

St. Norbert College

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User Guide

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PROJECT OVERVIEW AND REQUIREMENTS

Image Reconstruction with Polygons

Develop an application that builds an image from overlapping polygons so that it resembles an original picture.

General Requirements

- Use a collection of polygons to produce an image close to a chosen original image.
- Use a genetic algorithm to find the best arrangement of polygons.
- Provide an interface that allows users to interact with the algorithm.
- Graphically display the state of good fit genomes with appropriate statistics that show progress toward the goal.
- The system should allow modification of parameters, operators, and probabilities.
- Add your own parameters to the genome.
- Explore various measures of “best” fit.
- Save the best from some number of iterations.
- Provide comparison data for various configurations of input parameters.

RUNNING THE ALGORITHM

See 'PROJECT OVERVIEW AND REQUIREMENTS' for more information on my project.

To follow along with file paths, download my project files from my website (HOME PAGE > link at the bottom of the page)

Navigate to my project folder:

Zaragoza_Capstone26 > final_project > final_project >

[for code: final_project.sln]

[for exe: bin > Debug > final_project]

STEP-BY-STEP INSTRUCTIONS

1. Introduction

- a. The 'Introduction' form displays the title and image. The 'START' button allows the user to proceed to the next form.



2. Select Parameters

- a. The 'Select Parameters' form is where the user interacts with the algorithm. The user can do the following: import a target image, select the number of Individuals, polygons, and the number of Individuals for each operator.
- b. Importing an image. The 'IMPORT' button will open File Explorer. For the purpose of this project, images to run the algorithm on are found as so:
Zaragoza_Capstone26 > final_project > final_project > images.



- c. Selecting Individuals and Polygons. The number of each parameter can be selected using the blue thumb (within the two small red boxes). When the slider moves, the textbox on the far right of each slider will display the current value.



- d. Selecting Operators. The number of Individuals for each operator is determined using the slider bar, within the red box below. This control is not C# control - it is a custom control which was created specifically for my project by Dr. McVey-Pankratz. The sum of each operator must be the total number of

Individuals selected by the user. It only appears once the number of Individuals has been selected.

The 'SelectParams' window contains three main configuration sections on the right side, each with a slider and a numerical value:

- INDIVIDUALS**: A slider ranging from 20 to 80. The current value is 20.
- POLYGONS**: A slider ranging from 20 to 100. The current value is 20.
- OPERATORS**: A slider ranging from 20% to 60%. The current value is 20%.

Below the 'OPERATORS' slider, there are three input fields: 'BEST: 4', 'MUTANTS: 12', and 'CROSSOVERS: 4'. These fields are highlighted with a red box. At the bottom right of the window is a 'RUN' button.

By moving the blue thumb, the number of 'BEST' increases (right) or decreases (left) [itself and the number of 'MUTANTS'] and by moving the red thumb, the number of 'CROSSOVERS' increases (left) or decreases (right) [itself and the number of 'MUTANTS'].

- e. RUN. The 'RUN' button allows the user to proceed to the next form.

This screenshot shows the same 'SelectParams' window as the previous one, but with the 'RUN' button at the bottom right highlighted with a red box. The configuration values remain the same: Individuals = 20, Polygons = 20, and Operators = 20%.

3. Running the Algorithm

- a. When the user clicks the 'RUN' button on the previous form, the following form opens.

The screenshot shows a window titled 'RunAlgorithm'. It has two main image panels: 'TARGET IMAGE' on the left, which displays a cartoon of three balloons (blue, pink, and yellow), and 'BEST IMAGE' on the right, which displays an abstract image composed of various colored polygons. To the right of these panels is a section titled 'ALGORITHM STATS' containing several input fields with values: 'INDIVIDUALS' (20), 'POLYGONS' (20), 'BEST' (4), 'MUTANTS' (12), 'CROSSTOVERS' (4), 'GENERATIONS' (0), 'BEST SCORE' (3672384), and 'TIME ELAPSED' (00:00:00). At the bottom of the window, there is a text line: '***THE BEST IMAGE AND SCORE UPDATE EVERY 20 GENERATIONS ***'. Below this text are two buttons: 'BEGIN' and 'CANCEL'.

By clicking the 'BEGIN' button, the user will begin to run the algorithm. As indicated on the bottom, the best image and score update every 20 generations, but the time is updated continuously. Clicking the 'CANCEL' button allows the user to stop the algorithm - but not resume it. The button will open up the next form.

4. The algorithm is done (or was cut short)

- a. This form opens in two ways: the user clicked the 'CANCEL' button or the algorithm hit the targeted proportion of its initial best score.

The screenshot shows a window titled 'AlgorithmDone'. It has the same layout as the previous window, with 'TARGET IMAGE' (balloons) and 'BEST IMAGE' (abstract polygons). The 'ALGORITHM STATS' section on the right now shows: 'INDIVIDUALS' (50), 'POLYGONS' (20), 'BEST' (4), 'MUTANTS' (12), 'CROSSTOVERS' (4), 'TOTAL GENERATIONS' (0), 'LAST BEST SCORE' (3672384), and 'TOTAL TIME' (00:00:00). At the bottom of the window, there are two buttons: 'EXPORT' and 'CLOSE'.

The user has the option of saving the last best image by clicking the 'IMPORT' button. A click will open File Explorer. Lastly, the user can close the application by clicking the 'CLOSE' button.