

Towards a Multi-Disciplinary Approach in Urban Design Education: Art and Software (Depthmap) Use in Urban Design of Public Spaces

Raif Dimililer ^{1*}, Ugurcan Akyuz ²

¹ Near East University, Nicosia, CYPRUS

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ABSTRACT

Urban design plays an important role in architectural education and its subdivisions. When architects are looking at cities, they not only recognize three dimensionality and geographical appearances of spaces but also see the necessity of incorporating artistic, cultural, social, environmental and psychological elements alongside. Urban design is currently studied as a fundamental discipline with the use of developing technology and influential changes in educational practices, pedagogies and methods. In this study, the artistic aesthetic principles of Hermann Maertens towards monuments and public squares are used to analyze theoretical planning of urban spaces together with technological transformations in the practice with an educational software program called Space Syntax "depth map" as a case-study to redefine the multi-disciplinary perspectives of urban design; artistic, cultural, social, psychological as well as accessibility and usability perspectives. The analysis puts forth the necessity of new multidisciplinary approaches in urban design practices and education.

Keywords: education, space syntax, city, monuments, public square

INTRODUCTION

Cities are the reflection of culture and heritage of people who establish and inhabit them. Each city is a vessel that carries an ever evolving historical and cultural heritage through transcending time. Social, cultural, economic and political factors of each city together with technological and industrial developments of their design of spaces reciprocally reflect the structures governing society through them become more visible. All of these intense factors are parts of the reciprocal tie between the city and the public. The living core of the city is sculpted by the population that uses it functionally which may transcend its intended plan. As Henri Lefebvre's groundbreaking, in his book *The Production of Space*, his understanding of spaces and their multi-dimensionality of spaces in the modes of production are labeled as "perceived-conceived-lived triad...interconnected" (Lefebvre, 2009, p.40). Wholeness of these is another issue since urban spaces are social reproductions of the society.

In other words, looking at the multi-faceted productions of space in today's world prescribes an attitude towards urban design education which can foresee harmony of fragmented unity of spaces at large. The view of Lefebvre dictates a multi-dimensional and multi-disciplinary attitude towards the study, planning and organization of city. The realities of space may produce various other narratives of 'Conceived space' with discrepancies between 'planned' and 'lived' spaces of everyday life.

URBAN DESIGN EDUCATION

The definition of space is of primary importance to urban design education since it creates the fundamental view of what is being designed as Lang (2016) raises the issue and asserts his definition of urban design to be used and adapted here.

The design of any curriculum depends on the definition of urban design assumed. I have accepted the position that urban design involves the 'creation' of a vision of a city or a precinct within it or even more likely a project of a number of city blocks. The goal is to create settings for activities and milieus

Contribution of this paper to the literature

- The study aims to promote and raise awareness of the educational software tool called Space Syntax “Depthmap” that can be used as a part of a new multi-disciplinary approach.
- It provides an example of the new multi-disciplinary approach in urban space design and education in the related field.
- The new multi-disciplinary approach is used on a case study to address accessibility and visibility issues of urban spaces through technological tools that gather relevant data on these spaces.

that have the aesthetic qualities that enhance life for at least one group of people (or species) without being detrimental to others. The vision and the techniques for implementing it have to be ‘designed’ considering the dynamics of the political economy of cities. (Lang, 2016, p.561)

Lang’s definition of urban space incorporates the sociological side Lefebvre termed as lived, as a part of a whole city and political economy. Anne V. Moudon outlines the developments in the discipline of urban design over the course of the past two centuries as quoted below.

Urban design education has been based on three main streams of knowledge and skills building: design, theory, and methods. (Pittas & Ferebee, 1982) Those are typically grounded in three broad disciplinary areas: the creative arts (e.g., architectural or landscape design), the humanities (e.g., urban and art history), and the social sciences (e.g., psychology, sociology, geography). (Vernez Moudon, 2016, p.690)

Vernez Moudon’s overall outline (2016) of the urban design education towards PHD candidates stresses the multi-disciplinary vision of the current educational curricula being used. Vernez Moudon also points out (2016, p.690) the pursuance of theory over design and methods is majorly emphasized within the field. According to Vernez Moudon, the number of secondary literature in the field together with technological software of geographic information systems such as Urban Form Lab create a demand to rethink post-graduate education. The programs of urban design education are trying to adapt to the changes brought about by technology and by incorporating “[alternative processes of education]. (Jabareen, 2011) Such processes, when used with other disciplines and fields, bring about a momentum in generation of new ideas” (Sargin & Savaş, 2012, p.358). Sargin and Savaş criticize the urban design education’s detachment from social aspects of complex urban space and propose the reintroduction of social responsibility and social concern back into the field of urban design. This outlook provides the vision of this study to reassert social, political, cultural issues to the analysis of urban design that supports the merging multi-disciplinary outlook on urban space within the field of urban design.

A secondary vision is to address the design practice reformation through the use of open access technological tool to analyze Gönyeli square as a case study.

PUBLIC SPACE

Organization of public squares where the inhabitants of each city use are usually centralized around a heroic theme for remembrance of figures, events and sentiments of dominant ideology. Authorities exercise their power on the spaces designed with their political and cultural outlook. This practice shapes the public spaces that public experiences and urbanizes in a unique way as a “space becomes place” (Topcu & Topcu, 2012). The urban subdivisions which inhabitants use are eventually shaped by the flow of life reflecting all social, cultural and psychological aspects. Structure of the city should be seen, studied and thought as a complete unit containing all functionality of all urban subdivisions such as roads, streets, squares, public places that in fact connect to form a “living mesh” characterized by economic, political to psychological factors on various dimensions.

Organized spaces encapsulate layers of spaces that necessitate the classic notions of aesthetic functions of organized spaces with respect to functionality and everyday use. The theories of aesthetic ideals of urban spaces with respect to the desired aesthetic outcome of various monuments and squares are studied to trace accessibility and visibility issues.

In particular, public squares represent one of the most significant characteristics of the artistic and cultural heritages of cities. Design, development and renovation of these urban places and especially of public squares and the monuments used in the public squares in the design phase is very much defined by the ruling ideology of governments and economy.

Public squares do not only reflect the intangible characteristics such as heritage but also provide functionality in the daily routine of the people. (Figure 1) shows Hősök tere, the Heroes Square in Budapest is an example of a desirable aesthetic public square. The design of the square includes a monument seen in (Figure 2) that was



Figure 1. Heroes Square Budapest – photo by Civertan Grafikai Studio (*Top Budapest Attractions*, 2017)



Figure 2. Hungarian Millennium Monument on Budapest Heroes' Square (Hungarian Millennium Monument on Budapest Heroes' Square Admin, 2012)

completed by the 1000th anniversary of the country's foundation to represent the outstanding Hungarian statesmen, kings and heroes who tried to make Hungary a better place and an independent country; thus representing the cultural and historical heritage of the country and the dominant ideology and power structure of the society that produced it.

Two art museums, the Museum of Fine Arts and the contemporary Art Hall (also called Kunsthalle), can be found on each side of the Heroes Square and they are open to the public to give access to the cultural heritage of the country and the city. Furthermore, the City Park (Varosliget) which is the biggest park in Budapest, is placed next to the Heroes Square providing a convenient escape from the daily toil of everyday life to the people of the city. The Heroes Square also serves the city as a roundabout and is frequented by vehicle traffic.

The monument and square are designed in such a way that the monument is visible from all sides even though there is traffic flow due to the daily routine of the city. It is part of the city and it is accessible on foot as well as by car. The square is enhanced by museums and a park. Additionally the monument placed in front of the gate that represents a cultural heritage and informs the visitors on the desired outcome of the heroic history of the city and the country. The aesthetic qualities of the square and the design of its surrounding environment stands as a majestic mesh example of urban design, feudal and modern powers that have shaped it.

On the other hand, the planning of many public spaces do not produce the desired end product. The mightiness of feudal power and single power of the state has long passed so has the demand of inspiring majestic feelings of spaces declined. Centralized spaces have become enclaved by commercial economic areas of companies.

However, the multitude of planning and organizing spaces and its conception is an important aspect which has to be well thought and well-designed but approaches towards the planning of these spaces with respect to time need to take into account the technological developments in practice especially as software which address the troublesome issues of space planning needs to be incorporated into the curriculum and departments with multi-disciplinary framework.

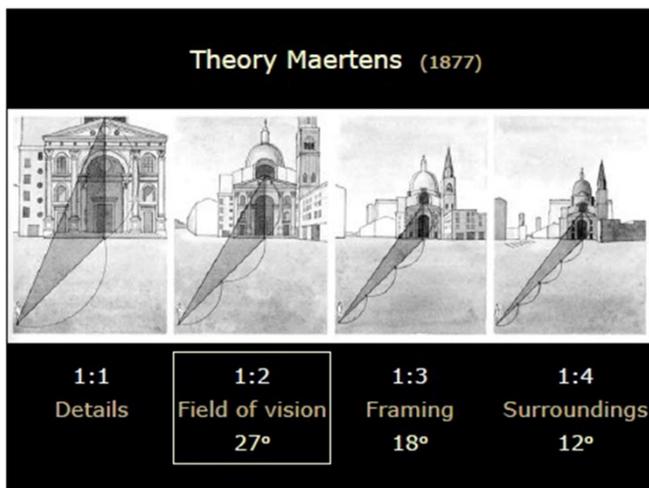


Figure 3. Theory Maertens (1877)

METHOD

This study analyzes the results derived from technological and educational program called depthmap, a multi-platform program that may be used to create solutions for visibility and accessibility problems of public spaces which is applied on a square and monument.

The technological and educational multi-platform program was used to analyze maps from cities, towns, public squares and buildings to obtain results of accessibility and visibility. This program creates graphics which highlight accessibility and visibility issues.

The results derived from case studying the software depthmap and applying it on Public Square as a case study together with the aesthetic and artistic principles of Maertens to analyze the current situation by taking into consideration the political, economical and psychological aspects of space. The new trend of promoting a multi-disciplinary approach towards urban spaces that suggest shifts and changes in practice, perspectives, pedagogy of urban space and urban design needs to be implemented.

Artistic and Aesthetic Principles of Hermann Maertens / Principles of Public Square Design for Monument

City planning was established in the 19th century based on the methods and principles proposed by the German architect and aesthetician Hermann Maertens (Collins, Sitte, & Collins, 2006). These principles provide important guidelines for the design of public squares and monuments. For instance, one of the principles is widely used in architectural planning on the proper size of a building or monument in relation to its surroundings. The building or monument has to be designed with their surroundings and they have to be taken as a whole unit in order to allow visibility. Maertens studied a series of measurements of many ancient and modern monuments and public squares. His system was based on the "the dioptric of the Eye" of Helmholtz, whose scientific experiments had influenced the fields of art and music. His main findings on the visibility of a monument may be briefly listed in Figure 3.

The spectator normally views a monument from a distance equal to the height of the object above eye level with an angle of 45 degrees (see Figure 3). The distance of the eye should be twice the height of the object above eye level with an angle of 27 degrees in order to appreciate the monument in its entirety as a complete unit (see Figure 3). The distance of the eye should be tripled with an angle of 18 degrees in order to appreciate the group or ensemble (see Figure 3). The distance of the eye should be four to five times the height of the object, in order to perceive the outline or silhouette of an ensemble in a panoramic view (see Figure 3) (Sitte, 1986).

A monument or statue should be positioned near a walking path in order to provide the viewers or public a satisfactory position to provide a good view.

Reliefs or monuments in public squares are normally used to achieve a movement on the surface. The monuments are placed on reliefs to influence the spectator's experience of space as discussed by Maertens (Collins et al., 2006). (see Figure 4) The figure shows how relief and location of the monument with respect to the surrounding buildings influences the viewpoints of the spectators in Piazza del Campidoglio.

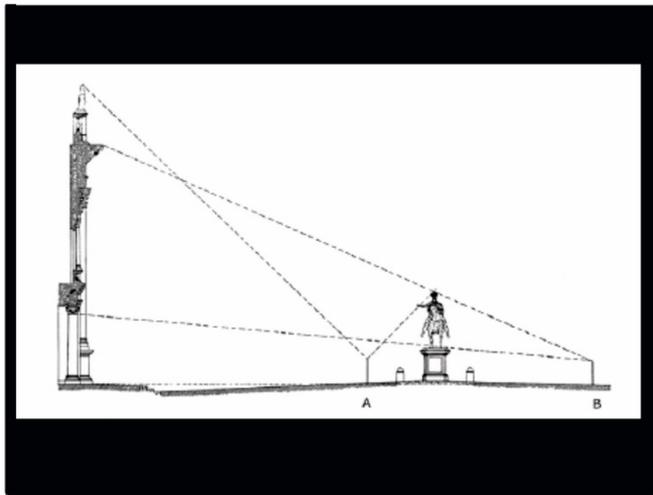


Figure 4. Campodoglio drawing

In point A and B, the monument is just as high as the building adjoining the square. That is to say:

When the spectator is standing at point A, the angles of the visual lines from the eye level to the top of the building and the top of the monument look equal. This gives an illusion of same height to the monument and the building. Similarly, when the line of vision from the eye level to the top of the monument is extended it aligns with the top corniches of the building, giving an illusion of same height. Additionally, when the line of vision is used at point B, the height of the relief appears to be the same as that of the plinth of the building. The visual zones created by the projections of lines of vision illustrate how the visual experience of spectators are influenced by critical positioning and thus the height of the monument with respect to the surrounding environment of the Campidoglio Square. When the spectator first enters the square, the monument appears smaller than the buildings and is viewed against the background of the surroundings. Nevertheless, when the spectator moves closer to the center, the monument appears bigger than or comparable to the buildings from all directions clearly marking the focal point of the square.

In the journal "Art Design Education in the New Era Featured with the Integration of Art and Motion Sensing Technology" "In the deep analysis of art definition and the history of art presentation forms development, a continuously developing trend of integration between art design contents and various technologies can be found. The former focuses on the realization of aesthetic function, while the latter concentrates on the physical forms that can provide art presentation. The nature of the relationship lies in the continuous supply of new forms and means to present artworks with the help of technology development, which requires art design education contents to keep pace with the development of the time. As a result, instead of excluding the study of advanced technologies, art design education should always seek the new presentation forms resulted from new technologies." (Jia, Keheng, & Haiyang, 2017).

Jia et al. advocates the inclusion of new technological ways of presentation to be included into the study and education of works of art. Monuments and statues of public spaces need to be looked at in a new multi-disciplinary way to achieve more successful aesthetic results.

ANALYZING VISIBILITY OF MONUMENTS AND SQUARES THROUGH SPACE SYNTAX

Space syntax is a software that provides information on the spatial dynamics of spaces. It defines itself as a science-based, human-focused approach that investigates relationships between spatial layout and a range of social, economic and environmental occurrences such as patterns of movement, urban growth, density, land use, societal differentiation and safety and crime distribution.

Space syntax is based on quantitative analysis and geospatial computer technology and it provides a set of theories and methods for the analysis of spatial configurations of all kinds and at all scales.

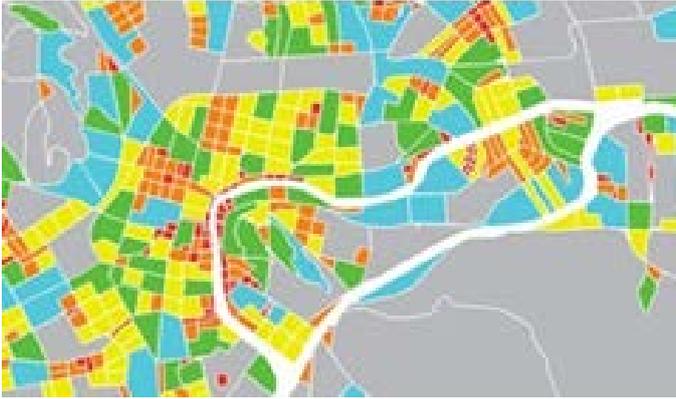


Figure 5. Spacesyntaxnet (2017)

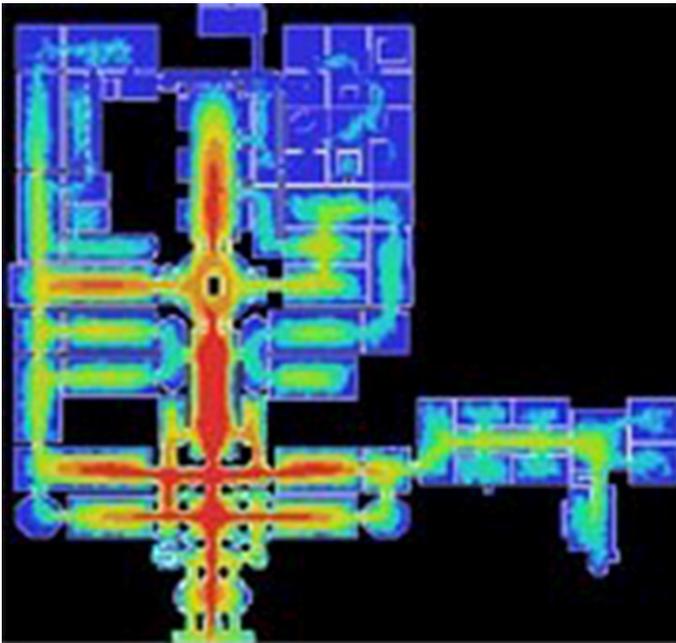


Figure 6. Spacesyntaxnet (2017)

APPLICABILITY OF DEPTHMAP AS AN EDUCATIONAL SOFTWARE

Available software of urban planning and designing is developing day to day and many software programs have been introduced into the field of urban design; designing buildings and spaces. The examples of the software includes changes from computerized 2D graphic design software to 3D sketching software as well as programs for the planning of spaces and buildings on virtual spaces, analytical maps (Quantum GIS) and Google earth. These technological advances have been great contributions to the field and urban design education software has evolved the tools of design.

On the other hand, the trend in contemporary urban design software is to establish links between plans and lived spaces through the use of the fictional spaces of technology; in which information of cities, its infrastructure, services and its people are connected through technology and the programming of geo-locations of human life, activities, services through the use of technological devices of smartphones and other devices to create live representations of urban organism online. Programs such as 3DCM which portrays designs with terrain.

3DCM is not simply as an abstraction of various objects of cities. Besides the geometric characters, it also contains the geographic information and other attributes, such as the location coordinate, the building height, colour, texture and so on. Although the primal intention of most 3DCM is for visualization. What we want to do now is to go for on the way of its more valuable applications. (Zhang, Zhu & Wang, 2009, p.82).

Another such endeavour is AlphaWorld of digitized urban planning process. Digitizing designing and planning and trying to establish ties with realities of city space.

On a theoretical level AlphaWorld also possesses many formal and conceptual links to real-world cities. These links are manifested in the fact that AlphaWorld often looks and operates like a real-world city. The visual analogies to real-world cities are both qualitative and quantitative... Can this digital environment be placed within known realities or ideals of urban form, or does it redefine these realities? In other words, what kind of a city is AlphaWorld? Though urban theory does not provide an exact answer to this question, viewing AlphaWorld through multiple theoretical lenses, including those of urban morphology, philosophy and technology, provides a useful means of clarifying AlphaWorld's significance and of framing future avenues of research into digital cities. (Ryan, 2004, p.303)

Ryan analyses the theoretical aspects to aid in the development of the process of creating digitalized cities. Cartography and GIS create new foundations to build upon with the aid of internet programs such as Google Street View and methods that demonstrate GSV as a high quality data source for mapping street greenery and GSVpanormas... to map the openness of street canyons" (Li, Ratti & Selferling, 2017, p.341)

Senseable MIT is a city lab led by Massachusetts Institute of Technology to carry out research with the above mentioned goals. An ultimate online city representation through technology still has many hurdles to come to its potential however Senseable platform omni-disciplinary approach to treat subjects and the Lab develops tools about the city. The Senseable MIT provides research and information on the city from its infrastructure, on recreational movements, various types of data on terrain, traffic, weather, power and social interaction in the city using billions of data points to monitor and develop the use of available technology.

The ultimate goal in urban design software seems to be connecting all forms of spaces in an online and being able to measure the needs, propose digitized design and simulate the effects of the digitized design through simulations. However, the ultimate goal is far-away and there are many obstacles on achieving it.

The discipline is becoming technology oriented to further which forces technology and academy to be multidisciplinary. One of the currently available program in this respect, which links planned and lived spaces is Depth Map.

Depthmap is a multi-platform software that may be employed at various scales ranging from individual buildings to cities and states in order to understand and analyze issues of visibility and usability that hint at the social processes within these environments. It is used to produce graphical visualizations or maps of open space elements that are related to various phenomena such as inter visibility, overlap and density. Depthmap can be utilized to survey the visual availability and it can deliver point isovists, that is, polygons showing visible areas or spaces from a certain point. Moreover, it can form a network of "isovists" to create a visibility chart of spaces. The visibility graph may then be investigated through chart measures, or employed as a tool of a specialist based examination.

From small to large urban scales, depthmap can be utilized to determine a 'hub delineate' a design. That is, infer a diminished straight-line system of the open space in a domain. The pivotal guide has been the staple of room language structure examine for a long time, yet its scientific deduction is novel. The programmed inference permits a target outline to look into formal and utilitarian properties of urban communities and structures. Once the guide has been produced, it might be dissected utilizing diagram measures, and the measures might be exchanged to entryway layers keeping in mind the end goal to contrast and markers of a person on foot or social conduct. For bigger frameworks where the inference calculation winds up noticeably unwieldy, pre-drawn hub maps might be transported in. Depthmap is yet another connection between the different types of spaces of conceived and lived in the space of fictional computerized digitized world.

GÖNYELİ SQUARE IN NICOSIA

In 14th Century the city was encompassed by walls as a bulwark and it has been create with the impact of political and social procedures. While the population increased, the city started to branch out from its surrounding walls. The inner part of the walls are referred to as 'Inside the walls / Old city'. The city put in the focal of the island and the squares (Gönyeli Squares) there is an extension of the interface for huge urban communities. (See [Figure 7](#)).

The closest settlement to Nicosia is the town of Gönyeli. As the population of capital Nicosia and the nearby town Gönyeli increased, private and public buildings extended the boundaries of the cities outward in such a way that they started overlapping. The Gönyeli square is strategically built on the inter-junction of the roads that connect these two settlements as well as the four major cities of Cyprus namely Nicosia, Kyrenia, Güzelyurt and Famagusta (Batırbaygil & Zafersoy, 2014).



Figure 7. Wordpresscom (2017)



Figure 8. Gönyeli Square Google Maps view

The map given in (Figure 8), shows the location of Gönyeli Square and the main high roads which connects four main cities together. One of the aims for choosing Gönyeli square is the fact that it is popular cognitive *place* of reference for locals and visitors

Therefore, in urban design education, 'space-place' relationship, transforming 'space' to authentic 'place', developing meaningful 'places' and designing 'space' with the sense of 'place' are considerably important on space usage and producing successful urban spaces (Topcu & Topcu, 2012, p.574).

Gönyeli square is positioned on the outskirts of the city like a compass aestheticized to show the spatiality of the compass is the intersection of Girne, touristic capital towards the North, the Nicosia industrial zone and Famagusta en route the east exit, one of the main dual carriage ways that splits through the north part of the city towards the Old City in the south and residential area of Gönyeli and Güzelyurt (Morphou) towards the west.

The political problems of North Cyprus over the entitlement of lands after the partition of the island has made Gönyeli a desired place of residence due to original Turkish title of the lands there. Girne which was majorly Greek Cypriot owned area and became Turkish Cypriot settled area after replacement of 1974 has tended to be an investment area for tourism sector. The political and economic investment has caused a stress on the traffic around the square.

The immediate surroundings of the square is under the control of the local authority whilst the privately owned lands closest to the square are surrounded by company buildings.

The map was downloaded from google maps and was prepared for importing into depthmap using the software tool. (Figure 9) shows the output of the depthmap portraying the usability of the roads. Red color on the roads indicates high usage areas. The range runs from blue for low usage to red for high usage.

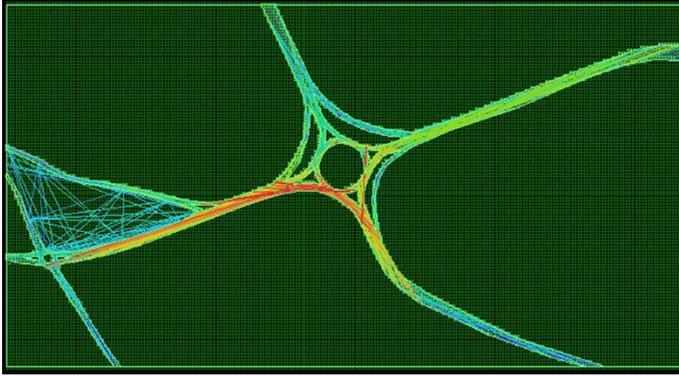


Figure 9. DepthmapX accessibility map

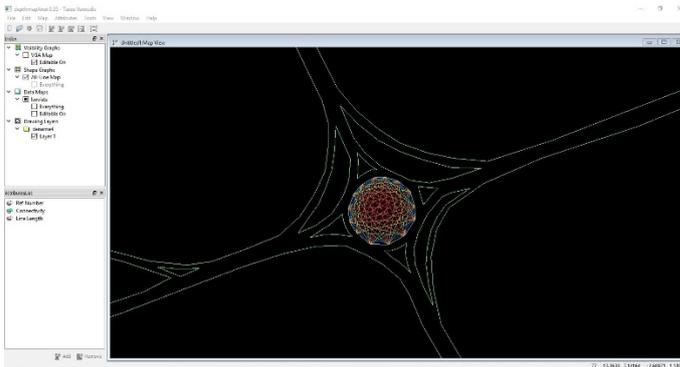


Figure 10. DepthmapX visibility map

(Figure 10) demonstrates the accessibility of the square is blocked by the road that surrounds it. The roads which surround the Gönyeli square has problematic issues; Vision perception of square is obstructed by vehicle density, and correspondingly accessibility along with visibility of monument and the square becomes almost impossible to reach and observe. Solution of this problem can be dissolve by positioning a pedestrian bridge around the square or similar options that suitable to surrounding habitat to help the tourist and public accessibility to square without any danger and redesign of pedestrian zones with required programs like “depthmap” or likewise. Visibility problem of the monument it also needs to consider artistic touches and solution that Heramn Maertens theories propose. The distance and the height proportion of the monument makes it visible from a distance.

EDUCATION IN ART AND SPACE SYNTAX TOOLS

The definition of space is much more complex due to the multi-dimensional understanding of urban space. This complexity arises from the differences of spaces defined by Henri Lefebvre as “conceived, perceived and lived” (Lefebvre, 2009, p.40). The multidimensional understanding of space together with Hermann’s aesthetic treatment and specifications of public space and monuments, as works of art, mounts interdisciplinary perspective on urban planners to think about the end product of their and its functioning.

In other words, accessibility for its use and function, visibility which incorporates aesthetic quality of monuments and the foreseen perception of public in these designated spaces become educational criteria to be addressed in the field. As noted in the introduction, the planning of such spaces also need to be considered with respect to the way in which it fits in the living mesh of the city in these respects. (van der Westhuizen, 2009)

Space syntax software provides the necessary graphic aid in understanding the current situation of designed spaces with respect to accessibility and visibility. Education in the field of urban design need to adapt to the use of such software programs to overcome the problems defined of existing urban spaces and its design.

CONCLUSION

The Gönyeli Square is used as a roundabout for diverting the traffic to all the major cities of North Cyprus and it is one of the most heavily used public squares in the country. The monument placed in the center of the roundabout of Gönyeli Square is problematic in terms of both visibility and usability aspects. The economic,

sociological and political conditions have produced more traffic which has resulted in the negative association of stress of its traffic produces the overarching definition of its current use. The access of the pedestrians to the monuments has become more dangerous over time. Therefore, pedestrians cannot reach the monument and is not easily observable by drivers in heavily polluted the city. Furthermore, the existence of a monument in the center of heavy traffic flow road provides a distraction to the drivers can be the outcome of the analysis of Depthmap analysis relating to the lived space of the square. The psychology of commuters due to traffic does not necessarily produce the desired sentiment with the planned intent and produces various other cognitive meanings as an *urban place*.

In other words, even though the intended to foster a vision on historical events and cultural heritage, it does not achieve the desired aim due to lack of multi-disciplinary vision to redesign it according to the change in time. The organization of the allocated space, its accumulated problems of accessibility; traffic density, pedestrian access, visibility and aesthetic styles of the monument.

The analysis of isolated spaces and single or multiple networks is possible through developing technology. The analysis of the density of the square's use is provided through Depthmap.

The design and development of public places, squares and city space must take on a multidisciplinary approach carried out by architects, engineers and artists since the desired outcome of public spaces may not transfer into lived spaces as in the case of Gönyeli square and roundabout. The possibility of achieving such an outcome is possible through the enhancement of the available technology and programs that can connect conceived, perceived and lived space through the fictional cyber digitized representations in computers.

The problems of planning as in the example of Gönyeli Square may destroy the desired outcome of the organized space or monument. This pitfall of discrepancies seems inescapable on various levels; accessibility, visibility, usability and artistic aesthetic principles governing such public places. Software syntax tools which provide the graphic of the data on these issues is an educational tool that needs to be incorporated into curriculum.

The conservative outlook on the discipline in universities and professional schools must transform the curriculum and merge courses to specifically analyze spaces with the incorporation of "art education curriculums must be revised to incorporate the use of technological tools and in the same way, the technical curriculums must include artistic principles (Jia et al., 2017). It must take into account the political, economic, psychological and sociological elements are to be incorporated into the analysis and design.

In practice, an in-depth analysis of the usage of the open spaces around the squares or other urban places must be performed using scientific methods and tools as discussed in this paper in order to improve and enhance access to the squares. The line of visibility of the spectators must be studied from various angles and directions in order to improve the experience and interaction between the monuments placed in the squares and the spectators.

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