Seafloor Optimization Mapper

A company that carries out natural resource exploration and extraction operations in the seas aims to divide the exploration area into areas (parcels) with the most accurate number and optimal dimensions in order to obtain maximum profit. For this purpose, it is expected to develop a software that performs the optimal area partitioning process with profit-cost calculations according to certain rules and creates a visual map of the partitioned exploration areas.

Objective: The project aims to reinforce students' knowledge of basic programming and graphing and to improve their problem solving skills.

Programming Language: The project will be implemented using C programming language.

The project consists of two main phases detailed below.

1. STAGE:

The first stage of the project is the seismic survey of the resource exploration company. Accordingly, the area of the closed shape formed by connecting the given coordinate points will correspond to 1/10 of the resource reserve amount. For this, the following steps should be taken: Step 1: Reading the coordinate values of different number of points (x,y) from the web page on a url link to be shared from e-support Step 2: Drawing the 2-dimensional closed area shape formed as a result of linear combination of these read points in the order given Step 3: Calculating the surface area value of the drawn shape and multiplying this value by 10 to obtain the resource reserve value. (When calculating the surface area, both methods can be preferred, either by finding the total number of all unit squares that the shape passes over and covers, or by mathematical area calculation). Here, it should be assumed that the initial coordinate values (0,0) correspond to the upper left corner of the drawing plane and that the x value increases as you move to the right and the y value increases as you move downwards. An example of the content format of the linked page is shown below:

1B(5,5)(13,12)(8,17)(1,10)(5,5)F
2B(20,20)(30,20)(20,40)(10,40)(20,20)(40,22)(50,32)(30,32)(40,22)F

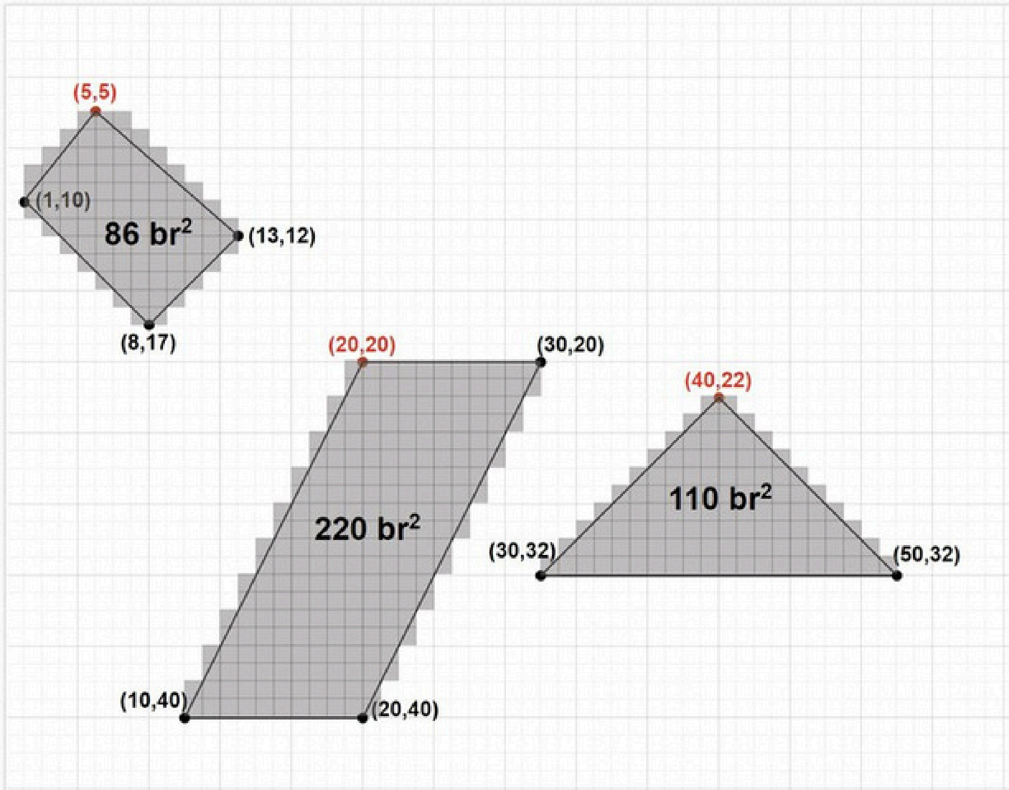


Figure 1. Graphical representation of the areas given coordinate (x,y) points

The graphical representation of the polygonal shapes whose coordinate points are given in rows 1 and 2 are shown together in Figure 1. In the application you will develop, only the graph of the coordinate points given in a single line should be drawn. For this reason, it should be requested from the user how many rows to plot the points.

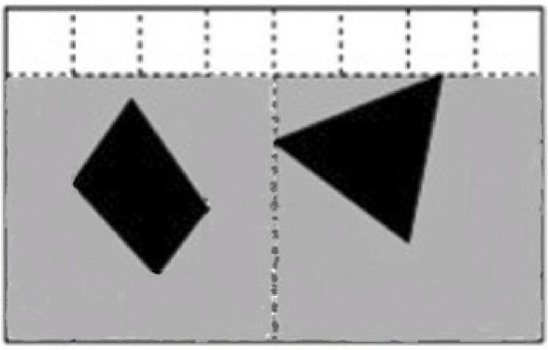
2. STAGE:

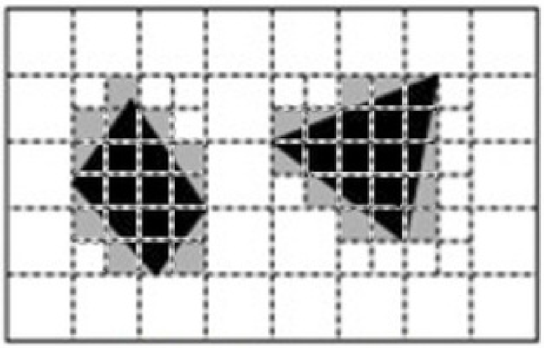
The second stage of the project is the drilling and resource extraction part of the resource exploration company in the areas where the reserve value was determined from the surface areas in stage 1. For this purpose, the reserve areas, the shape of which was drawn in the first stage, should be divided into uniform quadratic pieces of certain sizes in the most optimal (most profitable or least loss situation). The following constraints should be taken into account during this division process:

Constraint 1: Drilling will be carried out in all areas where the reserve zone boundary lines pass through and within the boundary. Therefore, it is desirable to minimize the sum of the divided quadratic areas in the reserve zones as much as possible. (The total drilling cost for a reserve zone will be obtained by multiplying the sum of all divided quadratic areas that cross over and remain within that zone boundary by the unit drilling cost. The unit drilling cost should be a variable parameter that can be set by the user between 1 and 10).

Constraint 2: In each divided quadratic area, a platform must be installed for storing the extracted resources. The cost of these platforms is identical (unit platform cost should be a variable parameter that can be determined by the user). In order to reduce the total cost, the total number of platforms to be installed is again desired to be as minimum as possible.

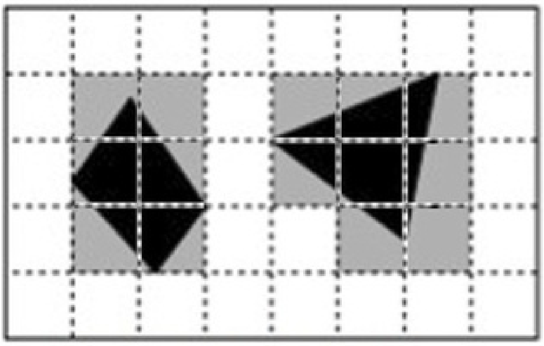
Constraint 3: The dimensions of the partitioned quadratic areas will be 1x1, 2x2, 4x4, 8x8 or at most 16x16. In addition, the boundary neighbors of each quadratic area must be either one larger or one smaller than its size. (That is, a 4x4 quadratic area can have neighbors of size 2x2 or 8x8; it cannot be bounded by a 16x16 or 1x1 quadratic area. Corner points alone should not be considered as boundaries between areas). A quadratic area can only fully encompass one reserve area at a time, it cannot fully encompass more than one reserve area.





a) Minimum number of frame states

b) Minimum total area availability



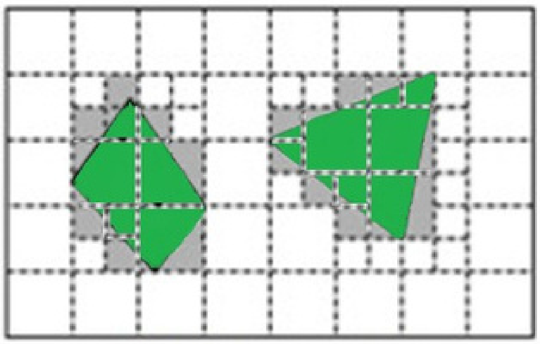


Figure2.c) The situation in the few

d) Optimum area-square footage situation

Figure 2 shows example cases of reserve areas divided into quadratic areas of different sizes. In case a, the total drilling cost is maximized due to the fact that the total gray areas are the largest compared to the other cases, while the storage platform cost is kept to a minimum in the entire region, which is divided into only 2 quadratic areas. In contrast to case a, in case b, the total area is the smallest and the number of squares is the largest, which minimizes the total drilling cost and maximizes the total platform cost. When case d is examined, while the total drilling cost is minimum, the total number of squared areas is reduced due to the use of 4x4 squared areas as much as possible, thus the number of platforms to be installed is reduced and the platform cost is reduced to the optimal level.

THEY WANT

- When the application is first run, the user should be asked for the number of coordinate points in the line, unit drilling cost and unit platform cost on the page accessed from the web link. (Drawing should only be done for points in a single line) Two separate drawings should be made in the program. In the first drawing, the user is requested

- The reserve zone formed by the points on the line is drawn and the user is visually shown

- must be shown. The reserve value amount of the plotted areas should be calculated and shown to the user. (Reserve value = surface area of reserve areas x 10) (More than one)

- In the second drawing, the partitioning process should be performed for the minimum total cost case in accordance with the constraints and the reserve area divided into quadratic areas should be drawn and visualized to the user.

- should be shown as a square. Squared areas of different sizes should be shown in different colors. As a result of the second plot, the user is presented with the total number of platforms, total number of drillings, total platform cost, total drilling cost, total cost (=total drilling cost + total platform cost) and profit amount (=reserve value-total cost) should be shown to the user.