

USING THE METHOD OF EMERGENCY UNIT LOCATION TO PROPOSE A LOCATION FOR A BASE OF MILITARY POLICE IN THE REGION OF SÃO MATEUS

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ABSTRACT

The objective of this work is to propose a better location for a base of Military Police that acts in the region of São Mateus. As it is not precisely located in the center of its delimited acting area, it was decided to analyze whether the current location equally attends the entire region or there would be a better location. With the help of Google Maps, the area was mapped and divided between the main neighborhoods, defining the main street of each neighborhoods and adjusting the Google Maps to trace routes considering the main streets and avenues. It was considered, too, the opinion of a police officer that works in that area there are two years. Then it was done the calculation based on the method of Emergency Unit Location (EUL). Results showed that the current location is not the better option because it well attends just part of the area; and they also showed which would be the neighborhood more indicated to install that base in order to become equal its capacity to attend all the neighborhoods of its acting area.

Keywords: Location; Emergency unit; Military Police.

RESUMO

O objetivo deste trabalho é propor uma melhor localização para uma base de Polícia Militar que atua na região de São Mateus, Estado de São Paulo. Como ela não está localizada precisamente no centro de sua área de atuação delimitada, decidiu-se então analisar se a atual localização atende toda a região por igual ou se haveria uma localização melhor. Com o auxílio do Google Maps, a área foi mapeada e dividida entre os principais bairros, definindo a rua principal de cada bairro e ajustando o Google Maps para traçar rotas considerando as principais ruas e avenidas. Considerou-se também a opinião de um policial que trabalha na área há dois anos. Foi feito então o cálculo baseado no método de Localização de Unidades de Emergência (EUL). Os resultados demonstraram que a atual localização não é a melhor opção, pois atende bem somente parte da área; e também demonstraram qual seria o bairro mais indicado para instalar essa base de modo a igualar sua capacidade de atendimento a todos os bairros da sua área de atuação.

Palavras-Chave: Localização; Unidade de emergência; Polícia Militar.

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INTRODUCTION

We live in a society where the population contingent in some areas is on the edge of disaster. In the great urban centers the agglomeration of people at the called 'suburb of neighborhoods' is each time bigger. According to the magazine *Exame* (2011), with source from IBGE, in 2010 it was estimated that around 6% of the Brazilian population, the equivalent of 11 million of people, live in shanty town and other irregular settlements. Only in São Paulo the number is 11% of dwellers, more than two million living in shanty towns.

Besides problems with infrastructure, education and quality of life, the safety issue is also a preoccupation in the great urban centers. According to the article published in the website of the IPEA (*Instituto de Pesquisa Econômica Aplicada*) in 2009, the national homicide rate was 23.7 cases per 100 thousand inhabitants, a high index, especially considering the international patterns. The World Health Organization (WHO) considers 'epidemics zones' those with rates over 10 murder per 100 thousand inhabitant.

The region of São Mateus, in the East Zone of São Paulo, is an example among many other cities, where there are many people in the suburb of neighborhoods (Fig. 1). In this scenario it is important that there be efficient public policies of safety, prioritizing the best use of the resources available to treat the local safety. Among other aspects, it is necessary to note the best location of Military Polices (PM), which, besides to facilitate the locomotion of police cars through the city, makes the population feel safe.



Figure 1 - Suburb of the neighborhood of Fazenda da Juta - Region of São Mateus / São Paulo. Source: Blog Minha Comunidade, 2011. Available at <<http://minhacomunidadejuta.blogspot.com.br/2011/11/historia-da-fazenda-da-juta.html>>. Accessed on January 19th, 2017.

In this context the emergency units are, who have as goal to help the population with efficiency and speed. The commonest emergency units are health units, as first aid and ambulances, and safety and security units, as fire departments and polices.

The aim of this work is to propose a better location for a base of Military Police that acts in the region of São Mateus, State of São Paulo, concerning the efficacy of the attendance of the police cars. It is important to point out that this study does not consider financial issues in the case of change of location, being the study restricted to the attendance time issue, so the financial part is a suggestion for future researches. This work also aims to contribute with the scientific production of applied theory.

THEORETICAL FOUNDATION

PUBLIC SECURITY

Lima, Bueno and Mingardi (2016) affirm that at the lack of a policy of public security based on the articulations and efforts for rights guarantee, on the respect and on the non-violence, we leave to face the fact that our justice and security systems need structural reforms deeper.

According to Bordin et al. (2013), in the whole country public security became issue within daily discussions, whether within the Government sphere or within the informal conversation of the population. Many things did not change it and probably will not quickly and significantly change it, but little changes noted within daily of those agencies can contribute for better using of the public resources in the attendance of the population.

Gurgel et al. (2010) affirm that the allocation of police units is an important point for the improvement of the public security, mainly in Brazil, where the violence grows in elevated proportions since the 1980's, generating sense of insecurity and creating demand from population for services that promptly attend and help them with the reduction of that *mazela*.

We noted that the most part of the articles that address about public safety and security as well as location regarding them is published in congress, which indicates a lack of this kind of study published in scientific journals.

LOCATION METHOD

According to Gurgel, Ferreira and Aloise (2010), the location of police units is a strategic point in the police operations management especially concerning the operations costs and the response-time for police occurrences.

Not only police bases may be characterized as emergency unit but also hospitals and fire departments. For that it is common the use of the method of Emergency Unit Location

(EUL), which has as aim to indicate a location where the attendance be faster, however, it is important to pay attention for other aspects before to define the location of a unit, as: general costs, locals with accessibility, demand level etc.

According to Vicente (2016), it is extremely important to highlight that the EUL method gives an alternative that offers more efficiency in the treatment, and it has as disadvantage the fact that neither to provide an optimal solution nor to aim the costs minimization. For these aims, it suggests to consult Ballou (2006), who well highlights both about location and costs factors, with examples ranging from simple to complexes and sophisticated.

Da Silva, Cabral and Quirno (2013) affirm that emergency public services, as public safety, civil defense and medical services, have in common the aim to attend the population in the smallest possible time, since they aim to save lives and to inhibit crimes.

So, the EUL method is simple. It supposes that the speed is fundamental. The steps are as follows:

- To define which are the neighborhoods that will be attended;
- To define which are the possible locations for the base;
- To determinate the connection routes, as well as the correspondent access times;
- To determinate the minimum time needed to go from one neighborhood to another, annotate them and table them into a matrix;
- To highlight among the values, the maximum times to travel through the neighborhoods; and
- To choice the smallest time among the values. Its place of reference is the suggestion to install the base.

METHOD

First of all we researched in literature concepts and examples regarding emergency unit and location, as well as its applications, in order to base the method. Next it was performed the data collect as follows: it was researched the region to be studied and its territorial limitation, being it divided by neighborhoods. In each neighborhood it was defined the main street and traced routes between all the neighborhoods starting from defined main streets, to find the minimum time needed to go from one neighborhood to another, all that with the Google Maps' help. After that, the data were tabled and interpreted based on the concepts of location, thus defining the local to be installed the police base. It was also considered the opinion of a police officer that works in that area there are two years. Finally, we describe the work at the section 4, followed by the final considerations about the study at the section 5, with suggestions for future researches.

RESULTS AND DISCUSSIONS

The study concerns to the acting area of a Military Police company. This area comprises part of the region of São Mateus, in the East Zone (ZL) of São Paulo. To the accomplishing of this study the area was divided into nine main neighborhoods, as Fig. 2 shows. Currently its base is located in neighborhood 8- Fazenda da Juta, which clearly shows a location outside the center, which theoretically well attends just half of the total area, which would prejudice the practicality and agility for the other half.

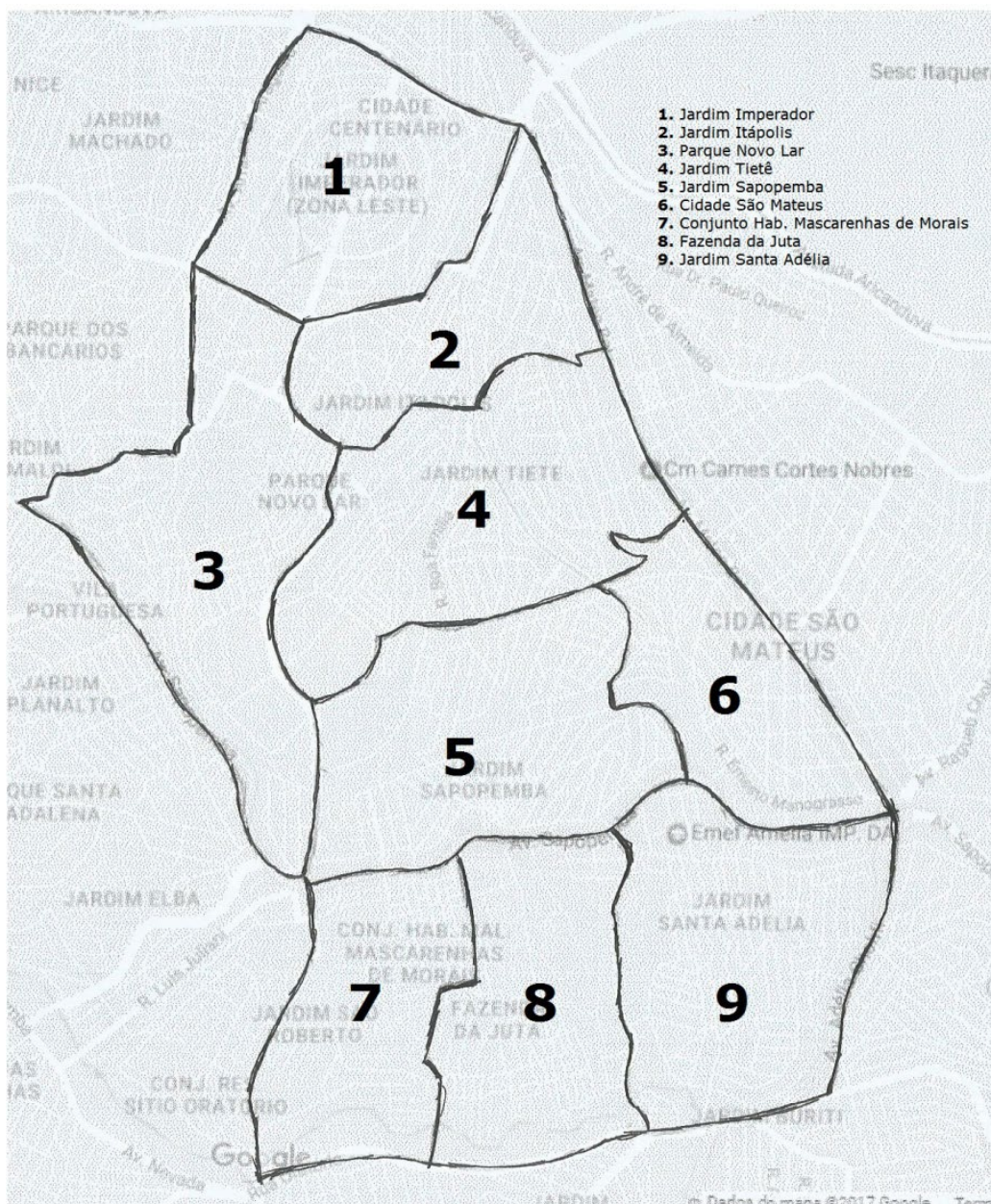


Figure 2 - Studied region and division into neighborhoods.

Source: Google Maps.

Based on the concepts of location and also on the real need that an emergency unit must be at the best possible location to equally favor its entire acting area, with the Google Maps' help, they were identified the main neighborhoods comprised by the area and defined the main streets in each neighborhood (Table 1), followed by the calculation to

find the minimum time needed to go from one neighborhood to another (Table 2). It notes that Google Maps was adjusted to prioritize the main streets and avenues for the path.

Table 1

Neighborhoods and main streets.

Number	Neighborhood	Main street (central street)
1	Jardim Imperador	Av. Piranguçu
2	Jardim Itápolis	Av. Riacho dos Machados X Rua Antônio Sampaio Dória
3	Parque Novo Lar	Rua Mara Rosa
4	Jardim Tietê	Rua Ministro Apolônio Sales
5	Jardim Sapopemba	Rua Manuel Quirino de Matos
6	Cidade São Mateus	Rua Maria Luísa do Val Penteadó
7	Conjunto Hab. Mascarenhas de Moraes	Rua Tenente Godofredo Cerqueira Leite
8	Fazenda da Juta	Rua Sargento Hermínio Aurélio Sampaio
9	Jardim Santa Adélia	Rua Ribeiro Duarte

Source: the authors.

Table 2 is the matrix needed to collect the data which will define the most indicated location for the studied case. To enlarge the base of analysis, it was considered the opinion of a police officer that works in that area there are two years. According to him, the stipulated times and distances are very close to reality.

Table 2

Matrix of minimum time in minutes for accesses between the neighborhoods.

From	to (minimum time in minutes for access)								
	1	2	3	4	5	6	7	8	9
1	0	5	5	8	12	13	14	15	15
2	5	0	7	5	7	7	11	11	11
3	5	7	0	7	10	11	10	11	15
4	8	5	7	0	3	5	7	8	9
5	12	7	10	3	0	5	4	5	6
6	13	7	11	5	5	0	7	7	3
7	14	11	10	7	4	7	0	2	7
8	15	11	11	8	5	7	2	0	9
9	15	11	15	9	6	3	7	9	0

Source: the authors.

Following the EUL method, among the numbers of the matrix in reference, it was chosen the biggest values of each line, thus producing the Table 3.

The final step is to select the smallest value among the values found in Table 3, in this case is number 9. Its reference is neighborhood number 4- Jardim Tietê. Therefore, according to calculation, the best location for that police base equally attends its whole area is in neighborhood Jardim Tietê.

Table 3

Maximum time of distance collected from matrix.

Region	maximum time (in minutes)
1	15
2	11
3	15
4	9
5	12
6	13
7	14
8	15
9	15

Source: the authors.

FINAL CONSIDERATIONS

The problem of location always requires dedication and attention. A well location, whether an emergency unit or any other department, as warehouses, for example, brings benefits as for the fast attendance of urgencies, in the first case, as with smaller costs, distances and routes, in the second case.

Aware those benefits, among other motives that also support the need for attention to locations, it is important to measure where determined base is installed, because two results will be possible: whether it be strategically well located, then it will have the consciousness that, in that aspect, it does the best; or the location shows itself outside the optimal, then it finds the opportunity to improve it.

An emergency unit exists to perform its attendance in the smallest possible time, and this only will be possible if the case were analyzed. Therefore, this study shows by means of simple methods, suggestions for optimization of the service provided by a determined police base. Besides that, the installation of a new police base in a neighborhood increases the sense of security for the local population, which will improve the image of the region and even the own institution image.

Regarding the eventual change, the place where it gets out, instead of it to be deactivated, it may be used as a support base, called 'communitary base', at this way it would keep the sense of security for the neighborhood.

SUGGESTIONS FOR FUTURE RESEARCHES

It suggests for future researches to verify the legislation concerning procedures to buy or rent the building in the region to establish the base, as well as the costs; to model by means of operational research, considering variables as criminal index, to determinate a location for either one or more mobile operating bases.

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