Research Article

Educational Vector Analysis of Hibiscus Enclosure Perimeter

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Abstract: *The manual method to calculate perimeter for asymmetrical shapes have been challenging and error-prone, thereby hindering the accuracy and efficiency of geometric research endeavors. The large discrepancies in the manual calculation of the perimeter can lead to inaccuracies between theoretical and actual value. In the absence of mathematical models and algorithms, manual perimeter calculations run the risk of inaccuracies, optimal production rates reduce and it directly impacts the productivity. To improve the calculation of perimeter by using FenceFort perimeter calculation for irregular shapes to mitigate error and inefficiency research. FenceFort utilizing vector methods involves breaking down the perimeter into small points and segments, allowing for a more accurate calculation by considering the nuances of the shape. This approach minimizes the risk of significant errors that may arise when using basic formulas, especially when dealing with complex or irregular geometries. FenceFort use graph theory and magnitude vector between two coordinates to get accurate calculation for irregular shapes. With the invention of FenceFort, it helps users to calculate the perimeter simultaneously. FenceFort gives a big potential to minimize the error during taking the data. Through precision manufacturing, FenceFort empowers industries to make data-driven decisions and reduce waste. Efficiency gains in apps drive productivity in industries. Subscription-based models offer advanced features for recurring fees, fostering a continuous revenue stream and ensuring users have an access to cutting-edge capabilities.*

Keywords: FenceFort; vector method; irregular.

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1. INTRODUCTION

In today's dynamic landscape, we know who good educators are and can detect good mathematics teaching when we see it; nonetheless, it is difficult to articulate what constitutes effective instruction (Joseph, 2008). These challenges include the time-intensive nature of manual calculations and the potential for errors to arise during the process. In school, pupils learn about perimeter as a fundamental aspect of Euclidean geometry (Russ, 2018). It is in the enumeration of unit squares, meticulously counted to envelop the surface of a closed figure, that the essence of area manifests. The practical dimension is that by introducing square units like cm and m, the special comprehensive gauge inspection can only be a qualitative measurement and cannot determine the direction (Ma, 2023). In this geometric tapestry, the quantification of space becomes a language, and the figures are silent narrators of mathematical tales. A shape's is a two-dimensional measurement.

The pursuit of accuracy has propelled innovative solutions in the rapidly changing field of technical innovation. The FenceFort system is one such option that has surfaced to satisfy the needs of precise perimeter measurement. This prototype, which has been painstakingly built to change the way we measure the perimeter of an irregular object, represents a paradigm shift in the field. At its core, FenceFort is a sophisticated system developed to cater to the intricate requirements of precise perimeter measurement.

Next, the FenceFort can be found in the identification of a pressing necessity in the field of measurement instruments. FenceFort uses images to get the data easily. The image measuring method offers non-contact, high-speed, wide dynamic range, and detailed information (Ma, 2023). Conventional techniques are frequently proven to be time-consuming and error-prone, particularly when handling intricate geometries (Tilleli, 2022). A team of progressive developers saw this gap and set out to build a tool that would improve area computations' accuracy while also making them simpler. Inspired by basic geometry, this method offers a fresh perspective on perimeter analysis and measurement.

Lastly, the importance of the vector method in FenceFort cannot be overlooked. This prototype adopts a vector approach to measure perimeters with high precision. By leveraging the direction and magnitude of vectors, FenceFort is capable of providing more accurate and detailed results, especially for irregular geometric shapes. FenceFort distinguishes itself by offering unmatched precision and efficiency in perimeter calculations. Its advanced algorithmic techniques contribute to a higher degree of accuracy; automatic contour identification is essential for graphic parameterization and assembly drawing creation in engineering (Ma, 2023).

2. METHOD & MATERIAL

To begin with, this prototype method needs a system called FenceFort to conduct the signal, with several steps that should be followed in order. FenceFort facilitates the calculation of the perimeter of an object based on the image and coordinates that the user inserts into the tools. FenceFort, utilizing vector methods, involves breaking down the perimeter into small points and segments, allowing for a more accurate calculation by considering the nuances of the shape. This approach minimizes the risk of significant errors that may arise when using basic formulas, especially when dealing with complex or irregular geometries. Therefore, FenceFort's main objective is to ease users use of this tool without having to calculate the perimeter manually. FenceFort employs mathematical models, specifically using the vector method between two points to find the perimeter. FenceFort users must input data information in the form of coordinates or upload an image to facilitate the final process of generating the answer. Figure (a) shows the sketch of hibiscus on graph paper along with plotted coordinates that help the user understand the structural details of the patterns.

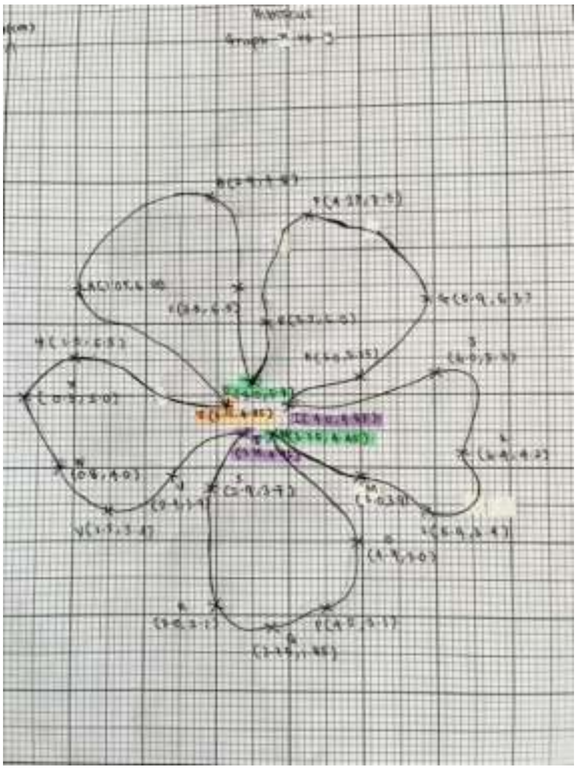

Figure 1. Sketching of Hibiscus on graph paper.

Therefore, the function of FenceFort is to minimize the error when finding the perimeter by vector using FenceFort simultaneously. It provides numerous benefits, including making calculations more precise and avoiding human errors, thereby saving time and effort in the calculation process. The representation of the flow sequence is shown in Figure 2.

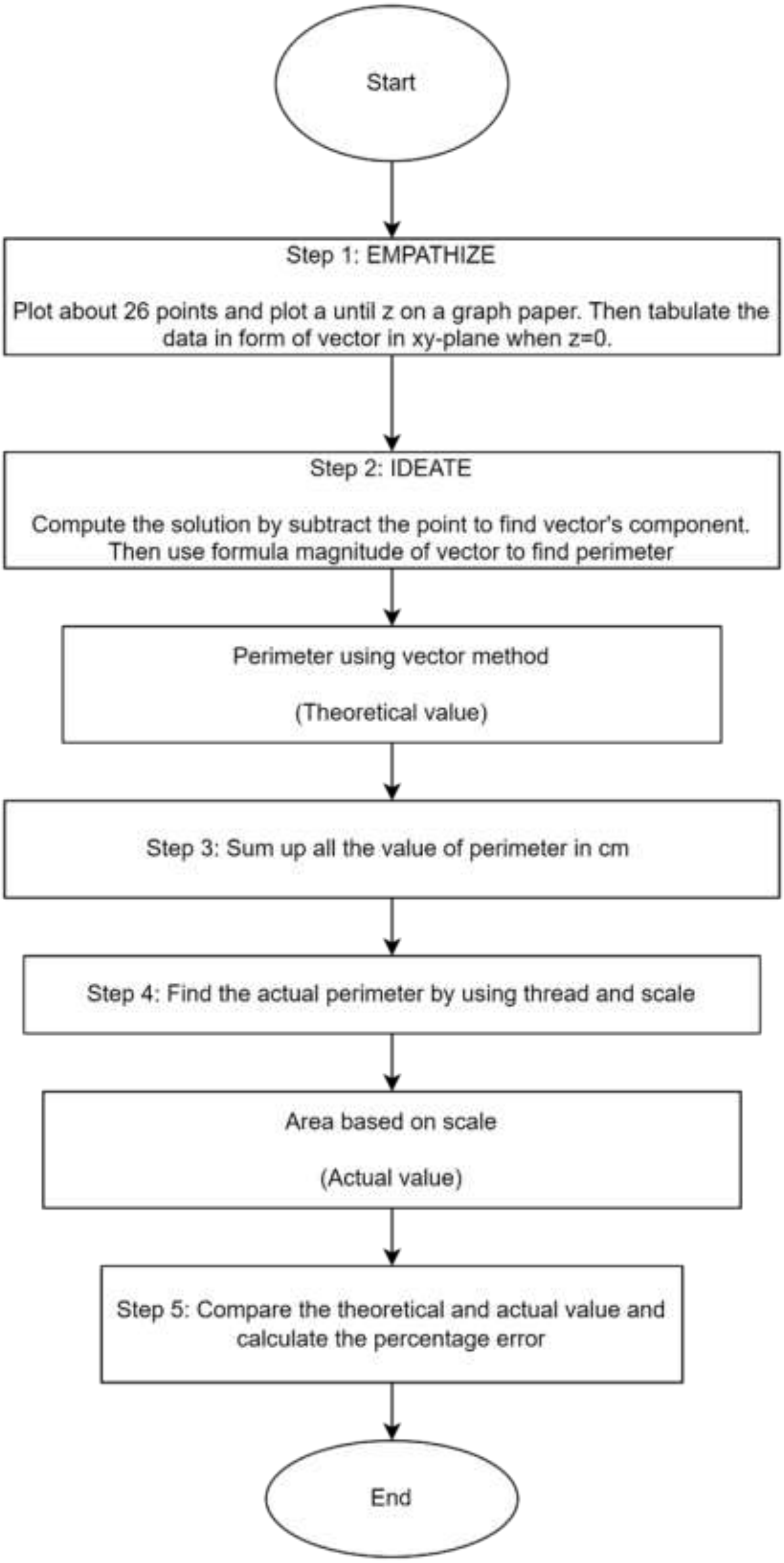

Figure 2. The flowchart of FenceFort usage.

3. FINDINGS

An effective and flexible way to determine the perimeter of irregular forms is to take the entire perimeter and sum all of the data. This method provides accurate and dependable results by plotting the hibiscus into smaller, more manageable parts and applying an established perimeter. It is a useful tool in domains where irregular shapes are common because of its versatility in handling different geometries, which helps to create a more nuanced knowledge of spatial configurations and territories. Perimeter can be calculated by using vector magnitude and summarizing all the data.

$$||a|| = \left|\sqrt{a^2 + b^2}\right| \quad (1)$$

3.1 Data Tabulation.

Table 1. Table of region.

Region	Area (cm)
$\|\|AB\|\|$	2.26
$\|\|BC\|\|$	1.36
$\|\|CD\|\|$	0.42
$\|\|DE\|\|$	1.76
$\|\|EF\|\|$	2.02
$\|\|FG\|\|$	1.38
$\|\|GH\|\|$	1.08
$\|\|HI\|\|$	2.05
$\|\|IJ\|\|$	0.89
$\|\|JK\|\|$	0.94
$\|\|KL\|\|$	1.03
$\|\|LM\|\|$	1.37
$\|\|MN\|\|$	1.85
$\|\|NO\|\|$	0.98
$\|\|OP\|\|$	0.79
$\|\|PQ\|\|$	0.79
$\|\|QR\|\|$	1.60
$\|\|RS\|\|$	0.87
$\|\|ST\|\|$	1.10
$\|\|TU\|\|$	1.03
$\|\|UV\|\|$	0.92
$\|\|VW\|\|$	1.12
$\|\|WX\|\|$	0.86
$\|\|YZ\|\|$	2.25
$\|\|ZA\|\|$	2.67
Total area	**34.21**

3.2 Solving using FenceFort.

Step 1: Press the start button that appears on the home page to proceed to the next page.

Figure 3. Step 1 of using FenceFort.

Step 2: Include two methods to calculate the perimeter. The chosen coordinate input is part of this experiment

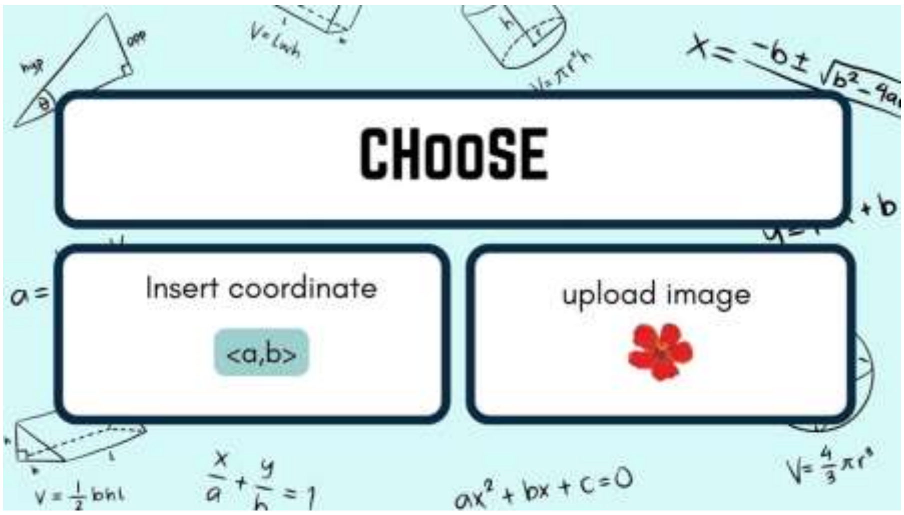

Figure 4. Step 2 of using FenceFort.

Step 3: Fill in the table with data that includes the x and y coordinates. Pressing the calculate button activates the vector method program within the system to generate the total perimeter. Users need to press enter if they want to put more coordinates, and they can reset all data or go to the previous page or next page.

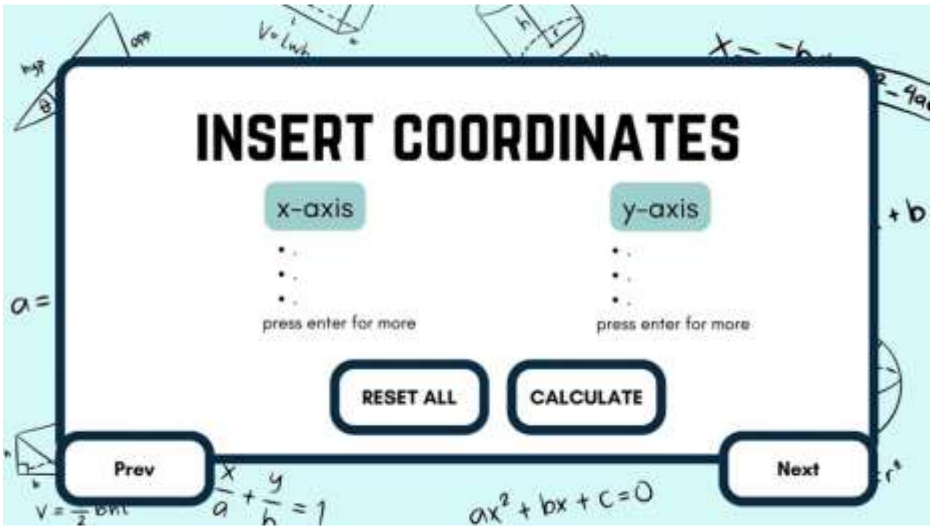

Figure 5. Step 3 of using FenceFort.

Step 4: The total perimeter shown on other page.

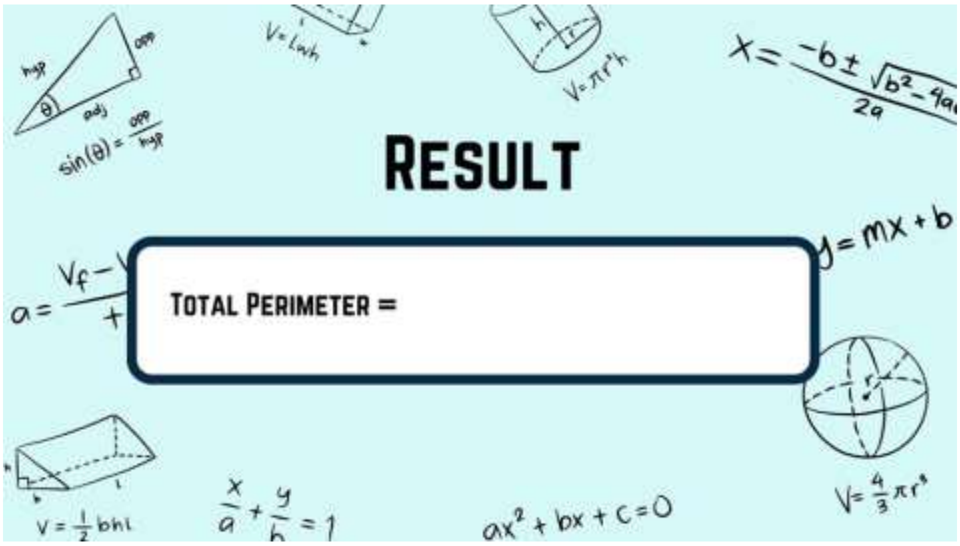

Figure 6. Step 4 of using FenceFort.

Magnitude is given by:

$$||v|| = \sqrt{a^2 + b^2}$$

Example:

OA= <1.05,6.50> ; OB= <2.90,7.80>

AB =OB-OA

= <2.90,7.80> - <1.05,6.50> = <1.85,1.3>

$||AB|=\sqrt{1.85^2 + 1.3^2}$ =2.26cm

Step 5: As if user choose to upload an image, users still need to insert the coordinate to get approximate result.

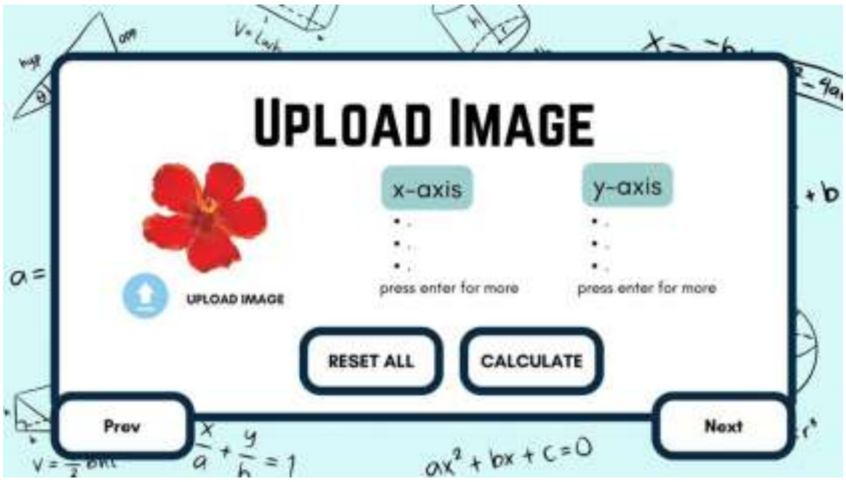

Figure 7. Step 5 of using FenceFort.

Step 6: This page shows total perimeter of the image and the actual perimeter from the data coordinates.

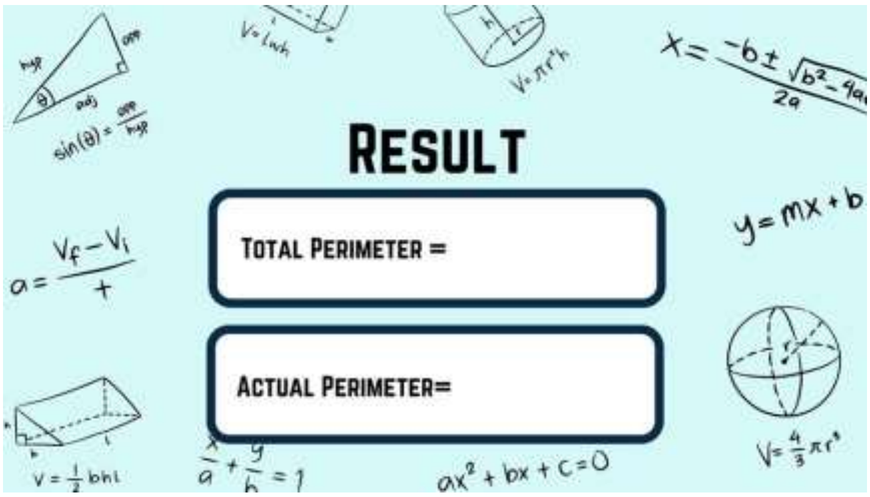

Figure 8. Step 6 of using FenceFort

3.3 Result

As a result, the manual calculation yields a perimeter for hibiscus of 34.21cm, whereas the utilization of FenceFort results in a slightly larger measurement of 65.30cm. In this comparison, the percentage error between the manual calculation and the FenceFort measurement is approximately 47.6%. This indicates a relatively small discrepancy, suggesting that both methods are in close agreement, with FenceFort providing a slightly larger but presumably more accurate perimeter measurement for the hibiscus.

Table 2. Perimeter for Hibiscus

Triangle	Perimeter (cm)
Theoretical value	34.21
Actual value	65.30
Percentage difference %	47.6%

$$\text{Percentage difference\%} = \left|\frac{Theoretical\ value - Actual\ value}{Actual\ value}\right| \times 100\%$$

$$\text{Percentage difference\%} = \left|\frac{34.21 - 65.30}{65.30}\right| \times 100\% = 47.6\%$$

Calculating percentage error is a learning exercise for students and researchers that emphasizes the need for accurate measurement and data interpretation. It facilitates critical analysis of data and a better knowledge of the potential sources of mistakes in experimental work.

4. DISCUSSION

The perimeter of Hibiscus can be measured manually, but the accuracy is less accurate than using FenceFort. FenceFort, utilizing vector methods, involves breaking down the perimeter into small points and segments, allowing for a more accurate calculation by considering the nuances of the shape. This approach minimizes the risk of significant errors that may arise when using basic formulas, especially when dealing with complex or irregular geometries. Its user-friendly interface and visualization features make it an accessible resource for students and professionals seeking to enhance their spatial analysis skills. FenceFort ensures consistent data input for coordinates. Manual calculations may introduce inconsistencies in data input due to human oversight or variations in measurement techniques, potentially leading to inaccuracies in the final results.

5. CONCLUSION

To sum up, using FenceFort as a tool to determine an irregular shape's area offers a strong and creative answer to a challenging issue, which is. FenceFort utilizes a sophisticated feature vector approach to solve the problems posed by irregular geometries. The automated features and platform's adaptability in managing intricate shapes in 2D ensure accuracy and efficiency. FenceFort facilitates a thorough grasp of irregular forms through its visual depiction and reliable data entry. Adopting a subscription-based business model also guarantees access to cutting-edge features and encourages ongoing advancements. All things considered, FenceFort is a noteworthy instrument that provides a whole answer for professionals and scholars looking for precise and trustworthy perimeter measurements in the field of irregular forms.

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