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Automated Image Reassembly with a Hybrid Genetic Algorithm

The project aimed to restore images that had been shredded into strips by means of a hybrid genetic algorithm. Possible solutions, represented as an order of strips, were randomly generated to create an initial solution set. The fitness criterion for each array was whether or not pixels had similar values over a cut- a numerical criterion was generated for each pair of pixels at a given height that represented their difference in color. After this fitness had been established, the algorithm combined the best solutions into a new generation and established their fitness, iterating until an optimum was reached. In order to introduce diversity into the solution set, a k-opt mutation function was implemented, in which a random amount of strips were removed from a possible solution and replaced in a new order. This new solution was only accepted into the set if it represented an improvement in fitness over the previous version. In addition, the genetic algorithm was hybridized with an implementation of the Lin-Kernighan algorithm in order to more accurately mimic a human approach to solving the problem. This algorithm found multiple strips known to be adjacent and kept them together throughout the combination and mutation process in order to preserve the integrity of good solutions. This implementation effectively reduced the number of strips in the image so that the genetic algorithm would optimize to an arrangement that was easily solvable by trial and error.