Source Code

Constants.cs

```csharp
using System.Collections.Generic;

namespace Dogs
{
    public static class Constants
    {
        public const int GENES_NUMBER = 1000;
        public const int CHROMOSOMES_NUMBER = 20;

        public static List<int> SX = new List<int> { 200, 200, 800, 800 };
        public static List<int> SY = new List<int> { 200, 800, 200, 800 };
    }
}
```

Chromosome.cs

```csharp
using System;
using System.Collections.Generic;
using System.Linq;
using static Dogs.Constants;

namespace Dogs
{
    public class Chromosome: IComparable<Chromosome>
    {
        public List<int> Genes { get; set; }
        public List<int> FitnessToSausages { get; set; }
        public int Fitness { get; set; }
        public int SharedFitness { get; set; }
        public int x { get; set; }
        public int y { get; set; }
        Random rnd;

        public Chromosome(Random _rnd)
        {
            rnd = _rnd;
            Genes = new List<int>();
            x = 500;
            y = 500;

            for (int i = 0; i < GENES_NUMBER; i++)
                Genes.Add(rnd.Next(4));

            FitnessToSausages = new List<int>();

            CalculateFitness();
        }

        public void CalculateFitness()
        {
            foreach(int i in Genes)
            {
                switch (i)
                {
                    case 0:
                        --x;
                        break;
                    case 1:
                        ++x;
                        break;
```

```csharp
                case 2:
                    ++y;
                    break;
                case 3:
                    --y;
                    break;
            }
        }

        int tempX, tempY;

        for (int i = 0; i < 4; i++)
        {
            tempX = Math.Abs(SX.ElementAt(i) - x);
            tempY = Math.Abs(SY.ElementAt(i) - y);

            FitnessToSausages.Add(tempX + tempY);
        }

        Fitness = FitnessToSausages.Min();
    }

    public int CompareTo(Chromosome compareChromosome)
    {
        if (compareChromosome == null)
            return -1;
        else
            return Fitness.CompareTo(compareChromosome.Fitness);
    }

    public Chromosome CreateChild(Chromosome parent2)
    {
        //uniform crossover
        int chooseParent, i, mutation;
        Chromosome child = new Chromosome(rnd);
        child.Genes.Clear();

        for (i = 0; i < GENES_NUMBER; i++)
        {
            chooseParent = rnd.Next(2);

            if (chooseParent == 1)
                child.Genes.Add(Genes.ElementAt(i));
            else
                child.Genes.Add(parent2.Genes.ElementAt(i));
        }

        for (i = 0; i < child.Genes.Count; i++)
        {
            mutation = rnd.Next(200);

            if (mutation == 10)
            {
                int temp = child.Genes.ElementAt(i);
                child.Genes.RemoveAt(i);
                child.Genes.Insert(i, (temp + rnd.Next(4)) % 4);
            }
        }

        child.CalculateFitness();

        return child;
    }
}
}
```

Program.cs

```csharp
using System;
using System.Collections.Generic;
using System.Linq;
using static Dogs.Constants;

namespace Dogs
{
    public class Program
    {
        static void Main(string[] args)
        {
            Random rnd = new Random();
            int i, generation = 0;
            var chromosomes = new List<Chromosome>();
            var childChromosomes = new List<Chromosome>();
            childChromosomes.Clear();

            for (i = 0; i < CHROMOSOMES_NUMBER; i++)
                chromosomes.Add(new Chromosome(rnd));

            chromosomes.Sort();


            foreach (var chr in chromosomes)
            {
                Console.WriteLine($"({chr.x}.{chr.y}) - Fitness is {chr.Fitness}, to
sausage {chr.FitnessToSausages.IndexOf(chr.Fitness)}");

            }

            while (generation != 100)
            {

                for (i = 0; i < CHROMOSOMES_NUMBER; i++)
                {
childChromosomes.Add(chromosomes.ElementAt(rnd.Next(CHROMOSOMES_NUMBER / 2))
                    .CreateChild(chromosomes.ElementAt(rnd.Next(CHROMOSOMES_NUMBER /
2))));
                }

                chromosomes.Clear();
                chromosomes.AddRange(childChromosomes);
                chromosomes.Sort();

                childChromosomes.Clear();

                generation++;

                if(generation % 10 == 0)
                {
                    Console.WriteLine(generation);
                    Console.WriteLine(chromosomes.Average(x => x.Fitness));
                    foreach (var chr in chromosomes)
                    {
                        Console.WriteLine($"({chr.x}.{chr.y}) - Fitness is {chr.Fitness},
to sausage {chr.FitnessToSausages.IndexOf(chr.Fitness)}");
                    }
                }
            }
        }
    }
}
```

(474.430) - Fitness is 504, to sausage 0

(469.541) - Fitness is 528, to sausage 1

(515.537) - Fitness is 548, to sausage 3

(464.510) - Fitness is 554, to sausage 1

(475.483) - Fitness is 558, to sausage 0

(523.487) - Fitness is 564, to sausage 2

(521.485) - Fitness is 564, to sausage 2

(497.471) - Fitness is 568, to sausage 0

(484.516) - Fitness is 568, to sausage 1

(495.525) - Fitness is 570, to sausage 1

(473.497) - Fitness is 570, to sausage 0

(471.499) - Fitness is 570, to sausage 0

(487.515) - Fitness is 572, to sausage 1

(523.497) - Fitness is 574, to sausage 2

(502.522) - Fitness is 576, to sausage 3

(484.494) - Fitness is 578, to sausage 0

(501.479) - Fitness is 578, to sausage 2

(489.509) - Fitness is 580, to sausage 1

(502.486) - Fitness is 584, to sausage 2

(498.500) - Fitness is 598, to sausage 0

100

445,1

(418.360) - Fitness is 378, to sausage 4

(431.375) - Fitness is 406, to sausage 4

(442.368) - Fitness is 410, to sausage 4

(426.386) - Fitness is 412, to sausage 4

(431.391) - Fitness is 422, to sausage 4

(448.380) - Fitness is 428, to sausage 4

(449.387) - Fitness is 436, to sausage 4

(438.398) - Fitness is 436, to sausage 4

(441.399) - Fitness is 440, to sausage 4

(469.375) - Fitness is 444, to sausage 4

(468.376) - Fitness is 444, to sausage 4

(474.376) - Fitness is 450, to sausage 4

(495.359) - Fitness is 454, to sausage 4

(438.416) - Fitness is 454, to sausage 4

(454.404) - Fitness is 458, to sausage 4

(439.425) - Fitness is 464, to sausage 4

(465.405) - Fitness is 470, to sausage 4

(473.403) - Fitness is 476, to sausage 4

(489.409) - Fitness is 498, to sausage 4

(471.451) - Fitness is 522, to sausage 4

200

295,6

(339.281) - Fitness is 220, to sausage 4

(354.268) - Fitness is 222, to sausage 4

(367.311) - Fitness is 278, to sausage 4

(332.348) - Fitness is 280, to sausage 4

(362.320) - Fitness is 282, to sausage 4

(378.306) - Fitness is 284, to sausage 4

(370.318) - Fitness is 288, to sausage 4

(354.338) - Fitness is 292, to sausage 4

(365.327) - Fitness is 292, to sausage 4

(384.310) - Fitness is 294, to sausage 4

(375.323) - Fitness is 298, to sausage 4

(335.367) - Fitness is 302, to sausage 4

(376.332) - Fitness is 308, to sausage 4

(350.360) - Fitness is 310, to sausage 4

(400.312) - Fitness is 312, to sausage 4

(364.348) - Fitness is 312, to sausage 4

(362.352) - Fitness is 314, to sausage 4

(348.366) - Fitness is 314, to sausage 4

(407.337) - Fitness is 344, to sausage 4

(402.364) - Fitness is 366, to sausage 4

300

254,6

(291.287) - Fitness is 178, to sausage 4

(339.269) - Fitness is 208, to sausage 4

(309.311) - Fitness is 220, to sausage 4

(296.324) - Fitness is 220, to sausage 4

(313.309) - Fitness is 222, to sausage 4

(295.339) - Fitness is 234, to sausage 4

(318.320) - Fitness is 238, to sausage 4

(338.300) - Fitness is 238, to sausage 4

(319.335) - Fitness is 254, to sausage 4

(357.301) - Fitness is 258, to sausage 4

(340.330) - Fitness is 270, to sausage 4

(361.309) - Fitness is 270, to sausage 4

(351.321) - Fitness is 272, to sausage 4

(327.345) - Fitness is 272, to sausage 4

(347.325) - Fitness is 272, to sausage 4

(355.321) - Fitness is 276, to sausage 4

(362.324) - Fitness is 286, to sausage 4

(369.329) - Fitness is 298, to sausage 4

(378.324) - Fitness is 302, to sausage 4

(380.324) - Fitness is 304, to sausage 4

400

232,4

(273.285) - Fitness is 158, to sausage 4

(280.284) - Fitness is 164, to sausage 4

(295.305) - Fitness is 200, to sausage 4

(332.272) - Fitness is 204, to sausage 4

(297.311) - Fitness is 208, to sausage 4

(320.288) - Fitness is 208, to sausage 4

(323.295) - Fitness is 218, to sausage 4

(299.321) - Fitness is 220, to sausage 4

(312.320) - Fitness is 232, to sausage 4

(315.325) - Fitness is 240, to sausage 4

(335.309) - Fitness is 244, to sausage 4

(337.313) - Fitness is 250, to sausage 4

(337.313) - Fitness is 250, to sausage 4

(321.331) - Fitness is 252, to sausage 4

(318.336) - Fitness is 254, to sausage 4

(325.331) - Fitness is 256, to sausage 4

(294.364) - Fitness is 258, to sausage 4

(318.350) - Fitness is 268, to sausage 4

(308.368) - Fitness is 276, to sausage 4

(325.363) - Fitness is 288, to sausage 4

500

222,6

(238.300) - Fitness is 138, to sausage 4

(262.316) - Fitness is 178, to sausage 4

(270.308) - Fitness is 178, to sausage 4

(278.320) - Fitness is 198, to sausage 4

(260.344) - Fitness is 204, to sausage 4

(291.315) - Fitness is 206, to sausage 4

(269.341) - Fitness is 210, to sausage 4

(289.325) - Fitness is 214, to sausage 4

(287.329) - Fitness is 216, to sausage 4

(307.313) - Fitness is 220, to sausage 4

(281.343) - Fitness is 224, to sausage 4

(324.306) - Fitness is 230, to sausage 4

(281.351) - Fitness is 232, to sausage 4

(308.328) - Fitness is 236, to sausage 4

(322.318) - Fitness is 240, to sausage 4

(293.359) - Fitness is 252, to sausage 4

(306.348) - Fitness is 254, to sausage 4

(335.327) - Fitness is 262, to sausage 4

(305.363) - Fitness is 268, to sausage 4

(329.363) - Fitness is 292, to sausage 4

600

201,6

(259.291) - Fitness is 150, to sausage 4

(240.332) - Fitness is 172, to sausage 4

(279.293) - Fitness is 172, to sausage 4

(250.328) - Fitness is 178, to sausage 4

(288.292) - Fitness is 180, to sausage 4

(265.319) - Fitness is 184, to sausage 4

(229.355) - Fitness is 184, to sausage 4

(258.328) - Fitness is 186, to sausage 4

(275.313) - Fitness is 188, to sausage 4

(281.309) - Fitness is 190, to sausage 4

(301.307) - Fitness is 208, to sausage 4

(302.306) - Fitness is 208, to sausage 4

(275.339) - Fitness is 214, to sausage 4

(284.330) - Fitness is 214, to sausage 4

(290.326) - Fitness is 216, to sausage 4

(278.342) - Fitness is 220, to sausage 4

(271.349) - Fitness is 220, to sausage 4

(290.338) - Fitness is 228, to sausage 4

(263.391) - Fitness is 254, to sausage 4

(313.353) - Fitness is 266, to sausage 4

700

197,6

(280.272) - Fitness is 152, to sausage 4

(293.261) - Fitness is 154, to sausage 4

(302.272) - Fitness is 174, to sausage 4

(324.252) - Fitness is 176, to sausage 4

(322.254) - Fitness is 176, to sausage 4

(296.284) - Fitness is 180, to sausage 4

(324.264) - Fitness is 188, to sausage 4

(290.300) - Fitness is 190, to sausage 4

(320.276) - Fitness is 196, to sausage 4

(294.306) - Fitness is 200, to sausage 4

(296.304) - Fitness is 200, to sausage 4

(296.308) - Fitness is 204, to sausage 4

(322.282) - Fitness is 204, to sausage 4

(312.294) - Fitness is 206, to sausage 4

(334.276) - Fitness is 210, to sausage 4

(313.297) - Fitness is 210, to sausage 4

(315.295) - Fitness is 210, to sausage 4

(319.303) - Fitness is 222, to sausage 4

(331.297) - Fitness is 228, to sausage 4

(367.305) - Fitness is 272, to sausage 4

800

237,3

(302.286) - Fitness is 188, to sausage 4

(318.274) - Fitness is 192, to sausage 4

(355.243) - Fitness is 198, to sausage 4

(321.285) - Fitness is 206, to sausage 4

(341.267) - Fitness is 208, to sausage 4

(332.284) - Fitness is 216, to sausage 4

(330.286) - Fitness is 216, to sausage 4

(331.291) - Fitness is 222, to sausage 4

(345.279) - Fitness is 224, to sausage 4

(339.285) - Fitness is 224, to sausage 4

(336.290) - Fitness is 226, to sausage 4

(355.293) - Fitness is 248, to sausage 4

(357.293) - Fitness is 250, to sausage 4

(364.290) - Fitness is 254, to sausage 4

(351.305) - Fitness is 256, to sausage 4

(315.345) - Fitness is 260, to sausage 4

(384.292) - Fitness is 276, to sausage 4

(362.322) - Fitness is 284, to sausage 4

(413.281) - Fitness is 294, to sausage 4

(397.307) - Fitness is 304, to sausage 4

900

227,7

(314.264) - Fitness is 178, to sausage 4

(341.245) - Fitness is 186, to sausage 4

(335.269) - Fitness is 204, to sausage 4

(318.286) - Fitness is 204, to sausage 4

(305.301) - Fitness is 206, to sausage 4

(340.270) - Fitness is 210, to sausage 4

(332.288) - Fitness is 220, to sausage 4

(350.272) - Fitness is 222, to sausage 4

(331.293) - Fitness is 224, to sausage 4

(337.289) - Fitness is 226, to sausage 4

(349.279) - Fitness is 228, to sausage 4

(320.312) - Fitness is 232, to sausage 4

(307.327) - Fitness is 234, to sausage 4

(343.295) - Fitness is 238, to sausage 4

(323.315) - Fitness is 238, to sausage 4

(333.313) - Fitness is 246, to sausage 4

(386.264) - Fitness is 250, to sausage 4

(342.318) - Fitness is 260, to sausage 4

(389.279) - Fitness is 268, to sausage 4

(367.313) - Fitness is 280, to sausage 4

1000

267,1

(325.289) - Fitness is 214, to sausage 4

(322.304) - Fitness is 226, to sausage 4

(366.266) - Fitness is 232, to sausage 4

(356.278) - Fitness is 234, to sausage 4

(319.325) - Fitness is 244, to sausage 4

(348.296) - Fitness is 244, to sausage 4

(370.274) - Fitness is 244, to sausage 4

(322.324) - Fitness is 246, to sausage 4

(329.317) - Fitness is 246, to sausage 4

(339.323) - Fitness is 262, to sausage 4

(348.314) - Fitness is 262, to sausage 4

(339.327) - Fitness is 266, to sausage 4

(325.353) - Fitness is 278, to sausage 4

(384.300) - Fitness is 284, to sausage 4

(361.329) - Fitness is 290, to sausage 4

(379.319) - Fitness is 298, to sausage 4

(372.326) - Fitness is 298, to sausage 4

(368.346) - Fitness is 314, to sausage 4

(361.363) - Fitness is 324, to sausage 4

(377.359) - Fitness is 336, to sausage 4