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Applying plane geometry to police work: Using Goolge Maps and ARP to investigate cannabis cultivation

Aplicação da geometria plana na atividade policial: Sso do Goolge Maps e ARP na investigação de plantio de cannabis

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ABSTRACT
This article addresses as a theme, the application of mathematics in police activity: mathematical studies inserted in the area of public security. The approach consists of using computational tools, such as the Google Maps (GPS) application and the use of ARP, aiming at application to the public security area. These technological resources make a significant contribution to combating illicit trade, such as the planting of cannabis sativa and other types of traffic that require technology for identification in areas of difficult access. To better describe the application, three problems are used that show the importance and indispensable usefulness of ARP and Google Maps in the fight against crime. The third problem will deal with the use of plane and analytical geometry in the calculation of cannabis planting area and coordinate distances in order to evaluate the modes operandi of trafficking, using, albeit empirically, mathematical knowledge in order to maximize planting of the herb, which corresponds to a maximum profit when the drug is benefited. The occupation of large areas of planting hardly ever happens, as they could be identified by a drone

that visualizes planting regions. The research concludes considering that modern technology, Google Maps, ARP, as well as mathematics in the contribution of coordinates in areas of difficult access, have been of great use in the production of knowledge, considering that these measures are essential for combating illicit trade.

Keywords: Google Maps, ARP, Mathematics, Cannabis, Public safety.

1 INTRODUCTION

When faced with a problem of any kind, it's normal to find a solution using only empirical knowledge. Frustration occurs when you can't solve the situation, which leads to the desire to have the problem actually solved. In this case, it is necessary to succeed in solving the problem, which is only possible and essential if you apply knowledge that will elucidate and verify the correct and scientific solution (SMOLE and CENTURIÓN, 1992, p.9).

In police operations, intelligence is used to obtain information, which leads to an even more arduous path, which is to turn information into a concrete object of certainty. In general terms, appropriating all the knowledge and technologies available is essential if the production of knowledge is to be dynamic and defined. The operability of intelligence activity depends precisely on being skillful, knowing and operating as many platforms as possible that add up to mathematics as an instrument for building knowledge, as well as being able to produce a positive effect that leads to the solution of information.

Given this context, the general aim of this work is to verify the application of mathematics in police work: the influence that mathematical studies have on the police service. The aim is to show how much mathematics is involved in the construction of police activity. In other words, mathematical study is intrinsic to the guidelines that converge in situations where crimes can be solved.

In order to better address the issue, we have developed a Google Maps application for locating Cannbis Sativa plantations using ARP (drone) and the use of plane geometry as a didactic resource in the elucidation of a crime. These digital technology tools and plane geometry are useful and capable of structuring the production of knowledge in police activity and intelligence. As such, the *Google Maps* Platform represents satellite monitoring *software* created by members of the US military, which is currently available for any smartphone. This *software* is of vital importance to the compendium of platforms accessed in police activity and will be used in this work to show how it becomes possible to identify and plot the location of areas where illicit trade takes place.

Therefore, police activity requires public agents to have knowledge and skills in certain areas of mathematics and technology, because not far from mastering this knowledge, it is necessary to have operational skills on some platforms available for free on *Play Story*, which help in the compilation and production of police field work. It is precisely with this in mind that the theme of this work is justified, using the aforementioned tools and flat geometry content for development and operation, bearing in mind that mathematics itself in an applied form can be useful in solving situations involving crime.

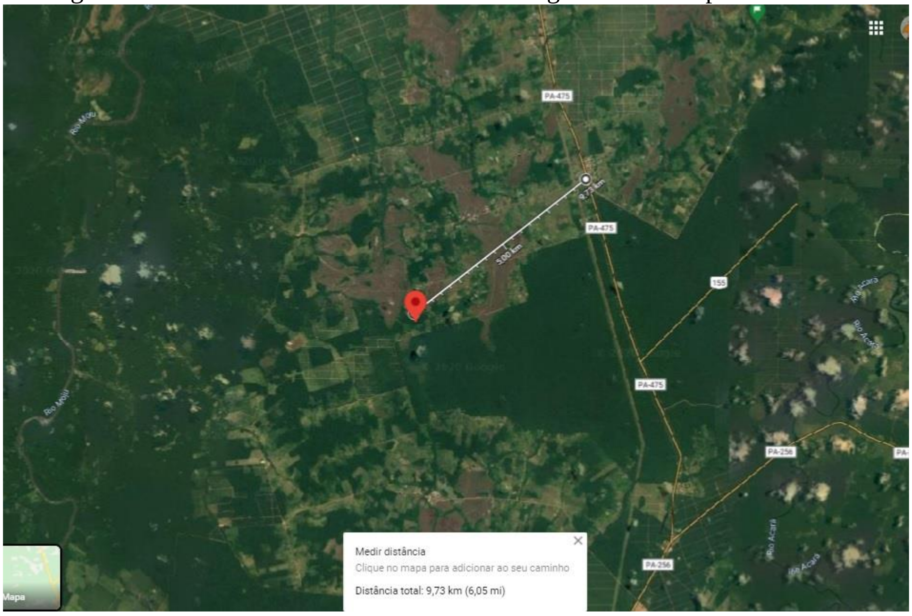
2 GOOGLE MAPS, ARP AND THE APPLICATION OF PLANE GEOMETRY

2.1 HOW GOOGLE MAPS WORKS AND HOW TO USE IT

GPS, the *Global Position System*, uses artificial satellites to define a geographical location based on altitude, latitude and longitude data (Dana 1997). In fact, data from several satellites is used to produce an accurate plot. Based on the coordinates of at least four satellites, using the same reference system between them and the receiver's antenna, it is possible to calculate the position (latitude, longitude and altitude) of the device from their distances (Ramos, Ferrão, Costa and De Castro 2012). According to the aforementioned authors, the working principle of GPS is the reception of signals by a receiver, which can be present in a cell phone, for example.

Google Maps has countless uses and applications in everyday situations and is the best location tool based on images taken directly from the lenses of NASA satellites, in partnership with Google. Google Maps has the advantage of providing an overview of a country, state or municipality, making it an essential application for mapping forests by locating points and plotting coordinates, calculating distances for possible monitoring and access to places where illicit trade may be taking place. Figure 1 shows how useful this tool can be for calculating the distance between two coordinates. The red dot could represent a cannabis plantation.

Figure 1: Coordinates and distances for locating the cannabis plantation area



Source: Author

2.2 ARP FOR INVESTIGATING CANNABIS CULTIVATION AND TRAFFICKING

The *International Civil Aviation Organization*'s (ICAO) definition of RPA is that Bispo (2013) "[...] are all aircraft that do not have a pilot on board to be guided, and can be applied in various segments, such as security, surveillance, agriculture, among others", gives an idea of the possible uses of this technology.

According to Puscov (2002 APUD MEDEIROS 2007), the history of unmanned aerial vehicles began in 1883, when Douglas Archibald installed an anemometer on a wire in a "pandorga"[1] in order to measure wind speeds at different altitudes, reaching a height of 1200 ft. On June 20, 1888, in France, Arthur Batat attached a camera to a pandora, which was the first recorded aerophotographic flight.

The history of unmanned aircraft projects dates back to 1918. In fact, these were cruise missiles built to destroy themselves along with the target, such as the *Kattering Aerial Torpedo* (CELESTINO, 2004). According to Celestino (2004), the first controlled RPA were a type of target drone, used in World War II to train anti-aircraft artillery. In 1935, Reginald Denny designed and tested the RP-1 or *Remotely Piloted Vehicle* (RPV)[2] , as RPAs were called at the time, which was the first radio-controlled unmanned aircraft.

From that moment on, the search for improvements began, and in the following years the RP-2 and RP-3 prototypes appeared, with various flight tests. In November 1939, the RP-4

[1] A type of kite
[2] Remotely Piloted Vehicle

prototype was completed and was considered, at the time, to be the most complete RPV. The US Army ordered 53 (fifty-three) units, giving them the designation OQ-1. The figure (Figure 2) shows a piece of equipment called a PHATON-3 used by the PM-PA for mapping and georeferencing work.

Figure 2: ARP used to visualize cannabis plantations

Source: Own authorship

The Minas Gerais Military Police, through its ARP Pilot Officer, CAP PM Jean Carlos Inácio da Silva, has developed a document outlining the use of these vehicles and their vital importance in supporting and developing knowledge for the field of Public Security Intelligence. According to Inácio 2018:

> The RPA have excelled in intelligence gathering and in actions to support command and control, demonstrating their value in other public security activities. An analysis of the characteristics and potential of RPAs shows that they can be used in PMMG's operational activities. In this context, with a view to spreading the use of this new type of aircraft throughout the PMMG, supported by the principles of flight safety, operational risk management and excellence in performance, ComAvE began to act as a central body for the use and propagation of doctrine, having promoted three remote pilot training courses, called 'Training Course for Remote Pilots of Remotely Piloted Aircraft', with the training of 37 (thirty-seven) military police officers.

2.3 ARP AND ITS USE BY THE MILITARY POLICE

In summary, the drone flies as follows: This model of drone described in this paper. DJI PHANTON 3 STANDARD, is equipped with four electric propulsion and control rotors. They have been designed in such a way that the propellers push the air downwards. As the forces come in pairs, when the rotor pushes the air down, this air therefore pushes the ARP up. It follows that the higher the speed of the rotors (the greater the spin), the greater the upward force (Michael Zardo, Cristina Elisa and Carine Geltrudes 2021). We see an application of physics in the operation of the ARP, which will not be detailed in this paper.

In the state of Pará, the Military Police actually joined the RPAS in March 2018 when it opened the first RPA pilot class in the state. From then on, the PMPA began to streamline police activity as a whole with the use of drones, according to Official Gazette No. 33.605 of April 25, 2018. With regard to the use of this equipment, the Intelligence activity, which exploits this indispensable technology with efficiency and salutary use.

3 PLANE GEOMETRY

This section deals briefly with the history of Euclidean geometry. This moment in the article is essential for structuring the next steps regarding the use of ARPs and GPS in police activity.

3.1 EUCLID'S GEOMETRY

Euclid was a Greek mathematician responsible for compiling practically all the mathematics developed up to his time in a monumental 13-volume work called *The Elements,* produced around 300 BC (Barbosa 2006).

His merit is not restricted to the compilation, but also to the introduction of the logical-deductive method in the development of a theory, that is, the axiomatic method, so well known in mathematics today. In Euclid's work there are 10 axioms, 5 of which are "common notions", which Euclid believed to be truths accepted without challenge in any science, and 5 "postulates" which were intended to be propositions specific to geometry and which should also be accepted without challenge. From these axioms, Euclid deduced 465 propositions, among which are also results from spatial geometry and number theory (from a geometric point of view). Geometry textbooks produced over time still use Euclid's *Elements as* their basis. It is the second most published work in the world (the first is the Bible).

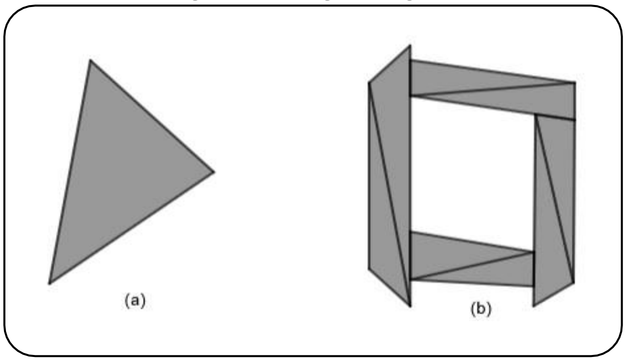
It is known that Euclid was born around 325 B.C. and died around 265 B.C. It is also known that he lived most of his life in the city of Alexandria, Egypt, where he worked in the famous Library of Alexandria, founded by Alexander the Great.

3.2 AREAS IN PLANE GEOMETRY

A triangular region (figure 4) is a set of points in the plane formed by all the segments whose ends are the sides of a triangle. The triangle is called the boundary of the triangular region. The set of points of a triangular region which do not belong to its boundary is called the interior of the triangular region. A polygonal region is the union of a finite number of triangular regions which two by two have no interior points in common (figure (b) above).

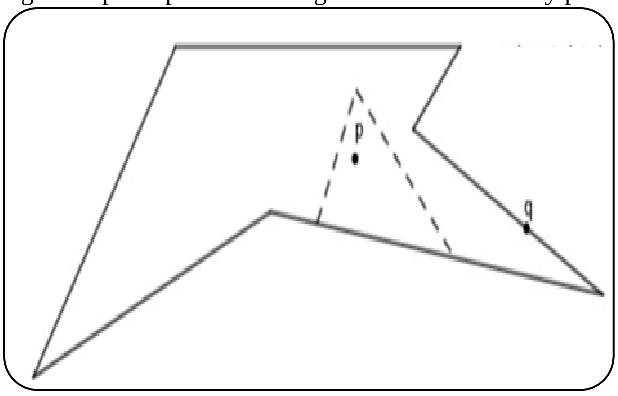
A point is inside a polygonal region if there is a triangular region contained within the polygonal region and containing the point inside it. The interior of a polygonal region is the set of points that are inside it. The boundary of the polygonal region is made up of the points in the region that do not belong to its interior (Figure 5).

Figure 3- triangular regions



Source Own authorship

Figure 5: p is a point in the region that is a boundary point



Source: Author

The notion of area of polygonal regions is introduced in geometry through the following axioms:

- **Axiom VI.1** Every polygonal region has a number greater than zero.

The number referred to in this axiom is called the area of the region.

- **Axiom VI.2** If a polygonal region is the union of two or more polygonal regions that have no interior points in common, then its area is the sum of the areas of those regions.
- **Axiom VI.3** Triangular regions bounded by congruent triangles have equal areas.

Of course, every convex polygon determines a polygonal region. We will take the liberty of using the expression "the area of a square" when we really mean "the area of the polygonal region whose boundary is a square". In general, we will speak of "the area of a given polygon" when we really mean the area of the region whose boundary is that polygon. Thus, axiom VI.3 above could have been stated as: "congruent triangles have equal areas".

- **Axiom VI.4** If ABCD is a rectangle then its area is given by the product: $\overline{AB} \cdot \overline{BC}$.

Based on these axioms, let's determine the area of some simple polygonal regions. Let's start with the parallelogram.

Given a parallelogram ABCD, let's denote by b the length of side AB and by h the length of a segment connecting the lines containing segments AB and CD and perpendicular to both. Such a segment is called the height of the parallelogram with respect to side AB.

Proposition 1- The area of a parallelogram is the product of the length of one of its sides and the length of the height relative to this side (Figure 6).

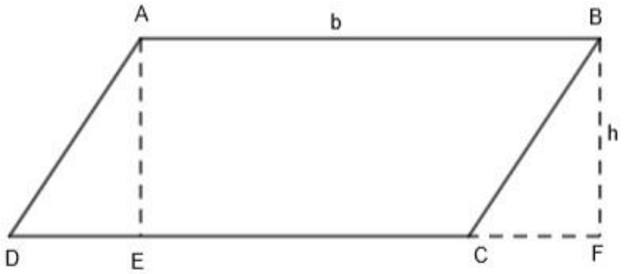
Proof: In terms of the notation given above, we must prove that the area of the parallelogram ABCD is $b \cdot h$. To do this, from points A and B, draw two segments, AE and BF, perpendicular to the line containing CD. The quadrilateral ABFE is a rectangle whose area is $\overline{AB} \cdot \overline{BF}$ which, in terms of our notation, is exactly $b \cdot h$. To conclude the demonstration, note that triangles ADE and CBF are congruent and that

$$\begin{aligned}
\text{Area (ABCD)} &= \text{Área}(ABCE) + \text{Área}(ADE) \\
&= \text{Área}(ABCE) + \text{Área}(CBF) \\
&= \text{Área}(ABFE) = b \cdot h
\end{aligned}$$

This concludes the demonstration. As a corollary to this proposition, determine the area of any triangle.

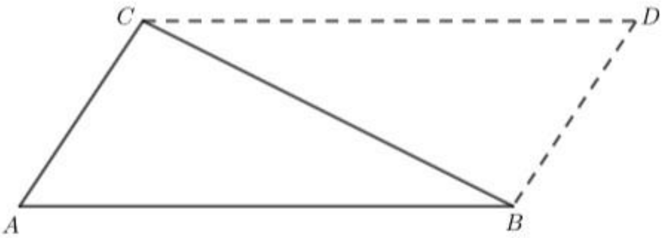
Proposition 2- The area of a triangle is half the product of the length of any of its sides and the height relative to this side (Figure 7)

Figure 5- The area of a parallelogram: the product of the length of the sides and the relative height.



Source: Author

Figure 6: The area of a triangle: half the product of the length and height relative to this side

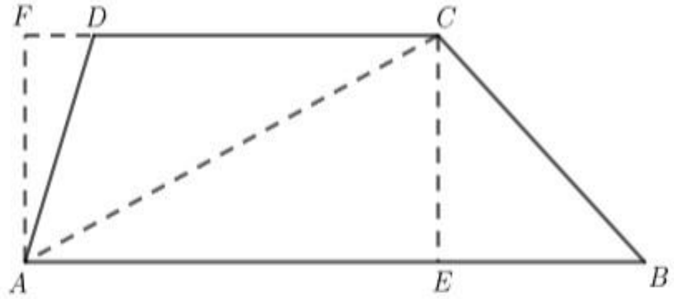


Source: Author

Proof: Given a triangle ABC, draw a line parallel to side AC through vertex C. These two lines intersect at point D. The polygon ABCD is a parallelogram, and the two triangles are congruent. These two lines intersect at a point D. The polygon ABCD is a parallelogram, and the two triangles ABC and CDB are congruent. Since $\text{Área}(\text{ABDC}) = \text{Área}(\text{ABC}) + \text{Área}(\text{CDB})$ and $\text{Área}(\text{ABC}) = \text{Área}(\text{CDB})$then: $\text{Área}(\text{ABC}) = \frac{1}{2}\text{Área}(\text{ABDC})$. To complement the demonstration, note that the height of vertex C of triangle ABC is exactly the height of parallelogram ABDC relative to side AB.

Proposition 3- The area of a trapezoid is half the product of the length of its height and the sum of the lengths of its bases. Proof: Let ABCD be a trapezoid whose bases are sides AB and CD. Draw the diagonal AC to divide the trapezoid into two triangles (Figure 8).

Figure 7: The area of a trapezoid: half the product of the length of its height and the sum of its bases



Source: Author

Plot the heights *CE of* triangle *ACB* and *AF of* triangle *ACD*. Then we have $AF = CE$since sides *AB* and *CD* are parallel. As a result

$$Área(ABCD) \; = Área\big(ACB + Área\big) \qquad (10.10)$$

$$= \frac{1}{2}\overline{AB}\cdot\overline{CE} + \frac{1}{2}\overline{DC}\cdot\overline{AF} = \qquad (10.11)$$

$$= \frac{1}{2}(\overline{AB} + \overline{DC})\cdot\overline{CE} \qquad (10.12)$$

This demonstrates the proposition.

3.3 AREA APPLICATION IN CANNABIS PLANTATIONS

In the Amazon region, which is the largest forest in the world, areas are generally measured in hectare units. Mathematically, the hectare is the measure of an area that has $10.000m^2$or a square of side$100m$. In this sense, in closed regions it is possible to distribute cannabis cultivation using as many plants as possible. The same happens in the agroecology area with some plants, such as oil palm or açaize palms. The aim of this distribution is to obtain as many trees as possible to be planted in a given rectangular or square area.

In a riverside community where there is a lot of açaizeiro planting, some producers still don't use this technique of knowing how to properly use the hectares they have with orderly and defined spacing of palm trees. However, in the illicit trade, this technique is becoming commonplace, as traffickers want to make as much profit as possible from the plantation by producing as much weed as possible. In this way, they look for areas with little access and well hidden from technological resources that can identify the plantation and bring considerable damage to the trade.

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So, look at an area of 300m^2 where you want to plant as many cannabis plants as possible. In this case, if in the plant's adult phase the spacing between two consecutive trees is 1m, what number of plants can be arranged along the 300m area ?^{2}

To solve this problem, it is enough to consider that if each plant has a distance of 1m, then it is possible to plant 15 herbs on one side of the rectangle and 20 herbs on the other side of the same rectangle. So the number of herbs that can be planted would be 300 herbs (Figure 8).

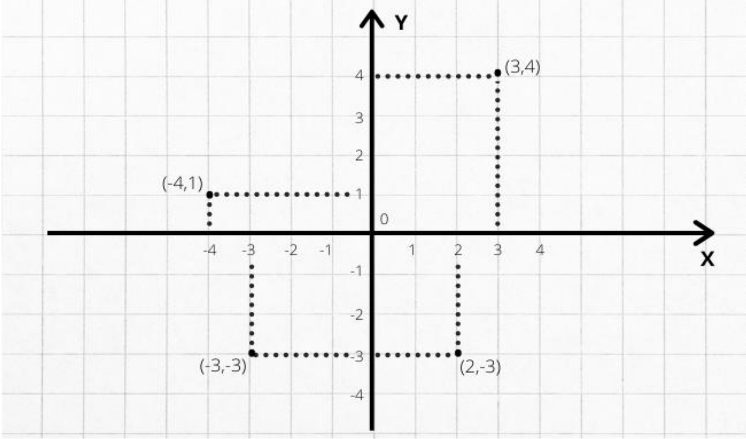
Figure 8: Cannabis plantation seen by ARP

Source: Author

3.4 COORDINATES IN THE CARTESIAN PLANE

The figure (Figure 9) shows a Cartesian plane and the coordinates of 4 points. This coordinate system can be very useful in practice and is often used to locate streets, avenues and so on. The application of this coordinate system can be seen in situations involving public security operations in which the location of drug dealers is studied using a GPS application, which contributes significantly to the fight against crime.

Figure 9: Cartesian coordinate system and location of points $P(x, y)$.

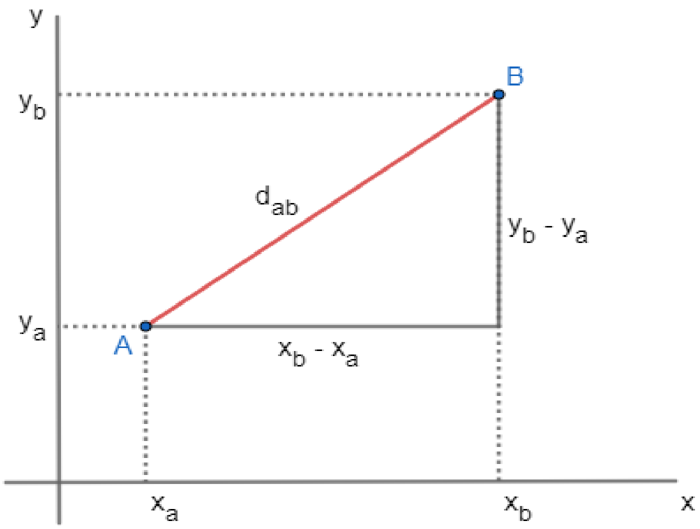


Source: https://www.significados.com.br/plano-cartesiano/

3.5 DISTANCE BETWEEN TWO POINTS

The distances between two points can be determined using the Pythagorean theorem, Consider the figure (Figure 10). Point A has coordinate $A(x_A, y_A)$ e $A(x_b, y_b)$

Figure 10: Distance between two points



Source: https://brasilescola.uol.com.br/matematica/distancia-entre-dois-pontos.htm

In this case, the expression that determines the distance between two points is,

$$D = \sqrt{(x_B - x_A)^2 - (y_B - y_A)^2}$$

4 METHODOLOGICAL PROCEDURES

Mathematics as a science guides and prospects the development of major projects in the sphere of public security, as will be seen with the application of tools such as ARP and Google Maps, as well as the use of plane geometry in situations involving police discipline and activity. In this sense, further study is needed with dedication, mastery and skill in digital and technological platforms, especially those involving mathematics, with the aim of measuring and solving problems linked to the day-to-day running of the police force.

Operating these technologies and trends in theories of mathematical knowledge can lead to solutions in situations linked to police activity, such as the use of ARP as a strategy in combating drug trafficking and marijuana planting, where using the computational tool, it became possible to investigate and identify through visualization and mapping with technological use.

Checking this context, the procedure is to use geometry as a resource to "measure distance" on *Google Maps in* order to diagnose and size the route of the Specialized Troops, from their arrival at the crime scene to the exact point where the area destined for the alleged illicit trade was located. This technological resource (Google Maps) will be used to see how it becomes possible to plot the coordinates to identify the area of the alleged cannabis cultivation.

With the use of ARP (Remotely Piloted Aircraft), a second problem used to map and calculate the number of cannabis plants distributed in a given plantation area will be dealt with, which in fact is tried to show, geometrically, by plotting Cartesian coordinates automatically inserted into this digital technology. Therefore, ARP or Drone as it has become popularly known, has the advantage of being used as a flight technology to recognize the area where the event or crime scene originates.

5 RESULTS AND DISCUSSIONS

The following are real-life situations experienced in police work. Based on these experiences, we will have an understanding and measurement of how mathematics is inserted into all the technical and non-technical aspects of a criminal investigation and survey. Were it not for the aggregation of all the theories and knowledge of mathematics, we would only have empirical (non-technical) cases of the activity itself.

5.1 SITUATION I: APPLICATION OF PLANE GEOMETRY

The first situation took place at a commercial establishment in the municipality of Abaetetuba where, during the night, three criminals broke into the place and tried to break into the safe where there were amounts of income from previous days, but they were unsuccessful.

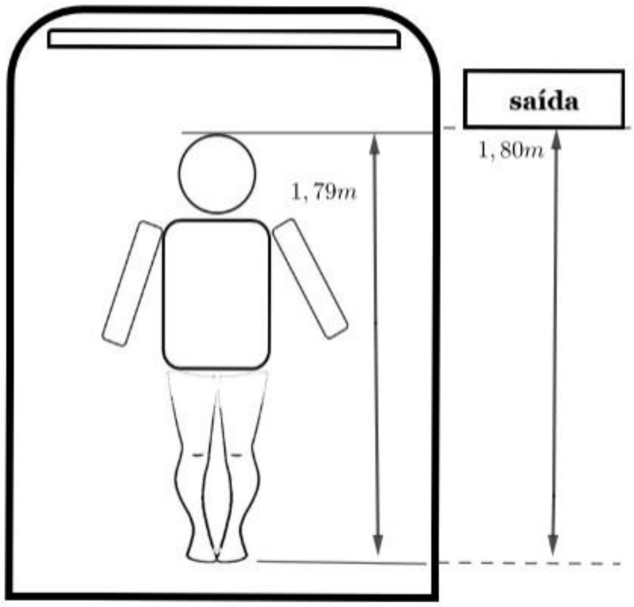
A team of investigating police officers began working to identify the criminals. Analyzing the images from the internal circuit cameras, it was found that they were all wearing masks or hoods and gloves, which meant that they could not be identified. However, it was decided to work on other methods to find evidence to identify the criminals

They then tried to analyze the suspects' physical features, and it turned out that one of the criminals had gone through a door where there was a sign that read "EXIT". It was also possible to see that one of the suspects was tall, thin and had a distinctive build. Another issue was that he had a leg disease called *"genu varum"* - Blount's disease, also called tibia vara, for the regionalism of Pará. This means that his legs were bowed, like "pliers" or "crankshafts". With this information, the team analyzed the place where the break-in had taken place and measured the door where the word "EXIT" was written. The result was that the height from the ground to the sign was exactly 1.80 m high.

The images from the cameras were checked again and something intriguing was observed in the investigation of that scene. The suspect with the characteristics described above, in an image of paused movement, which led to the conclusion that he was precisely the height seen earlier. In other words, the suspect, standing with his feet on the door, measured the height from the floor to the "EXIT" sign, 1.80m tall.

Following this criterion, the investigative team asked to observe the employee, where not only were the details of his measurement ascertained, but another new and relevant fact for the work carried out was that the employee had "Blount's disease", just like one of the suspects in the image. At this point, it can be concluded that from what has been gathered, significant and probable knowledge has been built up in order to draw up a suspect. This would not have been possible without prior scientific knowledge based on mathematical knowledge (Figure 11)

Figure 11 - illustration of situation I, created by the author with the help of Geogebra and PowePoint software.



Source: Own authorship.

4.2 SITUATION II: APPLICATION OF GOOGLE MAPS TO LOCATE COORDINATES, DISTANCE AND AREA

The active ingredient in Cannabis sativa is THC (tetrahydrocabinol), which is mainly responsible for the hallucinogenic effect on users. For this reason, it is prohibited for sale in Brazil. However, trafficking in favor of the use of this drug has occurred in a discriminatory manner, which is why police forces have taken action to combat it. It must be considered that the specific separation of the drug can help cure certain diseases, such as Aids, Multiple Sclerosis, Cancer, Schizophrenia and so on. However, this is a case where *Cannabis Sativa* has a non-legal origin, i.e. for the purposes of criminal trade, and how it can be combated with the help of technology.

In 2020, in the areas of jurisdiction of Alto Mojú - Moju PA, a great deal of work to gather evidence was carried out in order to identify several plantations of *Cannabis Sativa* (marijuana) at different equidistant points. With the help of photography equipment and aerial images (Drone), it was possible to gather a considerable collection of images and videos that contributed to the tangible knowledge of identifying the planting of the illicit product.

Despite this, the public agents responsible for the work had scientific tools and mechanisms to produce the necessary knowledge. The Google Maps application was used to identify and measure the large areas where *Cannbis Sativa was* supposedly planted and cultivated.

It is important to highlight some characteristic data for the region covered by the drone survey. In this respect, the investigative team investigated and located the plantation area with the knowledge that the farmers of the illicit product had rectangular water tanks made by hand and, based on this data, it was ascertained that this was indeed a cannabis plantation.

Google Maps has become a relevant computer application that uses the coordinate system, the distance between two locations and also areas of flat figures in order to obtain Cannabis sativa crops grown in enclosed areas. For example, see the figures (Figures 12, 13 and 14**)** which illustrate how Google Maps helps to determine coordinates, lengths and areas via satellite.

Any distance between two points can be calculated using the satellite. The figure (Figure 11) shows that the length between the points is 165.57m. Other distances can be calculated using Google Maps. In practice, we try to obtain these distances in order to orientate the location of the route with the aim of plotting these distances between points that show signs of crime, such as cannabis cultivation.

Figure 12- Obtaining the distance between two points located in an enclosed area.

In addition to the distances from the operations troops to the site, the plantation area for cannabis cultivation is also calculated (Figures 12 and 13). When these areas are located by satellites, they can be determined, for example, 2,247.85m^2 . If the area is rectangular, the perimeter is 246.27m. Therefore, the Google Maps application is a great ally for calculating areas and distances investigated by public security.

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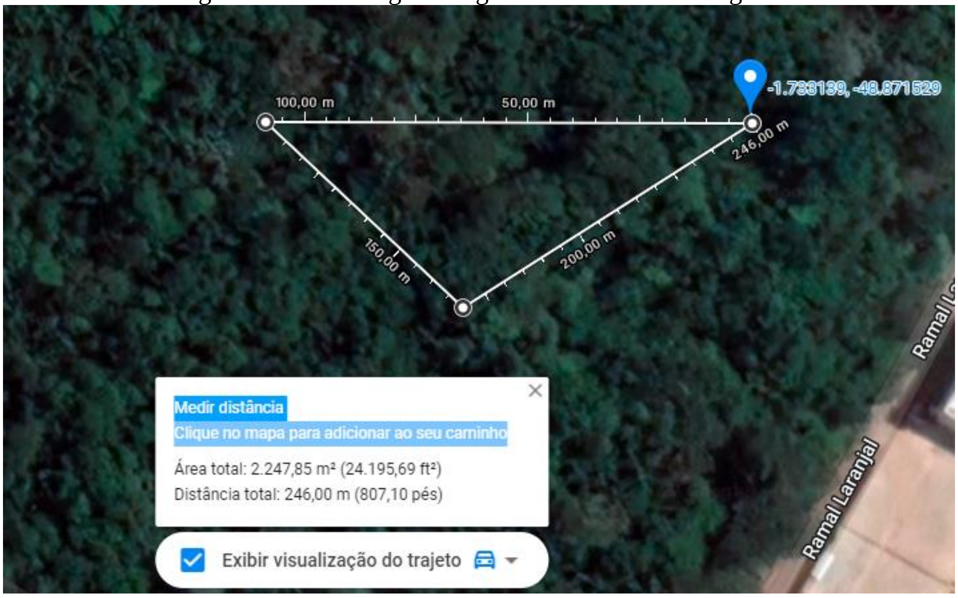
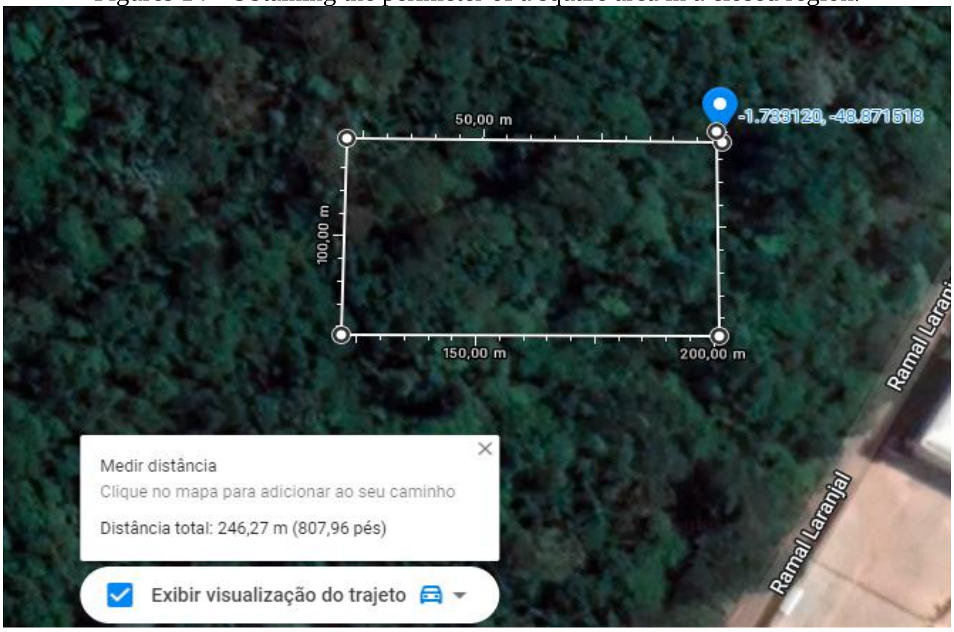
Figure 13- Obtaining a triangular area in a closed region.



Figures 14 - Obtaining the perimeter of a square area in a closed region.



4.3 SITUATION 3: USING ARP TO LOCATE A *CANNABIS* PLANTATION.

The drone, therefore, is a reconnaissance flight, aerial mapping and image collection technology that is fundamental to the production of a corporation's investigative object.

It was therefore used to build knowledge and produce documents and took intelligence activity in the Lower Tocantins to a new standard in terms of directions and logistical guidelines in the fight against trafficking and production (planting) of Cannabis Sativa[3] in the Lower Tocantins region.

In this way, he used this technology (the ARP) as a strategy where, based on the investigation, he was able to identify and visualize a cannabis plantation as shown in the figure (Figure 15) located in the lower Tocantins region. This equipment has been useful and is commonly used in police investigations to locate drugs and trafficking routes in the lower Tocantins region.

Figure 15 - ARP visualization for locating cannabis plantations

Source: Author

When the drug was discovered, the number of plants was estimated at around 300, according to the Military Police. According to the figure (Figure 15), it can be seen that drug traffickers are concerned with distributing the number of plants in order to maximize the number of plants. This can be explained by the fact that drug traffickers avoid a larger space because it can be seen from ARP or Google Maps.

6 FINAL CONSIDERATIONS

Considering the approach taken, it was found that mathematics as well as applications such as Google Maps and ARP can contribute to police activities. In the case of situation 1, the fact that led to the identification of the criminal was due to certain characteristics such as height and physical disability. These points were crucial to the investigation. Based on these requirements, it

[3] Marijuana

was possible to define the suspect. In terms of mathematics, the height of the suspect was 1.80m, so passing through the electronic door was enough to reach the criminal.

In relation to Google Maps, public security carried out operations related to a cannabis plantation, using the software as a starting point which made it possible to identify the distribution of the plantation in the middle of a closed forest, allowing the number of herbs distributed over a rectangular area to be counted. The calculation came to approximately 320 plants. He noticed that the traffic tries to maximize the number of herbs in a small area in order to avoid being seen by Google Maps and ARP.

In view of the above, it was found that software such as drones or ARPs have contributed to the fight against crime, using technological resources to find alternatives that converge to control and reduce trafficking. In addition to these resources, analytical and plane geometry can be used to calculate cannabis planting areas, in order to obtain coordinate locations and, consequently, distances that allow us to reach criminals in closed forests or in places that are difficult to access.

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