1 exercise – Kirill Zabrodsky

Conditions

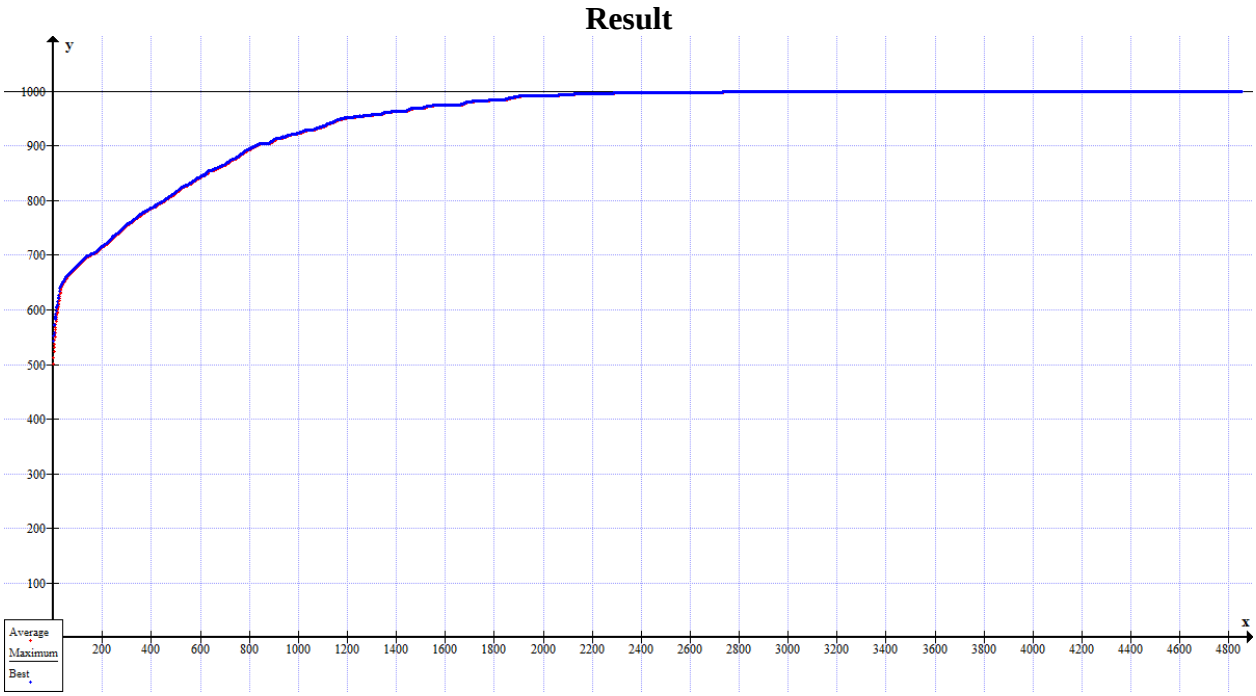
1. Create 100 random binary-chromosomes each with 1000 genes.
2. Fitness is the number of “1” in one chromosome – the more the better.
3. Select 2 chromosomes at random from the better half of the population.
4. Create a child chromosome by a onr-point-crossover.
5. Give the child a mutation with a probability of 1/1000 = 0.001.
6. Repeat from 2. to 5. 100 times and create the next generation.
7. Repeat 6. until the fitness value does not change any more.
8. Show the result: (1) Desplay the best chromosome in the 1st, an intermediate & final generation. (2) Desplay the best and average fitness vs. generation.

Source code:

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;

namespace WindowsFormsApplication1
{
public class GENALG
{
List<List<Boolean>> masbinChr;
public List<double> genFit;
public   List<double> BestInGen;
List<double> AverInGen;
double BestFirst;
double BestLast;
public GENALG()
{
AverInGen = new List<double>();
BestInGen = new List<double>();
genFit = new List<double>();
Random random = new Random();
masbinChr = new List<List<bool>>();
for(int i=0;i<100;i++)
{
List<Boolean> tempBinChrom= new List<bool>();
for (int j=0;j<1000;j++)
{
if (random.Next(2) == 0)
tempBinChrom.Add(false);
else
tempBinChrom.Add(true);
}
masbinChr.Add(tempBinChrom);
}
genFit.Add(getFitnessGen(masbinChr));
BestFirst = getTheBestFitnessGen(masbinChr);
int k = 0;
do
{
List<List<Boolean>> tempGen = getNextGen(masbinChr);
genFit.Add(getFitnessGen(tempGen));
BestInGen.Add(getTheBestFitnessGen(tempGen));
masbinChr = tempGen;
```

```
k++;

}
while (!isReady(genFit));
BestLast = getTheBestFitnessGen(masbinChr);
}
Boolean isReady(List<double> fitness)
{
if (fitness.Count < 100)
return false;
else
{
for(int i=fitness.Count-100;i<fitness.Count;i++)
{
if ((int)fitness[fitness.Count - 100] != (int)fitness[i])
return false;
}
return true;
}
}
List<List<Boolean>> getNextGen(List<List<Boolean>> masbinChr)
{
//Getting fitness
List<int> fitnessGen = new List<int>();
for(int i=0;i<masbinChr.Count;i++)
{
fitnessGen.Add(getFitness(masbinChr[i]));
}
//Sorting by fitness
for(int i=0;i<fitnessGen.Count;i++)
{
for(int j=fitnessGen.Count-1;j>i;j--)
{
if(fitnessGen[j]<fitnessGen[j-1])
{
int temp = fitnessGen[j];
fitnessGen[j] = fitnessGen[j - 1];
fitnessGen[j - 1] = temp;
List<Boolean> tempGen = masbinChr[j];
masbinChr[j] = masbinChr[j - 1];
masbinChr[j - 1] = tempGen;
}
}
}
//Getting children
Random random = new Random();
List<List<Boolean>> newGen = new List<List<bool>>();
for (int i=0;i<50;i++)
{
int numberFather= random.Next(50, 100);
int numberMother = random.Next(50, 100);
int poinCrossover = random.Next(0,1000);
List<Boolean> firstChild = new List<bool>();
for (int j = 0; j < poinCrossover; j++)
{
firstChild.Add(masbinChr[numberFather][j]);
}
for (int j = poinCrossover; j < 1000; j++)
{
firstChild.Add(masbinChr[numberMother][j]);
}
newGen.Add(firstChild);
List<Boolean> seconChild = new List<bool>();
for (int j = 0; j < poinCrossover; j++)
{
```

```
seconChild.Add(masbinChr[numberMother][j]);
}
for (int j = poinCrossover; j < 1000; j++)
{
seconChild.Add(masbinChr[numberFather][j]);
}
newGen.Add(seconChild);
//Mutation
for(int j=0;j<newGen.Count;j++)
{
int prob = random.Next(0, 1000);
if(prob==777)
{
int number = random.Next(1000);
if (newGen[j][number])
newGen[j][number] = false;
else
newGen[j][number] = true;
}
}
}
return newGen;
}
int getFitness(List<Boolean> binChrom)
{
int fitness = 0;
for(int i=0;i<binChrom.Count;i++)
{
if (binChrom[i])
fitness++;
}
return fitness;
}
double getFitnessGen(List<List<Boolean>>gen)
{
int sum = 0;
for(int i=0;i<gen.Count;i++)
{
sum += getFitness(gen[i]);
}
return (double)sum / 100;
}

double getTheBestFitnessGen(List<List<Boolean>> gen)
{
int maximal = 0;
for (int i = 0; i < gen.Count; i++)
{
int fit=getFitness(gen[i]);
if (fit > maximal)
maximal = fit;
}
return maximal;
}
}
}
```



First the best is 542

Last the best is 1000