

## A Digital Planning Tool for Shaping Up the Landscaping Architecture

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# A Digital Planning Tool for Shaping Up the Landscaping Architecture

**Abstract**— Landscape architecture is a comparatively new concept and is gaining prominence in town and country planning exercises. People marveled at the design of new towns when the infrastructure looks nice and well placed. However, when the planning exercise is not done properly this results in the implementation of poor infrastructure with narrow roads, lack of green spaces, no parking spots, congested streets and so. Architects are still using traditional hand drawing for their designs and sketches which have several limitations. Developing a landscape architecture planning system with appropriate tools will facilitate architects' tasks and others to have an appropriate to ensure proper landscape planning without unnecessarily wasting time manually. This paper aims to present a desktop application with features for generating appropriate cartography which allows users to place appropriate objects representing real-world urban structures and buildings. The Waterfall methodology was used to build and implement the proposed system. The latter is expected to help in the reduction of parking problems and increase the number of green areas in towns. The application proposed includes appropriate validation techniques to allow users to plan a site and made sure that the standards set for parking spaces and green areas are being respected.

**Keywords**- Architecture, Planning, Urban structure, Green areas, Landscape.

## I. INTRODUCTION

Urban planning in today's age is a much-needed discipline when cities will become overcrowded and highly limited in resources. Its motivation is to discover arrangements that make a city practical and operational for the utilization of land and open spaces, natural insurance, foundation, supply, organization, and numerous different sections. Not only have cities become too small and need to enlarge, but they are usually the area's biggest polluters.

With steady alerts about worldwide environmental change and natural disasters, for example, storms and cyclones, urban arranging has turned out to be a standout amongst the most imperative regions to make protected and powerful settlements.

Urban design and planning are the way toward forming the physical condition for life to manage the three-dimensional space in urban areas, towns, and villages, and its objective depends on the vision of things and the future. Urban design involves coordinated and self-conscious actions in the design or redesign of new cities and other human settlements and/or their precincts in response to the needs of their inhabitants [1,2] It is based on the social, environmental, political, esthetic, and economic importance of design in the public sphere and provides opportunities and cultural dimensions. It focuses on architecture, landscape design, and planning intersections. Urban designs have some features in common with urban planning, however, it

concentrates more on the physical plan of spots and manages the more finetuned and detailed design approaches. Space and land resources are regarded as limited resources in towns or urban areas in Mauritius. Town planning is a way to ensure the fine design of buildings and good distribution of land to be used by citizens for their daily activities. The objectives of the project are (1) to allow users to plan a small town and to have a view of the plan in 3D; (2) to provide a dashboard that contains tools such as roads, a building which will allow them to select a tool and place it anywhere on a plane; (3) to provide a virtual facility for 3D moving objects; (4) to validate the plan according to norms set for parking space and green space legislations.

## II. LITERATURE REVIEW

### A. Planning

Urban planning is concerned with scientific, conceptual, and design approaches land use planning [3]. The simplest definition of urban planning is that it is the organization of all essential elements of a town planning or other urban environment, utilizing extraordinary devices (land use plan, the operational arrangement or vital arrangement, auxiliary arrangement which are all the pieces of urban arranging). The land-use plan is recognized by two main ways in which a district may shape its example of land use – by guidelines and zoning respectively. The Zoning policy is usually approved by local authorities. Zoning regulations should decide on the use of land in areas for industrial, agricultural, residential, commercial, or other land use. In similar methods, the structure plan is an abnormal state plan that demonstrates the course of action of land-use types and recognizes an open framework, for example, rail, schools, boulevards, supplies, characteristic highlights, and different foundations. The operational arrangement is the execution arranging framework reason and general announcement of program activities concerning arranging procedure, laws, and plan or usage amendments and change. In the 21st Century, urban design and planning for durability is a significant issue. Good urban planning and design of the town is a strongly related challenge for sustainable development [4]. This includes not just the design of streets, public spaces, and houses, but also the configuration of greenway systems, transportation networks, regions' growth patterns, water and sewerage systems, and even industrialized practices. Design systems require judgment about how they relate to all other essentials of a given area, combining substantial planning (related to the design of places, infrastructure, and land use) with public policy frameworks (including economic incentives and tax regulation) that can sustain such changes. We will analyze the contemporary changes and problems that occur in urban areas and suggest the urban design and planning methods for sustainable and durable urban built project development. It all began in Ancient Rome

when the city had around one million inhabitants. The result of urban arranging was quickly recognized as a great measure for various issues in different urban communities. Occupants living in urban zones from 2% of the worldwide populace during the 1800s have expanded to 51.3% in 2010 as indicated by the information from the United Nations.

### **B. Parking**

Parking is a key aspect in towns and is becoming a worldwide issue where land resources are limited [5, 6]. Cities have tried to address parking problems associated with commercial activities, different types of institutions, and special events but often these solutions are costlier rather than having planned adequate parking spaces and parking zone for respective buildings and residential zone.

With the increase in amount or percentage of vehicle possession in many cities, parking is turning into a genuine befuddling and clashing circumstance for various individuals, especially in towns. Parking problems are a regular event. The absence of open stopping can make a negative effect on nearby businesses and reducing significantly the personal satisfaction of occupants. Because of the hugeness of parking problems, urban areas' study and examination of parking projects and execution are continuous. The list below presents the most commonly identified parking issues:

- Inefficient utilization of existing parking zones. Zoning mandates, building regulations, and other advancement practices can result in an oversupply of parking spots and insufficient utilization of available stopping.
- Insufficient data for drivers on parking cost and accessibility. Drivers become disappointed in the event that they expected free and plenty of parking however they discover constrained or costly parking and that they should invest part of their energy hunting down a parking spot.
- Excessive automobile use. Car reliance forces costs on society. Automobiles' costs incorporate a decrease in movement decisions, private leaving costs, and expanded vehicle and expanded unplanned hazards. There is additionally outside cost which incorporates expanded street and stopping office costs, uncompensated mishap harms, negative land-use effects, clog, and ecological degradation. Another point is that it can likewise diminish versatility for non-drivers.
- Monetary, ecological and tasteful effects of parking facilities. Organizations will unquestionably bear the expenses of unpriced parking, legitimately or through extra costs like charges that they should make the clients pay. Plenty of parking prerequisites can compel businesses in different ways.
- Parking spots that are an inconvenience to adjacent inhabitants and organizations. Organizations may encounter trouble in holding clients and living arrangements may have an issue finding stopping spots near their homes.
- Effect of extra parking spots on various territory traffic and nearby occupants. Inconvenient parking options.
- Parking ought to be inside a sensible strolling separation (3 blocks) is very hard to find during peak times.
- Low parking turnover rate. This happens essentially when vehicles are left in similar spaces for somewhere around 4-6 hours.

Although every single territory is unique, a few stopping issues and potential arrangements can help to tackle parking issues. The genuine test is to give a satisfactory parking spot to address the network's issues for monetary and ergonomic quality, to urge individuals to utilize different methods of movement, and along these lines minimize significantly the effects of parking on neighborhood character. Some parking management options to solve the existing and future problems are highlighted:

- Long haul worker versus present moment. A money-related and useful examination of building a parking spot or long-haul surface parcel would yield vital data for the territory as it plans for new advancements as opposed to illuminating the current conditions.
- Diminish the number of vehicles. Making new and productive kinds of basic transport will beyond any doubt sway transportation choices. Improve openness and accessibility of open transport including limited transport tolls.
- Increasing the scope of stopping accommodation and value levels accessible to purchasers by improving diverse installment strategies and time alternatives.
- Offer and share parking spaces. Parking can be shared among various businesses in a territory amid pinnacle periods given that no business is punished by this training.
- Park and ride. Automobiles Park their car and then are provided with a shuttle that will drop people across different strategic points in the city.
- Park and walk. In this circumstance, common parking will create a "park once and then walk" environment. This help in promoting business in the environment.
- Multi-level parking storey. A Multi-level parking storey is provided to residents and customers of surrounding businesses. This solution is more suitable where land resources are limited as parking capacity increases considerably for the same surface area occupied.

### **C. Green Areas**

Urban green space is a component of the "green foundation". It is a critical segment of open spaces and normal administrations given by a town and can give a well-being elevating setting to all individuals from the urban neighborhood. It is along these lines that the fundamental is to ensure that unlimited green spaces are easily reachable for all occupants and dispersed reasonably inside the city. Urban green spaces are a critical

venture that neighborhood specialists can make in the interest of natives and their prosperity [7]. The relations between green space or areas and health have been criticized and summarized in many publications [8, 9, 10]. Through improved water quality and air quality, buffering of different pollution such as noise and sound pollution, urban green spaces can decrease biological health dangers and hazards connected with urban living.

Today, over 50% of the world’s population are living in urban areas. By 2050, this figure will increase considerably up to 70% and many cities are struggling to cope with pressure from a swiftly growing population. [11]. According to the World Health Organization (WHO), the minimum green space per inhabitant should be 9m<sup>2</sup>. But unfortunately, this is not the case across many cities in the world as illustrated in Figure 1.

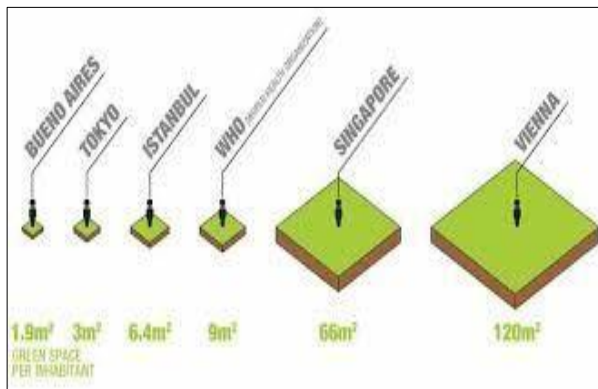


Figure 1. Amount of Green Areas in Different Regions (Bagherian, 2016)

Green spaces have several benefits for cities and they also improve the quality of life as they can:

- Bring positive well-being, and social, in addition to environmental outcomes • overhaul the social and ecological quality of impeded and denied regions • make urban areas more livable and enjoyable.
- Decrease warmth development. Trees in a parking area can diminish nearby warmth development, decline overflow, and upgrade evening cooldowns.
- Enhanced air quality. Trees, bushes, and turf expel smoke, dust, and different toxins from the air. One tree can expel 26 pounds of carbon dioxide from the air yearly, breaking even with 11,000 miles of vehicle emanations.
- Decreased temperatures. In Atlanta, temperatures have climbed 5 to 8 degrees higher than encompassing farmland where engineers bulldozed 380,000 sections of land somewhere in the range between 1973 and 1999, as indicated by NASA.
- Cooler summer days. Yards will be 30 degrees cooler than black-top and 14 degrees cooler than uncovered soil in the warmth of summer.

### III. THE PROPOSED ARCHITECTURAL PLANNING SYSTEM

Unity which is one of the most popular and user-friendly engines to create 3D applications was used as the development tool coupled with Blender which facilitates the drawing of 3D shapes and objects. The code editor which works best with Unity and Blender is Visual Studio where the syntax coloring and advanced text editing features were much helpful for developing the system. The architecture design in Figure 2 took into consideration the validation process which is one of the important features of the proposed system allowing architects to validate their design once objects are placed on the plane.

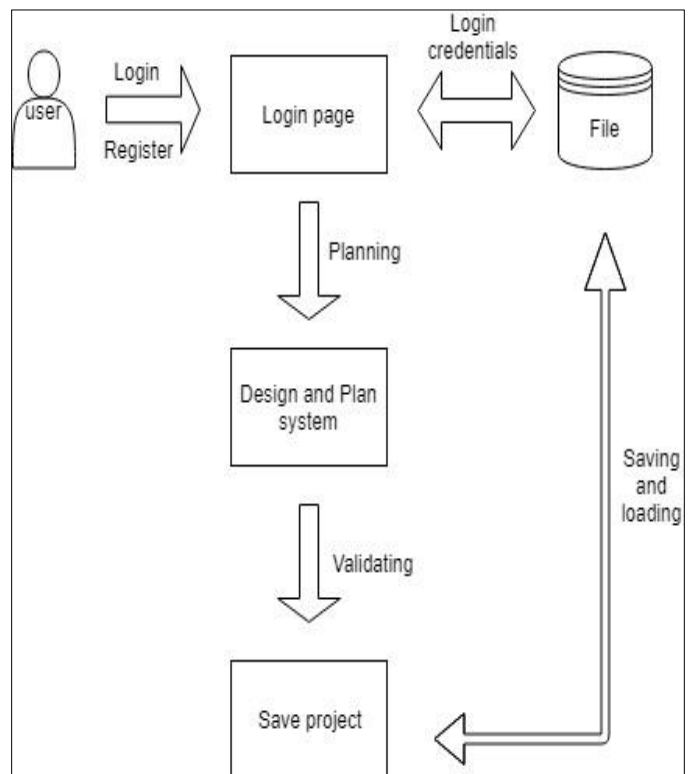
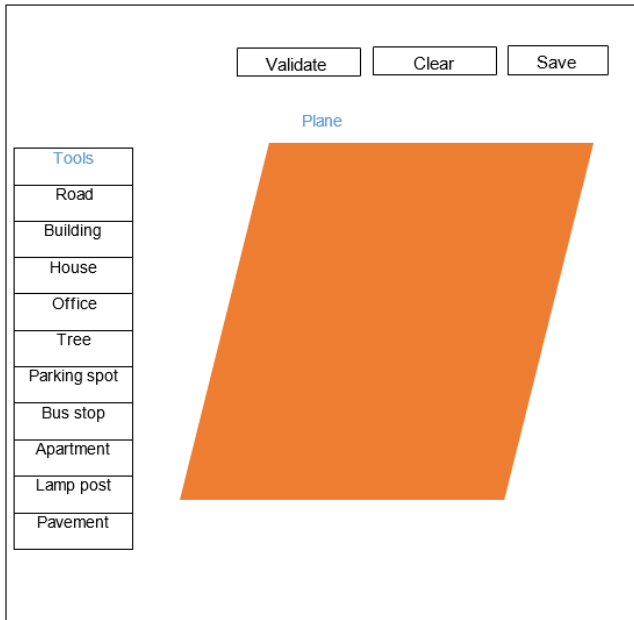


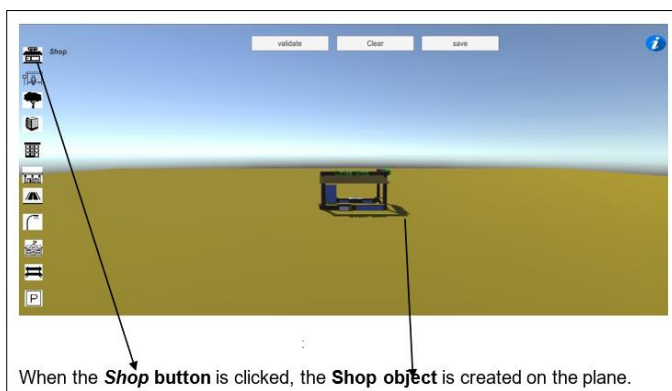
Figure 2. Architectural Design of the Proposed Solution

The validation algorithm takes into account two factors (1) adequate parking space; (2) sufficient number of green areas. If after designing the plan these criteria are not met, then the user (architect) will be prompted to make changes according to the norms set for parking spaces and green areas. The norms are that for every office building, there should be 1 parking lot having 200 parking spots and for every office building there should be at least 5 trees and for every apartment, there should be one parking lot. The tools to be used by the user are presented on a dashboard as shown in Figure 3 allowing ease of use in manipulating different objects on a plane and validating the same within a single click.



**Figure 3. Architectural Dashboard Design**

Camera movement scripts are implemented to provide different functionalities to users such as allowing the user to view the plane from different perspectives. Scripts are written for the camera to move along x and y axes using the arrow keys. Zooming facilities are included for the plane and the objects placed on it by mouse right-clicking and scrolling in and out at the same. The user can select specific objects then move them across the plane and place them anywhere on the plane. Deletion of objects is also made simple by right-clicking and selecting the delete option. Scripts are included for the creation of objects which enables instantiating that is creating an object on the plane when a button is clicked. Figure 4 illustrates the creation of an object on the plane. The number of specific objects that are created on a button click is also stored in different variables. Scripts are implemented to validate the sketch plan according to the norms set.



**Figure 4. Creation of Object on Plane**

#### IV. CONCLUSION

The proposed solution is expected to be a viable tool for architects and town planners facilitating their tasks in creating and placing objects on the defined plane with ease of manipulating and viewing as well as zooming. The features of catering and validating parking spaces and green areas prove to be quite interesting and add up weight to the system. The proposed system helps to control and reduce uncertainty and ensure short-term benefits so that long-term community interest is not jeopardized. The system guides planners and a desire for them to achieve results. It reduces random activities, overlapping efforts, and irrelevant actions. The application also ensures that key features are respected by the planner during planning exercises.

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