the campus information system, were used. Özyavuz et al. (2009), Aksu et al. (2011), Kahraman (2012), Çelik (2016), Kurdoglu (2018) and Eymen (2019) made use of the research methods and techniques made in the year [2, 4, 8, 9, 15, 17, 21, 22]. However, these research methods have been changed at a methodology stage, not in their complete form, but by developing different viewpoints.

In the first step, numerical maps of the Caucasus University Sehitler Campus and information about the region were compiled. General statements about urban equipment elements, university campus information system and geographical information systems are given. For the classification of urban reinforcement elements, attribute data for each reinforcement whereGIS support was used. The locations of the reinforcement units have been obtained through field work at different periods via GPS. The obtained data was accumulated in the GIS environment and a database was created. Identity cards with functional and structural characteristics are given in (Figure 2). The place of observation, coordinates, type, physical characteristics (size, material, color, shape/form), functional characteristics and damage detection situations of the urban equipment element were processed on the ID card, and finally a photo characterizing the equipment unit was added to the ID card.


KAÜ DONATI KİMLİK KARTI 	Fotoğraf	Hasar Durumu		Fiziksel Özellikleri			
			Hasarsız			Ölçü :	
			Az Hasarlı			Renk :	
				Çok Hasarlı		Malzeme :	
		İşlevsel Özellikleri			Biçim/Form :	Donatı-Mekan Uyumu	
		Aydınlatma				Form ile	
		Haberleşme				Büyükölçü ile	
		Dinlendirme				Kullanım Yoğunluğu ile	
		Bilgilendirme				Kullanıcı-Ergonomi ile	
		Yönlendirme				Etkinlikler ile	
	Görsellik				Doğal Malzemeler ile		
	Güvenlik				Yapay Malzemeler ile		
	Sınırlayıcı				Diğer donatılar ile		
	Koruma						
	Diğer						
	Gözlem Yeri:						
	GPS Koordinatları :						
	X :						
	Y :						
	Türü :						

Fig. 2. KAÜ Central Campus equipment identification card [1].

A database has been created by adapting the attribute information of 1434 urban furniture units to the digital environment through GIS. In this way, a Campus Equipment Information System (CUFIS) (Figure 3) has been created in the GIS environment. Aesthetics also urban furniture elements form, color, texture, materials, and damage to the findings of the criteria Halprin (1963), Husain (1972), Uzun (1997), Yaylalı (1998), Kaya (2001), Uzun (2002), Öner Bilen (2004), Yörük et al (2006), Yücel (2006), Bulut et al. (2008), Güremen (2011), Önder et al (2012), Hastürk (2013) and Çelik (2015) were analyzed according to the standards [6, 7, 11, 12, 13, 14, 16, 19, 20, 24, 25, 26, 27, 28, 29].

The analyses have been layered with the frequency values of the attribute information for the classified equipment and it is possible to query between the data. When making an inquiry among the sorted information, the location analysis of damaged, less damaged and very damaged equipment elements in the GIS environment and the distribution of equipment to structural units as a result of decoupling were examined. The scientific results obtained at the last stage have been evaluated and discussed and various suggestions have been made.

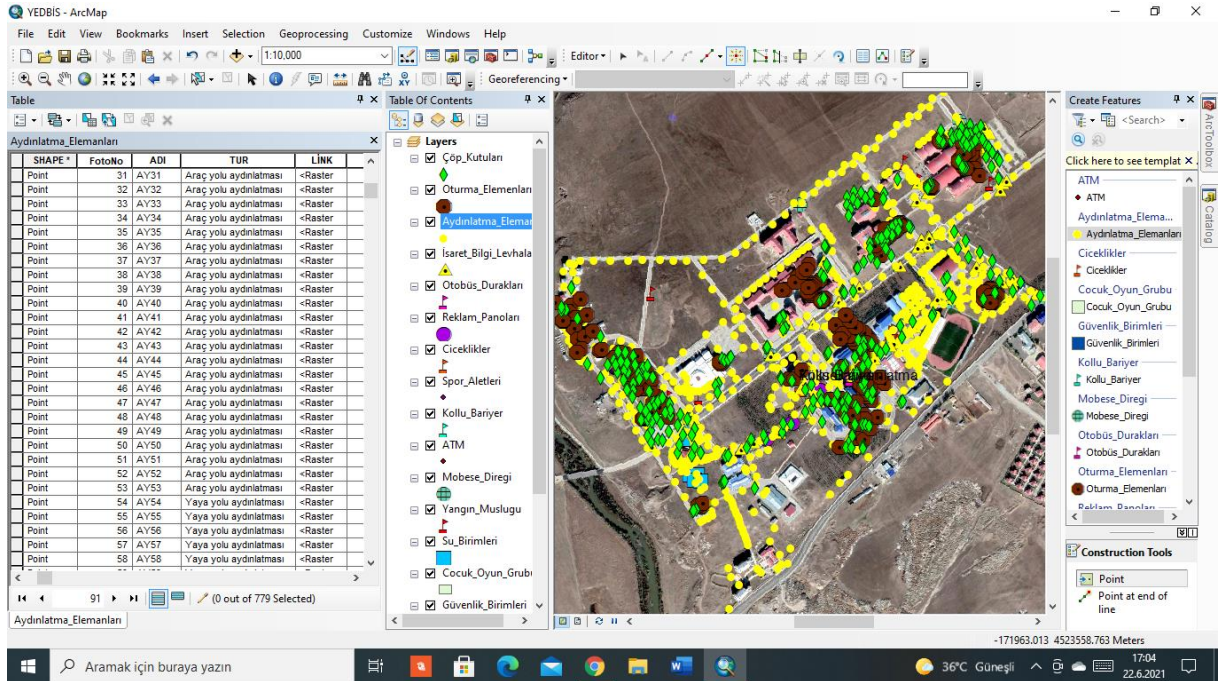


Fig. 3. A view from the attribute table with data entries of all urban reinforcement elements in the Campus Reinforcement Information System [1].

FINDINGS

Within the boundaries of the research area; 209 seating units (Table 1), 779 lighting units (Table 2), 300 garbage cans and containers (Table 3), 64 signage and information boards (Table 4), 5 Billboards (Table 5), 3 bus station units (Table 6), 22 flower boxes (Table 7), 1 water feature (Table 8), 5 fountains (Table 9) are located. In addition, there are also 8 mobile phone poles, 5 ATMs, 2 security booths, 2 children's playgrounds, 6 arm barriers, 14 sport equipments, 9 fire hydrants and 120 security cameras (Table 10).

Table 1. Distribution of types, colors, materials and quantities of damage cases and percentiles of lighting

Type	Percent	Pieces	Color	Percent	Pieces	Material	Percent	Pieces	Damage Status	Percent	Pieces
Vehicle road lighting	%48,2	370	Grey	%23,3	179	Aluminium casting	%31,4	241	Undamaged	%96,2	739
Pedestrian road lighting	%28,1	216	Black	%22,8	175	Galvanized mast	%21,5	165	Damaged	%1,8	14
Wall-mounted lighting	%10,2	84	Black-Grey-	%17,3	133	Iron profile	%17,4	134	Little Damaged	%1,6	12
High lighting	%9,0	69	Beyaz						Very Damaged	%0,4	3
Floor-standing lighting	%3,8	29	Turquoise	%15,6	120	Halogen projector	%11,6	89			

Table 2. The Distribution of types, colors, materials and damage cases of living elements and percentile ratio distribution

Type	Percent	Pieces	Color	Percent	Pieces	Material	Percent	Pieces	Damage Status	Percent	Pieces
Seating unit	%73,7	154	Brown-Black	%45,5	95	Metal leg-Wood	%80,4	168	Undamaged	%69,4	145
Camellia	%15,8	33	Tile-Brown	%31,1	65	Wood	%11,5	24	Damaged	%2,4	5
Picnic table	%10,5	22							Little Damaged	%28,2	59
									Very Damaged	-	-

Table 3. Distribution of types, colors, materials and quantities of damage cases of Garbage Cans and Containers and percentiles

Type	Percent	Pieces	Color	Percent	Pieces	Material	Percent	Pieces	Damage Status	Percent	Pieces
Garbage container	%18,7	56	Orange-Blue	%34,0	83	Sheet metal	%58,6	143	Undamaged	%68,7	206
Garbage box	%81,3	244	Grey-Mavi	%100	56	body-Profile foot		165	Damaged	%10,7	32
			Brown-Black	%27,9	68	Galvanized mast	%100	56	Little Damaged	%18,3	55
						Sheet-Impregnated wood	%27,9	68	Very Damaged	%2,3	7
						Steel bucket	%9,8	24			

Through the CUFIS model, damage detection status analysis has been carried out to examine; locations of equipment that is low damaged, damaged and very damaged.

In the case of the damaged units and lighting elements results are as follows: 39,1% of the units around Faculty of Health Sciences, 30,4% of the units around University Mosque, 17,4% of the units around Vasfiye Eris Sorority, 12,9% of the units around the Faculty of Economics and Administrative Sciences, indoor swimming pool and around the rectorate building, 33,3% of the units around Application and Research Hospital, 33,3% of the units around the Stadium, 33,3% of the units around University Mosque are in very damaged condition.

Condition of units that are less damaged are as such: 37,7% of the units around Faculty of Medicine %23,7% of the units around Faculty of Science and Literature, 21,7% of the units around Application and Research Hospital, 15,2% of the units around Kazım Karabekir Education Faculty, 2,2% of the units around Faculty of Health Sciences, 40% of the units around Faculty of Science and Literature, 60% of the units around School of Foreign Languages in the University and all around the residential area are in damaged condition.

40% (2 pieces.) of the units' picnic tables are located around the Faculty of Architecture and Design, 40% (2 pieces.) of the units are around Faculty of Arts and Sciences, 20% (1 pieces) is near Residential area and they are in low damaged condition.

87,5% of the units Camellias (7 units) are in the campus park, 12,5% (1 unit) is around the residential area and are in less damaged condition as well.

Bins and containers; the least damaged of the units; 34,5% of the units around Application and Research Hospital 23,6% of the units around Faculty of Medicine, 12,7% of the units around Faculty of Health Sciences, 15,5% of the units around Kazım Karabekir education faculty, Campus, and University Park Mosque, 7,2% of the units in front of the stadium, 5,4% of the units around the residential district, the Faculty of Arts and Science, and around the president's office; are in low damaged condition; 57,1% Faculty of Arts and Sciences 28,6% of the units around the University Mosque, 14,3% of the units around Application and Research Hospital are in damaged condition. 31,3% of the units around Application and Research Hospital, 21,9% of the units around the Faculty of Medicine 15,6% of the units around Faculty of Science and Literature, 9,4% of the units around Vasfiye Eris Sorority, 12,6% of the units around the residential area of the stadium, 9,3% of the units around the president's office and around the library.

20,0% of the units around the Application and Research Hospital have damaged sign-information. 20,0% of the units around the Rectorate, 40,0% of the units around the University entrance road and intersection; 100% of the units around the Faculty of Arts and Sciences are in very damaged condition.

It was determined that 100% of the units with damaged billboards are in front of the Campus Cafe, 50,0% of the units with little damage are in front of the Rectorate building, and 50,0% are around the Central Cafeteria.

In the production of equipment in damaged condition, 66,7% galvanized sheets and 8,3% aluminum casting materials are used.

When the existing material usage of the reinforcement units which are in undamaged condition are examined, 24,5% aluminum casting-iron profile material usage is available.

By taking into account the road boundaries passing through the research area and dividing them into parcels, these parcels were converted into a sheet index (Figure 4).

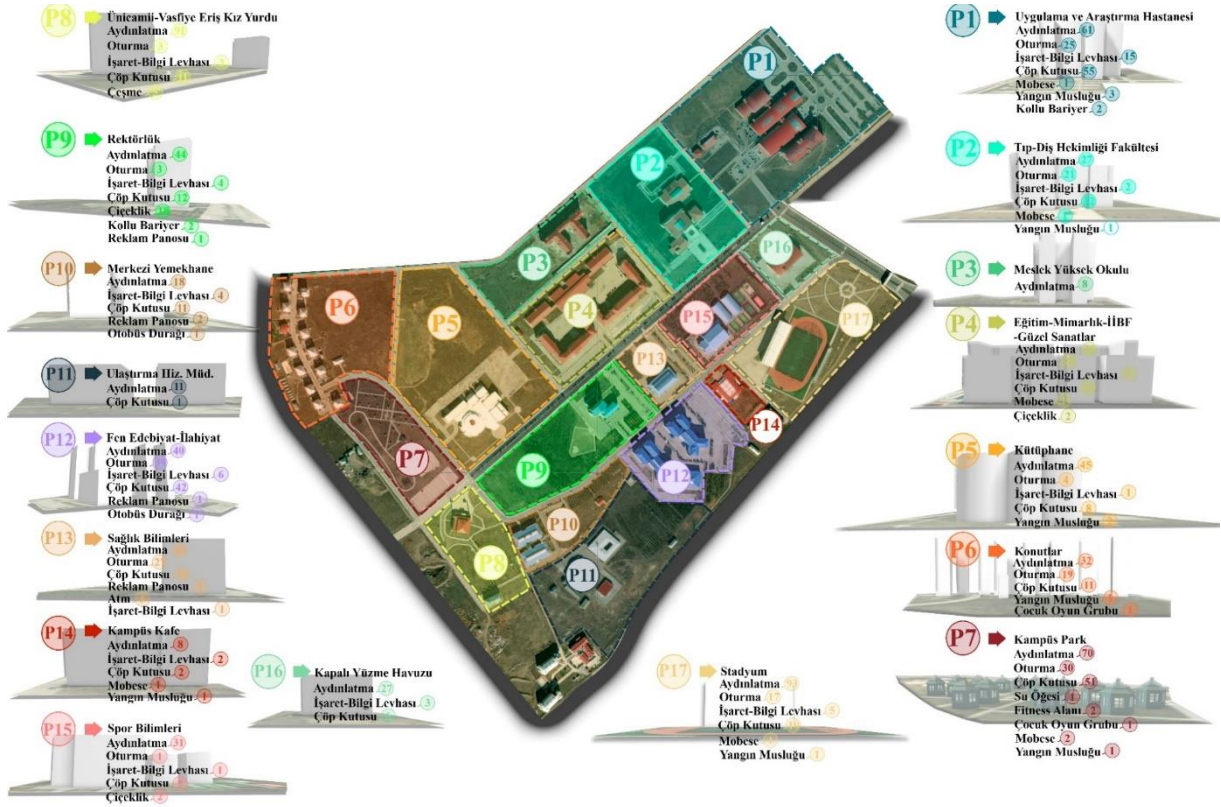


Fig. 4. It shows the distribution of urban reinforcement elements into structural units by parceling pafta [1].

The comparisons of the equipment data obtained from the parcels made in the campus with each other are presented as follows.

There is one bus stop around the Central Refectory and the Faculty of Arts, Sciences and Theology with page indexes 10 and 12, while no signs of these items have been detected on other parcels.

There are very few seating elements in the sheet indices 8.9 and 15.

There is 1 pool item around the Campus Park with a pafta index of No. 7, while no signs of water items have been detected on other parcels.

Fire hydrants were found in the indexes of sheets 1,2,5,7,14 and 17, while no signs of these items were detected in other parcels.

No findings have been detected from other reinforcement units except for 8 lighting elements around the Vocational School with a pafta index of No. 3.

5 fountain elements have been identified around the University Mosque and the Qualified Access Sorority, which has a pafta index of No. 8. However, no fountain elements were found in other pafta indices.

A billboard was found in the indexes of sheets 9,10,12 and 13. However, these items were not found on other parcels.

Floral items were found around the Faculty of Education, Architecture and Design, Economic and Administrative Sciences and Fine Arts, the Rectorate building No. 9 and the Faculty of Sports Sciences No. 15, which has a pafta index of No. 4. However, no flower garden items were found in other parcels.

No seating elements were detected around the Indoor Swimming Pool with the pafta index of No. 11, the Directorate of Transport Services with the pafta index of No. 15, the Faculty of Sports Sciences with the pafta index of No. 16 and the Indoor Swimming Pool with the pafta index of No. 16.

A total of 91 lighting elements, including pedestrian and ground, which are considered to be too many and unnecessary, have been identified around the University Mosque and the Qualified Access Sorority, which has a pafta index of No. 8.

Two arm barriers were found in the Application and Research Hospital with pafta index No. 1 and the Rectorate building No. 9. In contrast, no barrier findings were found on other parcels.

32 garbage cans were found in the Faculty of Medicine and Dentistry with a pafta index of No. 2, and 55 garbage cans were found around the Application and Research Hospital No. 1, which are considered too many and unnecessary.

DISCUSSION AND CONCLUSION

Universities are the most influential organization in the development of societies. Therefore, all kinds of information should be used efficiently in order for these organizations to develop more safely. The fact that the urban furniture elements, each of which has a different function, are brought to the university campus and are in a position to benefit will make universities invaluable.

Information system models provide secure and fast access to up-to-date requested data and any information needed in the light of various analyzes. In this study, urban equipment belonging to the Sehitler Campus of the Caucasian University was evaluated and processed on the GIS platform. With this study, access to the attribute information of urban furniture was provided with the existing map of the university campus on the GIS platform.

In the context of these reasons, the current status of the reinforcement elements and attribute data were processed and recorded in the system with the Campus Reinforcement Information System model made within the boundaries of the sehitler campus. With the CUFIS model, the ability to perform analyzes and query for all equipment has been introduced to the service. As academic staff, students, plants and floor covering data such as this model can be processed and access to any information needed for a future application can be provided, CUFIS has a developable model feature as it will not be limited to only the reinforcement elements.

It was concluded that the reinforcement elements are not included in the common denominator in terms of material, form and color, and they do not create continuity. Accessories material in terms of 19,0% (252 pieces) aluminum casting, 12,7% (168 pieces) metal foot-wood and 12,5% (165 pieces) galvanized mast, 10,8% and (143 pieces) hair-body-profile foot, by 10,1% (134 pieces) iron profile and material are available for use. According to the findings obtained from the analyses, vandalism-resistant, high-quality, functional and long-lasting products should be preferred when choosing equipment.

Reinforcement 14,1% of the units (187 pieces) in black, 13,5% (179 pieces) grey, 12,2% (162) brown-black, 11,1%. of (147 pieces) black-gray-white, 9,2% (122 pieces) turquoise, of 6,3% (83 pieces) blue and orange, 5,1% (67 pieces) grey-white, and 4,9% (65 pieces) of the tile in the color-brown, 4,2% (56 pieces) gray-blue, 3,4% (45 pieces) Gray-the use of black color is available. The use of warm colors that can make the university campus look more energetic and dynamic and attract the attention of users should be preferred more often.

According to the analyzes carried out, 10,4% of the city's equipment should be repaired and maintained, and 5,5% should be renovated.

In addition to the reinforcement data, information about natural materials should also be processed into the system model in order to more accurately implement the designs and plans, repairs and maintenance operations that will be implemented on the university campus in the coming times. October, the CUFIS model covers the equipment located on the borders of the university campus.

The master plans prepared for the university campus are produced only on a regional basis.

This situation causes a lack of forward-looking planning and problems. In general, as a result of the lack or lack of preparation of a master plan for the university campus, the compatibility of the reinforcement elements with the neighborhood in which they are located is determined randomly, and those who do not adapt are placed in different locations. In order to solve this problem, it is necessary to plan the entire campus as a result of obtaining the expert opinions prevailing in the subject. During the preparation of the master plan and the implementation phase, a database of the existing living and inanimate landscape material belonging to the campus will be needed. In this context, the data on the reinforcement elements included in the scope of CUFIS will be highly effective and useful.

This study generally serves the same purpose and supports each other in terms of other CBS-based studies on the university campus information system and applications that are planned for the future. It is separated from other studies both in terms of the processing of attribute data of all reinforcement elements and in terms of comparison findings obtained as a result of parcelization made within the campus and in terms of the recommendations brought. In addition, the presentation of this database in the web environment and the absence of 3D representations make it different from other studies.

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