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Evolutionary Algorithms

Natural Phenomenon:

Evolutionary algorithms are inspired by notion of survival of the fittest from Darwinian Evolution and modern genetics. It takes generations and variations to get perfect offspring. Just like that an Evolutionary algorithm Initializes, evaluate, best selected, variation is made, and process is repeated. If algorithm is not making progress, then it is terminated else process is continued until desired output is taken. Evolutionary algorithms are non-deterministic optimization problems of computation which are generally included in NP-hard problems.NP-hard problems are those which take exponential time to get optimal output. They are solved using Evolutionary algorithms and they can get required result or not. It takes time like biological generations to get best output. This phenomenon corresponds to the process of natural selection. One of the applications of evolutionary algorithms is image processing which uses these steps to make an algorithm capable to examine the right position in an image and provide suitable result.

Theory:

Theory provides following details:

**Initialization:**

It is the beginning of the solution of the problem where problem is provided to an algorithm.

**Evaluate:**

At this stage we must check fitness of solution. Here fitness mean results.

**Termination:**

The evolutionary process will be terminated on following stages on one of the following stages depending upon requirements:

* When goal is achieved.
* No progress is achieved over generations.
* Number of generations reached max.

**Selection:**

Here solutions with best fitness values are selected and others are neglected.

**Variation:**

Here some changes are made, and process is repeated from evaluation.

Model:

Here we are provided two images. One of them is cropped from other one. We must find that cropped picture is which part of full-size picture. We shall convert those images in to 2D matrices and then we shall match matrix of cropped image to matrix of full image from row by row and column by column. Once we are done, we shall have one or more matching areas via correlation. These matching areas will be called threshold. Then we must match the matrix of cropped image to matching areas and find perfectly matching areas. After all that we shall make a colored rectangle of size of cropped image over area to find on full image.

Application:

We shall first load both images and convert them to greyscale for better results. Then we will match cropped image to full image using ‘matchTemplate’ function. That function will return us a matrix with some values. The values that are near to 1 are most matching to template. Now using ‘numpy’ we shall separate values in matrix that are near to 1 so we can achieve results quickly. Now using a loop over separated values, we shall find best matching from them. And then we shall draw a rectangle over final values.