Evolutionary Model for Template Matching

Assignment 2

Artificial Intelligence

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CS \_ 04

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# Natural Phenomena:

Evolution can be seen everywhere in nature. Let’s take an example. Think about era of Hazrat Adam and beginning of human life. This was time when there were only two person.

So, there was only one language used for communication between them. Present human beings are all their descendants. They should speak only and same language used by Hazrat Adam but now there are more than 6000 languages spoken on earth. How these languages come into exist. It was basically only one language which start amending time by time. Now, We can see people of two neighboring districts are unable to understand each other but when this distance come very large there is no chance of communication of two reported areas persons. There is small variation in language of neighboring areas.

This is basically small evolution in language of neighboring area and when process continues for large area distance they are unable to speak so language evolute.

Let’s take another example. There is change in peak of bird (finch) to pick the insect of island. Because insect living on different island have different shapes so birds change their peak to fit to the environment and can catch their food easily. The change in their peak is due to genetic change which is totally natural.

# Theory:

All species in the universe exist due to change in their genes. It was basically due to natural selection and their demand to live and survive in better way. To come close to fittest. Small changes in phenomena caused huge change but require a lot of time.

# Computational Model:

Basically, this theory gives us evolutionary algorithm which is used as heuristic method (greedy approach) to solve complex problem.

If we have to find goal we will populate our guesses.

### Initialization:

We will start with making random guesses for possible solution and these guesses will called population.

### Selection:

We will check that how much each population is close to solution. And will sort population according to close ness to solution.

### Genetic operations:

We will make marriages of upper two populations from sorted list of fitness function. Marriage couple will produce new generation which will based upon cross over and mutation.

Cross Over:

Swapping some part of qualities from parents to produce new children like occur in chromosomes.

Mutation:

It is ability to differ from parents so by random guess we will change every children by very small amount.

# Application:

Given “barriImage” and “chotiImage” find “chotiImage” in “barriImage” by using evolutionary algorithm.

## Population:

First, I populate the BarriImage with 30 random points. Means generation two random numbers X and Y within range of width and height of Image barriImage recpectively.So, every population has two vertices.

## Fitness:

For every population taking it as initial point I took the chunk of barriImage that is same as dimensions of chotiImage. Than apply some functions that how much this chunk and choti Image match.

Normal correlation will give you result in range between 1 and -1.

## Selection:

Based on how much two Images match I sort the population.

Then pick each consecutive two as parents from population and they will produce new children.

## Cross over:

First I convert X and Y of each parent into binary and randomly pick a number in length of X and Y. And swap all element next to it.

X=11100101

Y=01100111

Random number is 5. So for 5th index and onward in X and Y we swap numbers.

Xc=11100111

Yc=01100101

## Mutation:

Slightly change a child by some small number. I generate a uniform random number for every bit in Xc and Yc and if that random number is less than 0.02 we will filp it.

After crossover and mutation we will convert it into decimal form.

## Termination:

We will terminate this when matching result of chunk of bigImage and template is maximum or will make loop for some number and will terminate it. And get highest X and Y point of population.