**Reconstruction of Image using regular polygon (weighted pentagon and hexagons)**

Pentagon and Hexagon with a radius coming from the evolution algorithm with a maximum radius size of respectively one-eighth and one-twelfth of the smaller one of image height or width and with a minimum size of one.

self.width, self.height = self.refImage.size

max\_radius = self.width/8 if self.width < self.height else self.height/8

max\_radius = self.width/12 if self.width < self.height else self.height/12

**What Selection?**

1. Select Best (fitness)
2. Tournament Selection (tournament size 2)

**What Crossover?**

1. Uniform Crossover (indpb=0.5)
2. Simulated Binary Binded (Crowding Factor=10, Bounds low = 0, Bounds high = 1.0)

**What Mutation?**

1. Polynomial Bounded (eta=10, indpb=1/NUM\_OF\_PARAMS, up=1.0, low=0.0)
2. Flip Bit (indpb=1.0/NUM\_OF\_PARAMS)

What Settings were used?

Fitness strategy: minimizing the error

Individual creation: creating an individual with NUM\_OF\_PARAMS random generated parameters and a Fitness function

# problem-related constants

C\_METHOD = "SSIM", “MSE”

POLYGON\_SIZE = 6

NUM\_OF\_POLYGONS = 700

# two coordinates per vertex, 3 color values, one alpha value, (starting and ending angles of arc, pie, ..) or (fixed radius of polygons)

NUM\_OF\_PARAMS = NUM\_OF\_POLYGONS \* (POLYGON\_SIZE \* 2 + 5)

POPULATION\_SIZE = 800

P\_CROSSOVER = 0.9 # probability for crossover

P\_MUTATION = 0.01 # probability for mutating an individual

MAX\_GENERATIONS = 2000

HALL\_OF\_FAME\_SIZE = 20

CROWDING\_FACTOR = 10.0 # crowding factor for crossover and mutation

What is the purpose of this work?

I have implemented genetic algorithms for image reconstruction using different settings and strategies proposed for probabilistic tasks like crossover and mutation and I used regular polygons with evolutionary color, transparency, and radius size, the evolution of the algorithm is calculated by the fitness function which calculates every individual’s fitness to the target of our algorithm so in our case the fitness is calculated by two of image comparison algorithms MSE and SSIM which respectively work based on Mean Square Error of each pixel in two equal sized images and the Structural Similarity of images. So the algorithm gradually develops an image similar to the given one.

What is the relationship between genetic algorithms with AI?

What are the comparative test results?

zte

Test Result graphs, and constructed images.

What experience do you gain?

Possible improvement on your code?