Indonesian Journal of Electrical Engineering and Computer Science
Vol. 33, No. 3, March 2024, pp. 1866~1875
ISSN: 2502-4752, DOI: 10.11591/ijeecs.v33.i3.pp1866-1875

Towards a consulting model for a good urban generation of social housing districts in terms of equipment

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Article Info

Article history:

Received Nov 5, 2023
Revised Nov 22, 2023
Accepted Jan 3, 2024

Keywords:

Density
Development plan
Mathematical formulas
Population
Social housing

ABSTRACT

Social housing in Morocco is housing built with state assistance. It is subject to precise rules of construction, management and allocation and governed by specifications defining requirements in a manual manner. This work which is done manually can produce errors either at the level of calculations or at the level of equipment proposal. The objective of this article is to computerize this area as there is a lack of tools and platforms. To solve this problem, we have created an advisory platform for good urban planning for residents which will help engineers. Based on mathematical formulas. This tool will allow architects and urban planners to design autonomous populations in terms of equipment.

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1. INTRODUCTION

All Even today, several housing estates and inhabitants in large cities are not yet provided with the socio-collective amenities necessary for their residents [1]. All stakeholders in this area are singled out by buyers. But who is responsible for creating this equipment? And how are they planned? You must first know that these facilities, which can be a youth centre, a police station, a school, a market, a municipality, or a sports centre, depend on several administrations and can concern services as numerous as they are different [2].

In fact, there are two types of socio-collective facilities. Larger, the first are provided for in town planning documents such as city master plans or development plans [3]. Their implementation is the responsibility of the supervisory departments. Heavy and expensive, this equipment requires budgetary allocations which are often lacking in the administrations supposed to carry them out. This is why they are carried out late, sometimes years after the inhabitants have settled [4]. Which depends on the number of housing units planned for each district and the surface area of the latter. The normative equipment grid provides how many primary or secondary schools, how many sports facilities and how many health centres must be built [5].

To respond to the problem of calculating the numbers and surface area of equipment necessary for each project, we offer a web advisory platform for good urban rehabilitation of inhabitants, which will allow specialists in the field to have good, well-calculated proposals for projects [6]. Therefore, the study of the existing will allow us to identify our objectives, to develop a quality application presenting the supreme solution, which reveals the absence of a computerized system allowing reliable and standardized results [7]. Currently, the calculation carried out is mainly based on manual work, on classic and basic tools such as paper,

Excel, and Word. The existing study phase allowed us to closely examine solutions to resolve this problem. This allowed us to identify the following problems:

- Waste of time especially when the processing and calculation is done manually and in the field
- The absence of a computerized system
- Possibility of encountering errors in manual calculation
- Loss of data
- Poor organization of data
- You can find several different pieces of advice for a single project, especially since each architect has his own way of calculating.

The rest of this document is organized as indicated; In section 2 the work methodology. In section 3, we present the mathematical formulas used. Finally, The proposal for the tool in section 4 then the conclusion.

2. METHOD

A for the development of this tool, we go through many stages. We start by understanding the state-of-the-art technology, followed by the generalization of mathematical formulas. Finally, we proceed with the creation of the planning platform, which is illustrated in the following diagram in Figure 1.

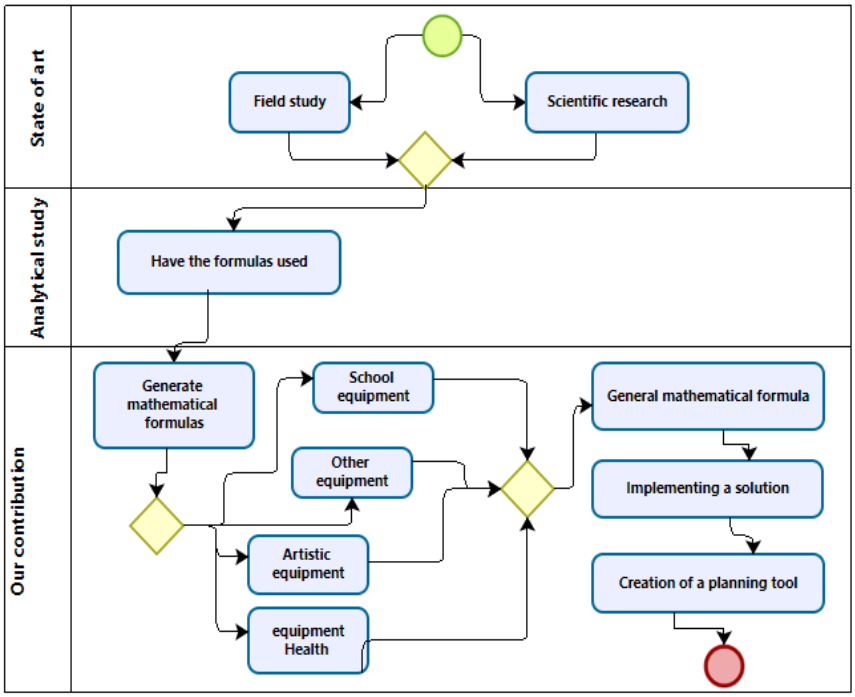

Figure 1. Work process

3. THE MATHEMATICAL FORMULAS USED

The architect is the building professional, who is responsible for designing the project, monitoring the site, until the completion of the work, on behalf of the client [8]. His project defines, through plans and written documents, the layout of the buildings, their compositions, their organization, and the expression of their volume, as well as the choice of materials [9]. Architects calculate the amount of equipment for a project -in accordance with the normative equipment grid developed and provided by the supervising Ministry - manually, which leaves room for error [10]. From this observation, we created a platform, which allows architects and technicians in the field to have the exact number of equipment for a project. According to three main parameters, which are housing per hectare, the land area supporting the project and the number of populations [11]. The platform is designed to allow us to calculate the number and type of equipment accurately [12]. Namely: gardens, schools, mosques, hammam's, police stations, schools, parks, and public service houses. Based on our research, we first generated a class diagram Figure 2 then mathematical formulas for each piece of equipment based on criteria and planning parameters used in accordance with the normative equipment grid [13], [14].

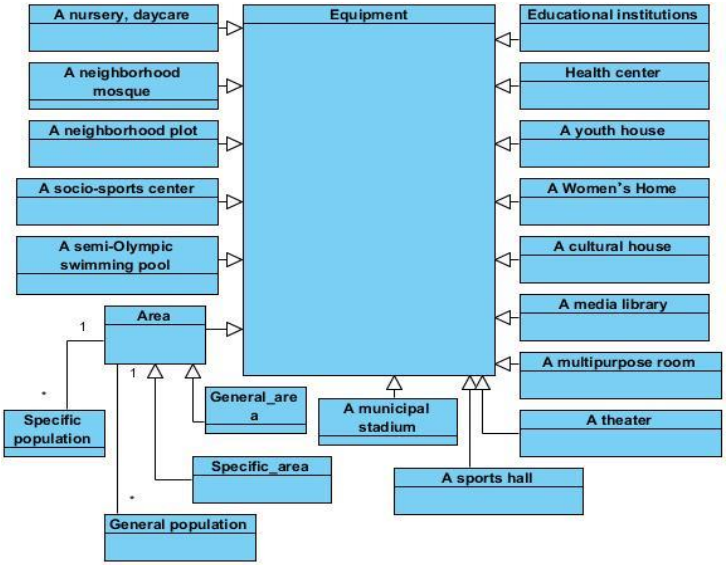

Figure 2. Class diagrams

The Table 1 shows the mathematical formulas. Such that; x: the number of inhabitants, y: the equipment surface. According to our study we have generated a general mathematical formula using the following algorithm Figure 3.

Table 1. Shows the mathematical formulas

Planning criteria and parameters	Mathematical formulas used
Educational institutions	$Y = \sum_{k=1}^{n} \frac{4000}{5000} x_i \ ; n\epsilon\mathbb{N}\ et\ k\epsilon\mathbb{N}$
Health centre	$y = \sum_{k=1}^{n} \frac{1000}{25000} x_i \ ; n\epsilon\mathbb{N}\ et\ k\epsilon\mathbb{N}$
A youth house	$y = \sum_{k=1}^{n} \frac{2200}{20000} x_i \ ; n\epsilon\mathbb{N}\ et\ k\epsilon\mathbb{N}$
A women's home	$y = \sum_{k=1}^{n} \frac{1200}{20000} x_i \ ; n\epsilon\mathbb{N}\ et\ k\epsilon\mathbb{N}$
A cultural house	$y = \sum_{k=1}^{n} \frac{900}{20000} x_i \ ; n\epsilon\mathbb{N}\ et\ k\epsilon\mathbb{N}$
A media library	$y = \sum_{k=1}^{n} \frac{950}{20000} x_i \ ; n\epsilon\mathbb{N}\ et\ k\epsilon\mathbb{N}$
A multipurpose room	$y = \sum_{k=1}^{n} \frac{1000}{20000} x_i \ ; n\epsilon\mathbb{N}\ et\ k\epsilon\mathbb{N}$
A theater	$y = \sum_{k=1}^{n} \frac{1250}{20000} x_i \ ; n\epsilon\mathbb{N}\ et\ k\epsilon\mathbb{N}$
A sports hall	$y = \sum_{k=1}^{n} \frac{3500}{20000} x_i \ ; n\epsilon\mathbb{N}\ et\ k\epsilon\mathbb{N}$
A municipal stadium	$y = \sum_{k=1}^{n} \frac{10000}{20000} x_i \ ; n\epsilon\mathbb{N}\ et\ k\epsilon\mathbb{N}$
A semi-olympic swimming pool	$y = \sum_{k=1}^{n} \frac{2200}{20000} x_i \ ; n\epsilon\mathbb{N}\ et\ k\epsilon\mathbb{N}$
A socio-sports center	$y = \sum_{k=1}^{n} \frac{5500}{20000} x_i \ ; n\epsilon\mathbb{N}\ et\ k\epsilon\mathbb{N}$
A neighborhood plot	$y = \sum_{k=1}^{n} \frac{1000}{20000} x_i \ ; n\epsilon\mathbb{N}\ et\ k\epsilon\mathbb{N}$
A neighborhood mosque	$y = \sum_{k=1}^{n} \frac{200}{10\%} x_i \ ; n\epsilon\mathbb{N}\ et\ k\epsilon\mathbb{N}$
A nursery, daycare	$y = \sum_{k=1}^{n} \frac{300}{300} x_i \ ; n\epsilon\mathbb{N}\ et\ k\epsilon\mathbb{N}$

We generated a general mathematical formula, such as:

$$Y_i = \sum_{k=1}^{n} \frac{y}{x} X_i \ ; n\epsilon\mathbb{N}\ et\ k\epsilon\mathbb{N}$$

X: $Number\ of\ inhabitants\ given$
Y: $Area\ requested$
x: $number\ of\ inhabitants\ fixed\ with\ equipment$
y : $fixed\ equipment\ surface$

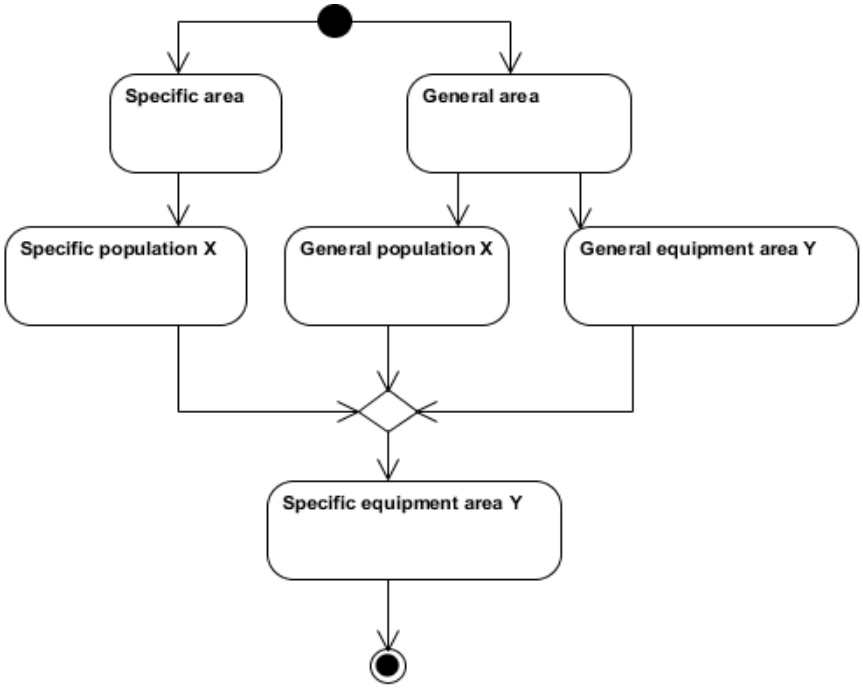

Figure 3. Algorithm generated

4. THE TOOL'S PROPOSAL

Urban rehabilitation refers to the redevelopment of a space without destroying it [15]. It assumes respect for the architectural character of the buildings and the district concerned [16]. Social housing is housing intended, following a public or private initiative, for people with modest incomes who would encounter difficulties in finding housing on the private market. The expression is also used to designate the economic sector constituted by this real estate market and the social economy policies which govern its administration [17].

The problem encountered by specialists and engineers is that they do not have a computerized system that can satisfy all the necessary and correct needs. The usual functioning of engineers is mainly based on manual work, they make calculations using classic and basic tools [18]. The existing situation in the field of urban rehabilitation presents significant gaps, namely:

- The absence of a computerized system adapted to the needs of specialists and engineers constitutes a major obstacle. Traditional tools, such as Excel spreadsheets, Word documents, or even relying on manual calculations on paper, are impractical and prone to errors. They do not make it possible to effectively manage the complexity of urban rehabilitation projects, particularly in terms of collection and organization. current operation relies largely on manual methods, which leads to significant inefficiencies. Specialists and engineers spend a lot of time and energy on repetitive and tedious tasks, such as manual data entry, manual calculation of parameters and analysis of results. This limits their ability to focus on more strategic and creative aspects of urban regeneration.
- Traditional tools and manual methods limit the productivity, precision and efficiency of specialists and engineers.
- Fragmentation of information and resources is another challenge. Relevant data is often dispersed across different files and physical media, making collaboration and coordination between team members difficult. This fragmentation can also lead to errors in communication and understanding, thus harming the overall effectiveness of the urban rehabilitation process.

A more modern, computerized approach is needed to simplify tasks, centralize information and data, and promote harmonious collaboration [19]. The establishment of an urban rehabilitation platform would respond to these critical needs and make it possible to considerably improve urban rehabilitation processes [20], [21].

Civil engineers are responsible for the design, construction, operation, and rehabilitation of construction works and infrastructure which they manage to meet the needs of society, while ensuring public safety and security [22]. Environmental protection. These engineers take charge of tasks by manually calculating the number of public places frequented by residents of the inhabitants. As a result, we have created a platform that allows civil engineers to have the number of public places necessary for the inhabitants. According to three main parameters which are housing per hectare, surface area and number of populations. Surface area is an area of land or any area. Or measure a surface according to its width and length [23], [24]. Based on the existing study we found several gaps and limitations in the field of urban rehabilitation, which highlights the pressing need for a more advanced and effective solution [25].

This will allow us to identify our objectives to develop a quality platform which will be the ultimate solution for this problem. The platform allows you to show the public places frequented by residents of the inhabitants, namely: gardens, schools, mosques, hammams, police stations, schools, parks, and public service houses. To create our platform, we generated mathematical formulas for each piece of equipment based on the criteria and planning parameters used by civil engineers.

4.1. Conceptual study

Conceptual Study describes the design using the unified modelling language (UML) modelling language. We present the use case diagram. The diagram is to determine what each user expects from the system. The determination of needs based on the representation of the interaction between the actor and the system Figure 4. Technical study will approach the technical side of the tool with exposure of the architectures used in our application also with the presentation of the technologies used.

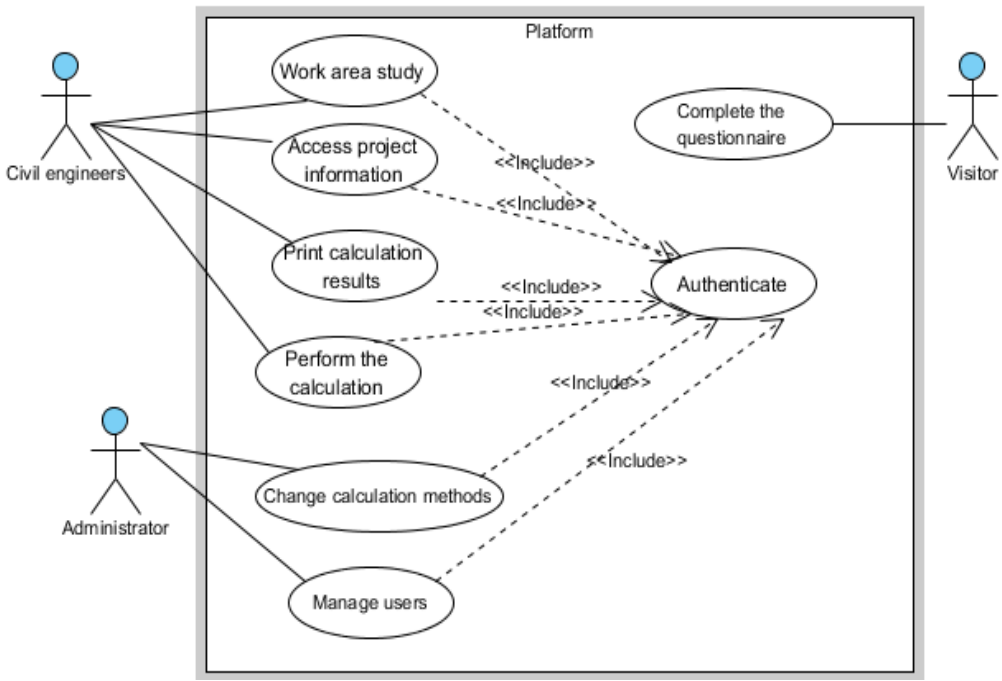

Figure 4. Use case of platform

Figure 5 class diagram allows to schematize everything that we have seen to present the overall architecture of our system by clarifying the relationships between the classes. This diagram presents the tables of our database. We integrate the protocols, the criteria as well as the measurements of each criterion from our comparative study. The Figure 6 shows these technical requirements. The tool to produce must be able to meet a number of technical requirements, specifically: security and authentication, the interfaces must be simple, and the tool must be easy to use, and the tool must be efficient and reliable.

4.2. Our platform

In this section we present the most important interfaces of our platform. In this interface Figure 7 the user can access the visitor page to fill out a questionnaire, visit the about page, register and authenticate. On

this page Figure 8 residents can fill out a questionnaire that helps architects achieve good urban rehabilitation. This interface Figure 9 represents the registration page where users fill out fields to register for the SAKINATONA web application. This interface Figure 10 presents the calculations page where users can either make calculations by filling in the required fields, namely the user, the surface area, housing per hectare, and the number of populations. We based on the mathematical formulas and the generated algorithm. This interface Figure 11 presents the advice form page, of which the user can consult the calculation results, and he can also print these results in Word or PDF format by clicking on the print button. In the platform there are other interfaces namely: authentication interface and account management. For the version presented in the article is a French version we are in the process of improving it to add functionality as well as language settings.

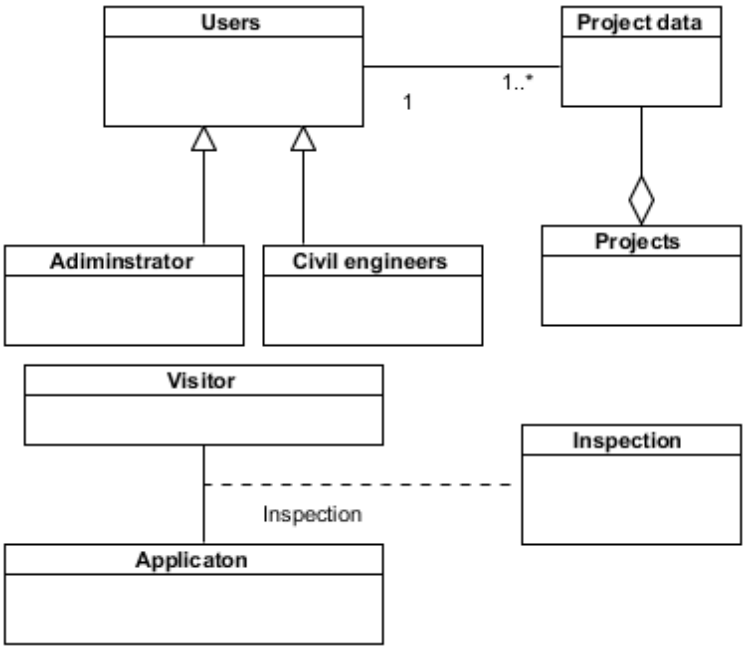

Figure 5. Class diagram of platform

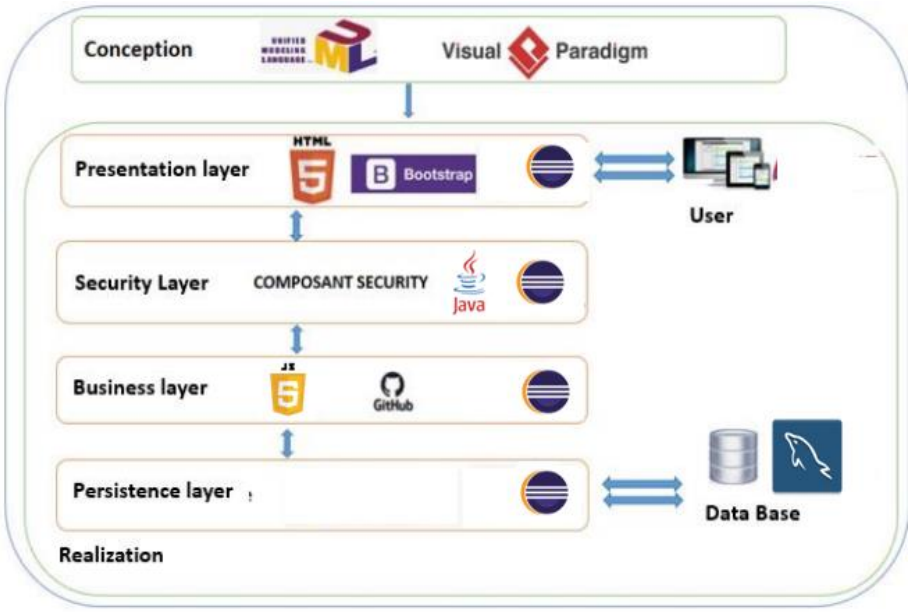

Figure 6. Technology uses

Figure 7. Home interfaces

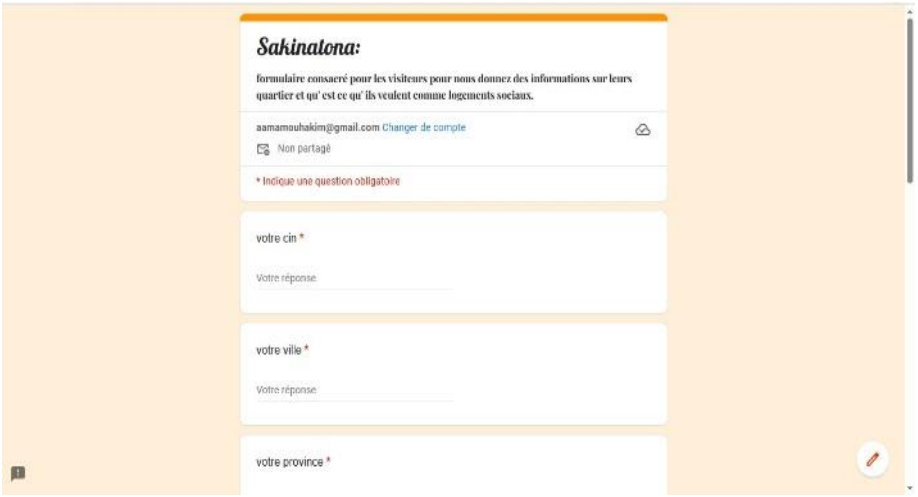

Figure 8. Visitor page

Figure 9. Registration interface

Figure 10. Calculations interface

User	user
superficie	6.0
logement par (h)	100
population	10000
logements	600
jardins	13
stations de police	30
terrains	60
hopitaux	30
mosquées	300
mosquées Vendredi	30
collèges	112
primaires	7
lycées	12
centres de santé	300
arrondissements policières	500
Maisons de service public	400
changer les données	Imprimer

Tableau de calcul

Figure 11. Advice form interface

5. CONCLUSION

To achieve our objectives, we followed several steps, ranging from analytical study, modelling, generation of mathematical formulas and creation of platform. the platform intended for civil engineers, we realized that data analysis could provide valuable information to optimize decisions in the field of urban planning and public infrastructure. As a continuation of our work, it consists of using clustering techniques to group public places according to their common characteristics. This will enable civil engineers to gain a better understanding of different types of public places and make more informed urban planning decisions. In addition, we intend to explore prediction models to determine the probability of attendance at public places based on various factors such as location, days of the week, and special events. We are confident that these additions will provide deeper enhancements and make the platform even more useful for civil engineers.

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