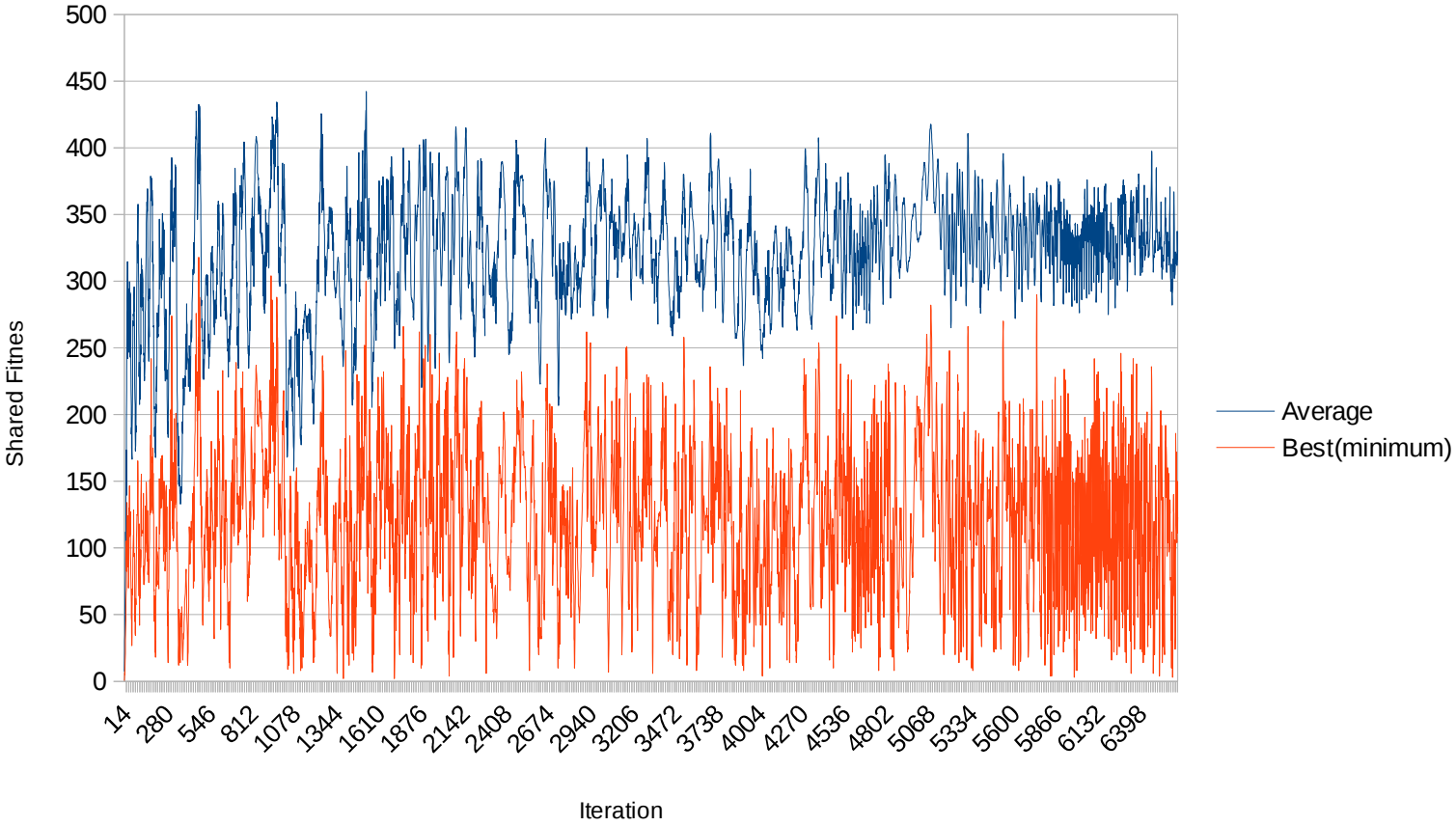
3 - Kirill Tsibikov

Lucky Dog

Brest 2016



0 generation		
Position	**Original Fitnes**	**Shared**
(505;497)	8.0	0.6666666666666666
(499;509)	10.0	0.7692307692307693
(503;509)	12.0	0.9230769230769231
(505;511)	16.0	1.3333333333333333
(485;495)	20.0	1.6666666666666667
(496;516)	20.0	1.8181818181818181
(497;517)	20.0	1.8181818181818181
(493;489)	18.0	2.0
(484;490)	26.0	2.3636363636363638
(474;500)	26.0	2.6
(484;484)	32.0	3.2
(505;523)	28.0	3.5
(487;523)	36.0	4.0
(466;496)	38.0	6.333333333333333
(527;489)	38.0	7.6
(498;540)	42.0	8.4
(521;483)	38.0	12.666666666666666
(459;473)	68.0	17.0
(570;498)	72.0	72.0
(523;433)	90.0	90.0

100 generation

Position	Original Fitnes	Shared
(188;22)	410.0	82.0
(178;12)	390.0	97.5
(203;1)	398.0	99.5
(167;21)	388.0	129.33333333333334
(211;25)	414.0	138.0
(246;78)	432.0	144.0
(249;95)	446.0	148.66666666666666
(235;101)	466.0	155.33333333333334
(120;132)	452.0	226.0
(142;120)	462.0	231.0
(89;989)	300.0	300.0
(49;51)	300.0	300.0
(342;122)	380.0	380.0
(257;961)	382.0	382.0
(296;90)	394.0	394.0
(140;72)	412.0	412.0
(49;221)	428.0	428.0
(207;103)	496.0	496.0
(169;177)	546.0	546.0
(202;184)	582.0	582.0

500 generation

Position	Original Fitnes	Shared
(540;32)	172.0	86.0
(551;27)	178.0	89.0
(483;159)	276.0	138.0
(473;155)	282.0	141.0
(447;25)	178.0	178.0
(357;119)	362.0	181.0
(355;129)	374.0	187.0
(424;976)	200.0	200.0
(487;89)	202.0	202.0
(510;902)	208.0	208.0
(385;993)	222.0	222.0
(647;7)	254.0	254.0
(433;911)	256.0	256.0
(434;108)	274.0	274.0
(403;921)	276.0	276.0
(531;147)	278.0	278.0
(342;22)	280.0	280.0
(367;63)	296.0	296.0
(436;140)	304.0	304.0
(334;50)	316.0	316.0

1000 generation			5000 generation		
Position	**Original Fitnes**	**Shared**	**Position**	**Original Fitnes**	**Shared**
(993;821)	386.0	128.66666666666666	(30;522)	152.0	152.0
(976;834)	390.0	130.0	(953;545)	192.0	192.0
(988;814)	398.0	132.66666666666666	(12;376)	236.0	236.0
(1;981)	220.0	220.0	(933;427)	240.0	240.0
(30;16)	246.0	246.0	(966;620)	254.0	254.0
(969;983)	248.0	248.0	(157;495)	262.0	262.0
(8;50)	258.0	258.0	(385;335)	280.0	280.0
(975;951)	274.0	274.0	(910;596)	286.0	286.0
(51;957)	294.0	294.0	(112;422)	290.0	290.0
(928;966)	306.0	306.0	(160;404)	356.0	356.0
(81;963)	318.0	318.0	(637;725)	362.0	362.0
(963;895)	342.0	342.0	(15;157)	372.0	372.0
(914;70)	356.0	356.0	(55;281)	374.0	374.0
(115;939)	376.0	376.0	(93;705)	398.0	398.0
(39;859)	380.0	380.0	(892;304)	404.0	404.0
(99;871)	428.0	428.0	(890;276)	434.0	434.0
(858;906)	436.0	436.0	(792;46)	438.0	438.0
(69;831)	438.0	438.0	(303;249)	448.0	448.0
(941;809)	450.0	450.0	(164;748)	512.0	512.0
(96;796)	492.0	492.0	(150;216)	534.0	534.0

Source Code

```
/*
 * To change this license header, choose License Headers in Project Properties.
 * To change this template file, choose Tools | Templates
 * and open the template in the editor.
 */
package squaredog;

import java.awt.*;
import java.util.Random;
import java.util.logging.Level;
import java.util.logging.Logger;
import javax.swing.*;

/**
 *
 * @author kil
 */
class GeneticAlgo {

    int[][] popln;
    public int[][] crdnt;

    public enum SelectionType {
        TOURNEY, ROULETTE_WHEEL, TRUNCATING
    }

    public enum CrossingType {
        ONE_POINT_RECOMBINATION, TWO_POINT_RECOMBINATION,
ELEMENTWISE_RECOMBINATION, ONE_ELEMENT_EXCHANGE
    }
```

```
    private SelectionType slctp;
    private CrossingType crstp;
    private int genomLength; //Длина генома в битах
    private int generationCount; //Кол-во поколений
    private int individualCount; //Кол-во Геномов(Индивидов,Особей) в поколении
    private int[] chosenchromosom;
    private SelectionType selectionType; //Тип Селекции
    private CrossingType crossingType; //Тип Скрещивания
    private double[] ftnes;
    private double[] orftn;
    private SQUAREDOG d;

    public GeneticAlgo(String s, String c, SQUAREDOG dd) {
        slctp = SelectionType.valueOf(s);
        crstp = CrossingType.valueOf(c);
        popln = new int[20][1000];
        crdnt = new int[20][2];
        ftnes = new double[20];
        orftn = new double[20];
        d = dd;
        for (int i = 0; i < 20; i++) {
            crdnt[i][0] = 500;
            crdnt[i][1] = 500;
        }
        for (int i = 0; i < 20; i++) {
            ftnes[i] = 600.D;
        }
        genomLength = 1000;
        generationCount = 20;
        individualCount = 20;
        chosenchromosom = new int[20];
    }

    public boolean[][] run() {
        this.generateFirstGeneration();
        double ftnsmax = 0.D;
        for (int i = 0; i < 100000000; i++) {
            crdntdog();
            this.selection();
            ftnsmax = ftnes[0];
            for (int j = 1; j < 20; j++) {
                ftnsmax = (ftnsmax >= ftnes[j]) ? ftnes[j] : ftnsmax;
            }
//            System.out.print(avgfitnes());
//            System.out.print(":");
//            System.out.print(ftnsmax);
//            System.out.println();
            if (i == 0 || i == 100 || i == 500 || i == 1000 || i == 5000) {
                System.out.print(i + " generation");
                    System.out.println();
                for (int j = 0; j < 20; j++) {
                    System.out.print("("+crdnt[j][0]+";"+crdnt[j][1]+")");
                    System.out.print(":");
                    System.out.print(orftn[j]);
                    System.out.print(":");
                    System.out.print(ftnes[j]);
                    System.out.println();
                }

            }
```

```
            d.repaint();
            try {
                Thread.sleep(00);
            } catch (InterruptedException ex) {
                Logger.getLogger(SQUAREDOG.class.getName()).log(Level.SEVERE,
null, ex);
            }
            if (ftnsmax == 1000) {
                break;
            }
            ftnsmax = 0.D;
        }

        return (new boolean[20][1000]);
    }

    private void generateFirstGeneration() {
        Random rnd = new Random();
        for (int i = 0; i < 20; i++) {
            for (int j = 0; j < 1000; j++) {
                popln[i][j] = Math.abs(rnd.nextInt()) % 4 + 1;
            }
        }
    } //генерация первого поколения

    private void selection() {
        int[][] genomListOffsprings = new int[20][1000];
        Random rndd = new Random();
        switch (this.slctp) {
            case ROULETTE_WHEEL: {
                double[] wheel = new double[this.individualCount];
                wheel[0] = fitnes(0);//Значение ФитнессФункции для 1-ого генома
                this.chosenchromosom[0] = 0;
                for (int i = 1; i < this.individualCount; i++) {
                    wheel[i] = wheel[i - 1] + fitnes(i);//Значение
ФитнессФункции для i-ого генома
                    this.chosenchromosom[i] = 0;
                }
                double all = wheel[this.individualCount - 1];

                for (int i = 0; i < this.individualCount; i++) {
                    double index = Math.abs(rndd.nextFloat()) * all;
                    int l = 0;
                    int r = individualCount - 1;
                    int c = 0;
                    while (l < r) {
                        c = (l + r) >> 1;
                        if (index <= wheel[c]) {
                            r = c;
                        } else {
                            l = c + 1;
                        }
                    }
                    int a = l;
                    index = Math.abs(rndd.nextFloat()) * all;

                    l = 0;
                    r = individualCount - 1;
                    c = 0;
                    while (l < r) {
```

```
                    c = (l + r) >> 1;
                    if (index <= wheel[c]) {
                        r = c;
                    } else {
                        l = c + 1;
                    }
                }
                this.chosenchromosom[l]++;
                this.chosenchromosom[a]++;
                genomListOffsprings[i] = this.crossing(l, a);
            }
            popln = genomListOffsprings;
            break;
        }
        case TOURNEY: {
            for (int i = 0; i < this.individualCount; i++) {
                int index1 = rndd.nextInt(individualCount);
                int index2 = rndd.nextInt(individualCount);
                int index3 = rndd.nextInt(individualCount);
                int index4 = rndd.nextInt(individualCount);
                double fr1 = fitnes(index1);
                double fr2 = fitnes(index2);
                index1 = (fr1 > fr2) ? index1 : index2;
                double fr3 = fitnes(index3);
                double fr4 = fitnes(index4);
                index2 = (fr3 > fr4) ? index3 : index4;
                genomListOffsprings[i] = this.crossing(index1, index2);
            }
            popln = genomListOffsprings;
            break;
        }
        case TRUNCATING: {
            this.sort();
            for (int i = 0; i < this.individualCount; i++) {
                genomListOffsprings[i] =
this.crossing((Math.abs(rndd.nextInt())) % 10, (Math.abs(rndd.nextInt())) % 10);
            }
            popln = genomListOffsprings;
            break;
        }
        default:
            break;

    }
} //Процедура селекци

private int[] crossing(int a, int b) {
    int[] vec = new int[1000];
    switch (crstp) {
        case ONE_ELEMENT_EXCHANGE: {
            for (int i = 0; i < genomLength; i++) {
                Random rndd = new Random();
                vec[i] = (rndd.nextBoolean()) ? popln[b][i] : popln[a][i];
            }
            break;
        }
        case ONE_POINT_RECOMBINATION: {
            Random rndd = new Random();
            int point = Math.abs(rndd.nextInt()) % genomLength;
            System.arraycopy(popln[a], 0, vec, 0, point);
```

```
                System.arraycopy(popln[b], point, vec, point, genomLength -
point);
                break;
            }
            default:
                break;
        }

        //mutation
        Random rdd = new Random();
        for (int i = 0; i < 1000; i++) {
            vec[i] = (((Math.abs(rdd.nextInt())) % 1000) == 0) ?
(Math.abs(rdd.nextInt())) % 4 + 1 : vec[i];
        }
        return vec;
    } //Процедура скрещивания

    private double fitnes(int nmb) {

        double a, b, c, d;
        a = dst(crdnt[nmb][0], crdnt[nmb][1], 200, 200);
        b = dst(crdnt[nmb][0], crdnt[nmb][1], 800, 200);
        c = dst(crdnt[nmb][0], crdnt[nmb][1], 200, 800);
        d = dst(crdnt[nmb][0], crdnt[nmb][1], 800, 800);
        double originalftns = 600 - Math.abs(Math.min(Math.min(a, b),
Math.min(c, d)));
        orftn[nmb]=originalftns;
        double sumdij = 0.D;
        for (int i = 0; i < 20; i++) {
            sumdij += ((Math.abs(crdnt[nmb][0] - crdnt[i][0]) <= 25) &&
(Math.abs(crdnt[nmb][1] - crdnt[i][1]) <= 25) && (dst(crdnt[nmb][0], crdnt[nmb]
[1], crdnt[i][0], crdnt[i][1]) < 50)) ? 1 - dst(crdnt[nmb][0], crdnt[nmb][1],
crdnt[i][0], crdnt[i][1]) / 50 : 0;
        }
        return originalftns / sumdij;
    } //Фитнес функция

    private int dst(int x1, int y1, int x2, int y2) {
        return Math.abs(x1 - x2) + Math.abs(y1 - y2);
    }

    private double avgfitnes() {
        double ftns = 0.D;
        for (int i = 0; i < 20; i++) {
            ftns += this.ftnes[i];
        }
        return ftns / 20;
    } //Фитнес функция

    private void crdntdog() {
        for (int i = 0; i < 20; i++) {
            for (int j = 0; j < 1000; j++) {
                switch (popln[i][j]) {
                    case 1: {
                        crdnt[i][1] += (crdnt[i][1] == 1000) ? -999 : 1;
                        break;
                    }
                    case 2: {
                        crdnt[i][1] -= (crdnt[i][1] == 0) ? -999 : 1;
                        break;
```

```
                    }
                    case 3: {
                        crdnt[i][0] += (crdnt[i][0] == 1000) ? -999 : 1;
                        break;
                    }
                    case 4: {
                        crdnt[i][0] -= (crdnt[i][0] == 0) ? -999 : 1;
                        break;
                    }
                    default: {
                        System.out.print("ERROR!");
                        break;
                    }
                }
            }
        }
    }

    private void sort() {
        for (int i = 0; i < this.individualCount; i++) {
            ftnes[i] = fitnes(i);
        }
        for (int i = 0; i < this.individualCount; i++) {
            int[] amiba;
            amiba = new int[1000];
            amiba = popln[i];
            double fit = ftnes[i];
            double ft=orftn[i];
            int[] c = new int[2];
            c = crdnt[i];
            for (int j = i; j < this.individualCount; j++) {
                if (ftnes[j] < fit) {
                    fit = ftnes[j];
                    ft=orftn[j];
                    amiba = popln[j];
                    popln[j] = popln[i];
                    popln[i] = amiba;
                    ftnes[j] = ftnes[i];
                    orftn[j]=orftn[i];
                    ftnes[i] = fit;
                    orftn[i]=ft;
                    c = crdnt[j];
                    crdnt[j] = crdnt[i];
                    crdnt[i] = c;
                }
            }
        }
    }
}

public class SQUAREDOG extends JPanel {

    public GeneticAlgo p;

    public SQUAREDOG() {

        JFrame frame = new JFrame("SQUAREDOG");
        frame.setMinimumSize(new Dimension(1000, 1000));
        frame.setDefaultCloseOperation(WindowConstants.EXIT_ON_CLOSE);
        frame.getContentPane().add(this);
```

```
        frame.pack();
        Container c = frame.getContentPane();
        this.setLayout(new GridLayout(1000, 1));
        for (int i = 0; i < 1; i++) {
            this.add(new JLabel(" "));
        }
        JScrollPane jsp = new JScrollPane(this);
        c.add(jsp);
        frame.setSize(1000, 1000);
        frame.setVisible(true);
        p = new GeneticAlgo("TRUNCATING", "ONE_ELEMENT_EXCHANGE", this);
        p.run();
        //repaint();
    }

    @Override
    protected void paintComponent(Graphics g) {
        super.paintComponent(g);
        g.setColor(Color.orange);
        g.drawRect(0, 0, 1000, 1000);
        g.fillRect(200, 200, 15, 5);
        g.fillRect(200, 800, 15, 5);
        g.fillRect(800, 200, 15, 5);
        g.fillRect(800, 800, 15, 5);
        g.setColor(Color.red);
        for (int i = 0; i < 20; i++) {
            g.fillRect(p.crdnt[i][0], p.crdnt[i][1], 5, 5);
        }

    }

    /**
     * @param args the command line arguments
     */
    public static void main(String[] args) throws InterruptedException {
        SQUAREDOG d = new SQUAREDOG();

        // TODO code application logic here
    }

}
```