Лабораторна робота №15
Колекції в Java

Мета: Ознайомлення з бібліотекою колекцій Java SE. Використання колекцій для розміщення об'єктів розроблених класів.

1 ВИМОГИ

1. Розробити консольну програму для реалізації завдання обробки даних згідно прикладної області.
2. Для розміщення та обробки даних використовувати контейнери (колекції) і алгоритми з Java Collections Framework.
3. Забезпечити обробку колекції об'єктів: додавання, видалення, пошук, сортування згідно розділу Прикладні задачі л.р. №10.
4. Передбачити можливість довготривалого зберігання даних: 1) за допомогою стандартної серіалізації; 2) не використовуючи протокол серіалізації.
5. Продемонструвати розроблену функціональність в діалоговому та автоматичному режимах за результатом обробки параметрів командного рядка.

1.1 Розробник

- П.І.Б: Заночкин Є. Д.
- Группа: КІТ-119а
- Варіант: 7

2 ОПИС ПРОГРАМИ

2.1 Засоби ООП:

Scanner inInt, inStr = new Scanner(System.in) – для введення обраних опцій користувачем з клавіатури;

XMLEncoder encoder = new XMLEncoder(new BufferedOutputStream(new FileOutputStream("Lab15.xml"));

encoder.writeObject(container); – нестандартна серіалізація;

XMLDecoder decoder = new XMLDecoder(new BufferedInputStream(new FileInputStream("Lab15.xml")));

container = (ArrayList<Client>) decoder.readObject(); – нестандартна десеріалізація;

ObjectOutputStream oos = new ObjectOutputStream(new BufferedOutputStream(newFileOutputStream("Lab15.ser")));

oos.writeObject(container);

oos.flush(); – стандартна серіалізація;

ObjectInputStream ois = new ObjectInputStream(new BufferedOutputStream(new FileInputStream("Lab15.ser")));

container = (ArrayList<Client>) ois.readObject(); – стандартна десеріалізація;

Pattern pattern = Pattern.compile() – компілює регулярний вираз у шаблон;

Matcher matcher = pattern.matcher(data); – створює matcher, який буде відповідати даному вводу для цього шаблону.

2.2 Ієрархія та структура класів

Було створено класи Main (головний клас програми), Client (містить всі поля та методи предметної області «Бюро знайомств»), 4 класи, що реалізують інтерфейс Comparator для сортування за певними критеріями, клас MyThread (реалізує інтерфейс Runnable для роботи з потоками), а також підключено класи з попередньої роботи: InfoAboutYourself та PartnerRequirements.

2.3 Важливі фрагменти програми

Клас Main

```
package ua.khpi.oop.zanochkyn15;

import java.beans.XMLDecoder;
import java.beans.XMLEncoder;
import java.io.BufferedInputStream;
import java.io.BufferedOutputStream;
import java.io.File;
import java.io.FileInputStream;
import java.io.FileNotFoundException;
import java.io.FileOutputStream;
import java.io.IOException;
import java.io.ObjectInputStream;
import java.io.ObjectOutputStream;
import java.util.ArrayList;
import java.util.Calendar;
import java.util.GregorianCalendar;
import java.util.Scanner;
import java.util.regex.Matcher;
import java.util.regex.Pattern;
import ua.khpi.oop.zanochkyn10.InfoAboutYourself;
import ua.khpi.oop.zanochkyn10.PartnerRequirements;

public class Main
{
	public static void main(String[] args)
	{
		ArrayList<Client> container = new ArrayList<Client>();
		for(String str: args)
		{
			if(str.equals("-a") || str.equals("-auto"))
			{
				auto(container);
				return;
			}
			else if(str.equals("-d") || str.equals("-dialog"))
			{
				menu(container);
				return;
			}
		}
		menu(container);
	}

	private static void auto(ArrayList<Client> container)
	{
		System.out.println("Size of container: " + container.size());
		System.out.println("\nAdding elements...");
		File file = new File("Lab15-data.txt");
		int countClientHobbies, countPartnerHobbies;
		String[] clientHobbies, partnerHobbies;
		GregorianCalendar date;
		InfoAboutYourself info;
		PartnerRequirements requirements;
		try
		{
			Scanner reader = new Scanner(file);
			while (reader.hasNextLine())
			{
		           String data = reader.nextLine();
		           Pattern   pattern   =   Pattern.compile("^((Male|Female),\\s([a-zA-Z]+),\\s(([1-9])|([1-
9][0-9])),\\s(([1-9])|([1-9][0-9])|([1-2][0-9][0-9])),\\s([a-zA-Z]+),\\s([0-4]),\\s" +
					"([a-zA-Z]+|[a-zA-Z]+\\s[a-zA-Z]+)(,\\s([a-zA-Z]+|[a-zA-Z]+\\s[a-zA-
Z]+))*,\\s(Male|Female),\\s(([1-9])|([1-9][0-9])),\\s(([1-9])|([1-9][0-9])),\\s([0-4]),\\s" +
					"([a-zA-Z]+|[a-zA-Z]+\\s[a-zA-Z]+)(,\\s([a-zA-Z]+|[a-zA-Z]+\\s[a-zA-
Z]+))*)");
				Matcher matcher = pattern.matcher(data);
```

```
              if (matcher.matches())
              {
                String[] tmp = data.split(",\\s");
                    if(Integer.parseInt(tmp[5]) == 0)
                    {
                        countClientHobbies = 0;
                            clientHobbies = new String[countClientHobbies];
                    }
                    else
                    {
                        countClientHobbies = Integer.parseInt(tmp[5]);
                        clientHobbies = new String[countClientHobbies];
                        for (int i = 6, j = 0; i < 6 + countClientHobbies; i++, j++)
                            clientHobbies[j] = tmp[i];
                    }
                    if(Integer.parseInt(tmp[9 + countClientHobbies]) == 0)
                    {
                        countPartnerHobbies = 0;
                        partnerHobbies = new String[countPartnerHobbies];
                    }
                    else
                    {
                        if(countClientHobbies == 0)
                        {
                            countPartnerHobbies = Integer.parseInt(tmp[9 + 1]);
                            partnerHobbies = new String[countPartnerHobbies];
                            if(countPartnerHobbies != 0)
                                for (int i = 9 + 1 + 1, j = 0; i < tmp.length;
i++, j++)
                                    partnerHobbies[j] = tmp[i];
                        }
                        else
                        {
                            countPartnerHobbies = Integer.parseInt(tmp[9 +
countClientHobbies]);
                            partnerHobbies = new String[countPartnerHobbies];
                            for (int i = 9 + countClientHobbies + 1, j = 0; i <
tmp.length; i++, j++)
                                partnerHobbies[j] = tmp[i];
                        }
                    }
                    info = new InfoAboutYourself(tmp[1], Integer.parseInt(tmp[2]),
Integer.parseInt(tmp[3]), tmp[4], clientHobbies);
                    int pos;
                    if(countClientHobbies == 0)
                        pos = 7;
                    else
                        pos = countClientHobbies + 6;
                    requirements = new PartnerRequirements(tmp[pos],
Integer.parseInt(tmp[pos+1]), Integer.parseInt(tmp[pos+2]), partnerHobbies);
                    date = new GregorianCalendar();
                    container.add(new Client(tmp[0], indexGenerator(container), date, info,
requirements));
              }
             }
                reader.close();
            }
            catch (FileNotFoundException e)
            {
                e.printStackTrace();
            }
            System.out.println("Elements added.");
            System.out.println("\nSize of container: " + container.size());
            System.out.println("\nOutput the container...");
            printAll(container);
            Pattern patternAgeDifference = Pattern.compile("^([0-5])");
            Pattern patternHobby = Pattern.compile("^(Morning runs)");
            Pattern patternMale = Pattern.compile("^(Male)");
            Pattern patternFemale = Pattern.compile("^(Female)");
            Matcher matcherHobby1, matcherHobby2, matcherAge, matcherGenderMale, matcherGenderFemale;
            ArrayList<Integer> positions = new ArrayList<>();
            boolean hobbyCheck1 = false, foundCouple = false;
            System.out.println("Finding all combinations of couples with heterosexual partners with an age difference of no more than 5 years for morning runs...\n");
            for(int i = 0; i < container.size(); i++)
            {
                clientHobbies = container.get(i).getInformation().getClientHobby();
                partnerHobbies = container.get(i).getRequirements().getPartnerHobby();
                if(clientHobbies.length != 0 && partnerHobbies.length != 0)
                {
                    for(int a = 0; a < clientHobbies.length; a++)
                    {
                        matcherHobby1 = patternHobby.matcher(clientHobbies[a]);
                        if(matcherHobby1.matches())
                        {
                            hobbyCheck1 = true;
                            break;
                        }
                    }
                    if(hobbyCheck1 == true)
                        for(int b = 0; b < partnerHobbies.length; b++)
                        {
                            matcherHobby2 = patternHobby.matcher(partnerHobbies[b]);
                            if(matcherHobby2.matches())
                                positions.add(i);
                        }
                }
            }
            int num = 1;
            if(!positions.isEmpty())
                for(int i = 0; i < container.size(); i++)
                {
                    if(positions.contains(i))
                        for(int j = i + 1; j < container.size(); j++)
                            if(positions.contains(j))
                            {
                                int ageDifference = Math.abs(container.get(i).getInformation().getAge() - container.get(j).getInformation().getAge());
                                matcherAge = patternAgeDifference.matcher(Integer.toString(ageDifference));
                                if(matcherAge.matches())
                                {
                                    matcherGenderMale = patternMale.matcher(container.get(i).getClientGender());
                                    if(matcherGenderMale.matches())
                                    {
                                        matcherGenderFemale = patternFemale.matcher(container.get(j).getClientGender());
            if(matcherGenderFemale.matches())
                                                                                                                                            {

            System.out.println("Couple " + num + ":\n" + container.get(i).toString() + "\n" + container.get(j).toString()
+ "\n");
                                                                                                                                                        foundCouple        =
true;
                                                                                                                                                        num++;
                                                                                                                                            }
                                                                                                                                }
                                                                                                                                else
                                                                                                                                {
                                                                                                                                            matcherGenderMale          =
patternMale.matcher(container.get(j).getClientGender());

            if(matcherGenderMale.matches())
                                                                                                                                            {

            System.out.println("Couple " + num + ":\n" + container.get(i).toString() + "\n" + container.get(j).toString()
+ "\n");
                                                                                                                                                        foundCouple        =
true;
                                                                                                                                                        num++;
                                                                                                                                            }
                                                                                                                                }

                                                                                                                    }
                                                                                                        }
                                                                        }
                                                            if(foundCouple != true)
                                                                        System.out.println("There is no matching couples.");
                                                            System.out.println("Change the second client's hobby...");
                                                            String[] clientHobbies3 = {"Dancing"};
                                                            container.get(1).getInformation().setClientHobby(clientHobbies3);
                                                            System.out.println("Second client's hobby - changed.");
                                                            System.out.println("\n" + container.get(1).toString() + "\n");
                                                            System.out.println("Sorting the container by count of client's hobbies...");
                                                            container.sort(new ClientHobbiesComparator());
                                                            System.out.println("Container sorted");
                                                            System.out.println("\nOutput the container...");
                                                            printAll(container);
                                                            System.out.println("Removing first client from the container...");
                                                            container.remove(0);
                                                            System.out.println("First client removed.");
                                                            System.out.println("\nOutput the container...");
                                                            printAll(container);
                                                            System.out.println("End.");
                                                }

                                                private static void menu(ArrayList<Client> container)
                                                {
                                                            String gender = "";
                                                            String partnerGender;
                                                            String name;
                                                            GregorianCalendar date;
                                                            InfoAboutYourself info;
                                                            PartnerRequirements requirements;
                                                            Pattern patternName = Pattern.compile("^([a-zA-Z]+)");
                                                            Pattern patternAge = Pattern.compile("^(([1-9])|([1-9][0-9]))");
```

```
			Pattern patternHeight = Pattern.compile("^(([1-9])|([1-9][0-9])|([1-2][0-9][0-9]))");
			Pattern patternEyeColour = Pattern.compile("^([a-zA-Z]+)");
			Pattern patternHobby = Pattern.compile("^[a-zA-Z]+|[a-zA-Z]+\\s[a-zA-Z]+");
			boolean endCheck = true;
			Scanner inInt = new Scanner(System.in);
			Scanner inStr = new Scanner(System.in);
			while (endCheck)
			{
				System.out.println("Menu:");
				System.out.println("1. Show clients");
				System.out.println("2. Add client");
				System.out.println("3. Remove client");
				System.out.println("4. Change information");
				System.out.println("5. Clear list");
				System.out.println("6. Serialize data");
				System.out.println("7. Deserialize data");
				System.out.println("8. Count elements in a container");
				System.out.println("9. Sort the container");
				System.out.println("10. Finding all combinations of couples with heterosexual
partners with some age difference for morning runs");
				System.out.println("11. Threads task");
				System.out.println("0. Exit");
				System.out.println("Enter your option:");
				int option = inInt.nextInt();
				System.out.println();
				switch (option)
				{
				case 1:
					if(container.size() > 0)
						printAll(container);
					else
						System.out.println("Container is empty.\n");
					break;
				case 2:
					System.out.println("Choose gender:\n1. Male\n2. Female");
					int genderOption = inInt.nextInt();
					if(genderOption == 1)
					{
						gender = "Male";
						partnerGender = "Female";
					}
					else
					{
						gender = "Female";
						partnerGender = "Male";
					}
					System.out.println("\nEnter information about yourself");
					System.out.println("Name:");
					name = inStr.nextLine();
					name = stringRegexCheck(name, patternName);
					System.out.println("Age:");
					int age = inInt.nextInt();
					age = intRegexCheck(age, patternAge);
					System.out.println("Height:");
					int height = inInt.nextInt();
					height = intRegexCheck(height, patternHeight);
					System.out.println("Eye colour:");
					String eyeColour = inStr.nextLine();
					eyeColour = stringRegexCheck(eyeColour, patternEyeColour);
					System.out.println("Enter count of client's hobbies:");
					int countClientHobbies = inInt.nextInt();
					String[] clientHobbies = new String[countClientHobbies];
					if(countClientHobbies != 0)
					{
						System.out.println("Enter client's hobbies (max 2 words):");
						for(int i = 0; i < countClientHobbies; i++)
						{
							String hobby = inStr.nextLine();
							hobby = stringRegexCheck(hobby, patternHobby);
							clientHobbies[i] = hobby;
						}
					}
					info = new InfoAboutYourself(name, age, height, eyeColour,
clientHobbies);
					System.out.println("\nEnter partner requirements");
					System.out.println("Min age:");
					int minAge = inInt.nextInt();
					minAge = intRegexCheck(minAge, patternAge);
					System.out.println("Max age:");
					int maxAge = inInt.nextInt();
					maxAge = intRegexCheck(maxAge, patternAge);
					System.out.println("Enter count of partner's hobbies:");
					int countPartnerHobbies = inInt.nextInt();
					String[] partnerHobbies = new String[countPartnerHobbies];
					if(countPartnerHobbies != 0)
					{
						System.out.println("Enter partner's hobbies (max 2 words):");
						for(int i = 0; i < countPartnerHobbies; i++)
						{
							String hobby = inStr.nextLine();
							hobby = stringRegexCheck(hobby, patternHobby);
							partnerHobbies[i] = hobby;
						}
					}
					requirements = new PartnerRequirements(partnerGender, minAge,
maxAge, partnerHobbies);
					date = new GregorianCalendar();
					container.add(new Client(gender, indexGenerator(container), date, info,
requirements));
					printAll(container);
					break;
				case 3:
					System.out.println("Enter client's ID to remove him:");
					int id = inInt.nextInt();
					int size = container.size();
					for(int i = 0; i < container.size(); i++)
						if(container.get(i).getId() == id)
						{
							container.remove(i);
							break;
						}
					if(size == container.size())
						System.out.println("\nThere is no such client");
					else
						System.out.println("\nClient removed");
					System.out.println();
					break;
				case 4:
					System.out.println("Enter client's ID to change his information:");
					id = inInt.nextInt();
```

```
                    int index = 0;
                    for(index = 0; index < container.size(); index++)
                        if(container.get(index).getId() == id)
                            break;
                    if(index == container.size())
                    {
                        System.out.println("\nThere is no client with that ID.\n");
                        break;
                    }
                    boolean endCheck2 = true;
                    int option2 = 0;
                    while(endCheck2)
                    {
                        System.out.println("\n" + container.get(index).toString() +
"\n");
                        System.out.println("Which information you want to change?");
                        System.out.println("1. Gender");
                        System.out.println("2. ID");
                        System.out.println("3. Registration date");
                        System.out.println("4. Information about yourself");
                        System.out.println("5. Partner requirements");
                        System.out.println("6. End of change");
                        System.out.println("Enter option:");
                        option2 = inInt.nextInt();
                        switch(option2)
                        {
                        case 1:
                            if(container.get(index).getClientGender() == "Male")

    container.get(index).setClientGender("Female");
                            else

    container.get(index).setClientGender("Male");
                            break;
                        case 2:
                            System.out.println("\nEnter new ID (e.g. 10):");
                            container.get(index).setId(inInt.nextInt());
                            break;
                        case 3:
                            Pattern patternYear =
Pattern.compile("^(?!^0)\\d{4}$");
                            Pattern patternMonth = Pattern.compile("^(([1-
9])|([1][0-2]))");
                            Pattern patternDay = Pattern.compile("^(([1-
9])|([12][0-9])|([3][01]))");
                            Pattern patternHour = Pattern.compile("^(([0-
9])|([1][0-9])|([2][0-4]))");
                            Pattern patternMinute = Pattern.compile("^(([0-
9])|([1-5][0-9])|([6][0]))");
                            GregorianCalendar newDate = new
GregorianCalendar();
                            System.out.println("\nEnter registration year:");
                            int value = inInt.nextInt();
                            value = intRegexCheck(value, patternYear);
                            newDate.set(Calendar.YEAR, value);
                            System.out.println("Enter registration month:");
                            value = inInt.nextInt();
                            value = intRegexCheck(value, patternMonth);
                            newDate.set(Calendar.MONTH, value-1);
                            System.out.println("Enter registration day:");
```

```
                                                        value = inInt.nextInt();
                                                        value = intRegexCheck(value, patternDay);
                                                        newDate.set(Calendar.DAY_OF_MONTH, value);
                                                        System.out.println("Enter registration hour:");
                                                        value = inInt.nextInt();
                                                        value = intRegexCheck(value, patternHour);
                                                        newDate.set(Calendar.HOUR_OF_DAY, value);
                                                        System.out.println("Enter registration minute:");
                                                        value = inInt.nextInt();
                                                        value = intRegexCheck(value, patternMinute);
                                                        newDate.set(Calendar.MINUTE, value);
                                                        newDate.set(Calendar.SECOND, 0);
                                                        container.get(index).setDate(newDate);
                                                        break;
                                                case 4:
                                                        System.out.println("\nInformation about yourself:");
                                                        System.out.println("1. Name");
                                                        System.out.println("2. Age");
                                                        System.out.println("3. Height");
                                                        System.out.println("4. Eye colour");
                                                        System.out.println("5. Hobbies");
                                                        System.out.println("6. Change all information");
                                                        System.out.println("Enter option:");
                                                        int option3 = inInt.nextInt();
                                                        System.out.println();
                                                        switch(option3)
                                                        {
                                                        case 1:
                                                                System.out.println("Enter new name:");
                                                                name = inStr.nextLine();
                                                                name = stringRegexCheck(name,
patternName);

        container.get(index).getInformation().setName(name);
                                                                break;
                                                        case 2:
                                                                System.out.println("Enter new age:");
                                                                age = inInt.nextInt();
                                                                age = intRegexCheck(age, patternAge);

        container.get(index).getInformation().setAge(age);
                                                                break;
                                                        case 3:
                                                                System.out.println("Enter new height:");
                                                                height = inInt.nextInt();
                                                                height = intRegexCheck(height,
patternHeight);

        container.get(index).getInformation().setHeight(height);
                                                                break;
                                                        case 4:
                                                                System.out.println("Enter new eye colour:");
                                                                eyeColour = inStr.nextLine();
                                                                eyeColour = stringRegexCheck(eyeColour,
patternEyeColour);

        container.get(index).getInformation().setEyeColour(eyeColour);
                                                                break;
                                                        case 5:
```

```
                                        System.out.println("Enter    new    count    of
client's hobbies:");
                                        countClientHobbies = inInt.nextInt();
                                        clientHobbies          =          new
String[countClientHobbies];
                                        if(countClientHobbies != 0)
                                        {
                                            System.out.println("Enter      client's
hobbies (max 2 words):");
                                            for(int i = 0; i < countClientHobbies;
i++)
                                            {
                                                String      hobby      =
inStr.nextLine();
                                                hobby                  =
stringRegexCheck(hobby, patternHobby);
                                                clientHobbies[i] = hobby;
                                            }
                                        }

    container.get(index).getInformation().setClientHobby(clientHobbies);
                                        break;
                                    case 6:
                                        System.out.println("Enter new name:");
                                        name = inStr.nextLine();
                                        name       =       stringRegexCheck(name,
patternName);
                                        System.out.println("Enter new age:");
                                        age = inInt.nextInt();
                                        age = intRegexCheck(age, patternAge);
                                        System.out.println("Enter new height:");
                                        height = inInt.nextInt();
                                        height       =       intRegexCheck(height,
patternHeight);
                                        System.out.println("Enter new eye colour:");
                                        eyeColour = inStr.nextLine();
                                        eyeColour  =  stringRegexCheck(eyeColour,
patternEyeColour);
                                        System.out.println("Enter    new    count    of
client's hobbies:");
                                        countClientHobbies = inInt.nextInt();
                                        clientHobbies          =          new
String[countClientHobbies];
                                        if(countClientHobbies != 0)
                                        {
                                            System.out.println("Enter      client's
hobbies (max 2 words):");
                                            for(int i = 0; i < countClientHobbies;
i++)
                                            {
                                                String      hobby      =
inStr.nextLine();
                                                hobby                  =
stringRegexCheck(hobby, patternHobby);
                                                clientHobbies[i] = hobby;
                                            }
                                        }
                                        info  =  new  InfoAboutYourself(name,  age,
height, eyeColour, clientHobbies);
                                        container.get(index).setInformation(info);
```

```
                                                                        break;
                                                                default:
                                                                        System.out.println("Wrong command.");
                                                                        break;
                                                                }
                                                                break;
                                                        case 5:
                                                                System.out.println("\nPartner requirements:");
                                                                System.out.println("1. Gender");
                                                                System.out.println("2. Min age");
                                                                System.out.println("3. Max age");
                                                                System.out.println("4. Hobbies");
                                                                System.out.println("5. Change all requirements");
                                                                System.out.println("Enter option:");
                                                                option3 = inInt.nextInt();
                                                                switch(option3)
                                                                {
                                                                case 1:

        if(container.get(index).getRequirements().getPartnerGender() == "Male")

        container.get(index).getRequirements().setPartnerGender("Female");
                                                                        else

        container.get(index).getRequirements().setPartnerGender("Male");
                                                                        break;
                                                                case 2:
                                                                        System.out.println("\nEnter new min age:");
                                                                        minAge = inInt.nextInt();
                                                                        minAge       =       intRegexCheck(minAge,
patternAge);

        container.get(index).getRequirements().setMinAge(minAge);
                                                                        break;
                                                                case 3:
                                                                        System.out.println("\nEnter new max age:");
                                                                        maxAge = inInt.nextInt();
                                                                        maxAge       =       intRegexCheck(maxAge,
patternAge);

        container.get(index).getRequirements().setMaxAge(maxAge);
                                                                        break;
                                                                case 4:
                                                                        System.out.println("\nEnter   new   count   of
partner's hobbies:");

                                                                        countPartnerHobbies = inInt.nextInt();
                                                                        partnerHobbies            =            new
String[countPartnerHobbies];

                                                                        {
                                                                                System.out.println("Enter    partner's
hobbies (max 2 words):");

                                                                                for(int    i    =    0;    i    <
countPartnerHobbies; i++)

                                                                                {
                                                                                        String       hobby       =
inStr.nextLine();

                                                                                        hobby                    =
stringRegexCheck(hobby, patternHobby);

                                                                                        partnerHobbies[i] = hobby;
                                                                                }
```

```
                                }

    container.get(index).getRequirements().setPartnerHobby(partnerHobbies);
                                break;
                            case 5:

    if(container.get(index).getRequirements().getPartnerGender() == "Male")
                                    partnerGender = "Female";
                                else
                                    partnerGender = "Male";
                                System.out.println("\nEnter new min age:");
                                minAge = inInt.nextInt();
                                minAge = intRegexCheck(minAge,
patternAge);
                                System.out.println("Enter new max age:");
                                maxAge = inInt.nextInt();
                                maxAge = intRegexCheck(maxAge,
patternAge);
                                System.out.println("Enter new count of
partner's hobbies:");
                                countPartnerHobbies = inInt.nextInt();
                                partnerHobbies = new
String[countPartnerHobbies];
                                {
                                    System.out.println("Enter partner's
hobbies (max 2 words):");
                                    for(int i = 0; i <
countPartnerHobbies; i++)
                                    {
                                        String hobby =
inStr.nextLine();
                                        hobby =
stringRegexCheck(hobby, patternHobby);
                                        partnerHobbies[i] = hobby;
                                    }
                                }
                                requirements = new
PartnerRequirements(partnerGender, minAge, maxAge, partnerHobbies);

    container.get(index).setRequirements(requirements);
                                break;
                            default:
                                System.out.println("\nWrong command.");
                                break;
                            }
                            break;
                        case 6:
                            endCheck2 = false;
                            System.out.println();
                            break;
                        default:
                            System.out.println("\nWrong command.");
                            break;
                        }
                    }
                    break;
                case 5:
                    container.clear();
                    System.out.println("Container cleared.\n");
                    break;
				case 6:
					System.out.println("Choose the method");
					System.out.println("1. Standard serialization");
					System.out.println("2. XML serialization");
					System.out.println("3. End");
					System.out.println("Enter your option:");
					option2 = inInt.nextInt();
					System.out.println();
					switch(option2)
					{
					case 1:
						try(ObjectOutputStream oos = new ObjectOutputStream(new
BufferedOutputStream(new FileOutputStream("Lab15.ser"))))
						{
							oos.writeObject(container);
							oos.flush();
							System.out.println("Serialization successful.\n");
						}
						catch(Exception ex)
						{
							System.out.println(ex.getMessage() + "\n");
						}
						break;
					case 2:
						try(XMLEncoder encoder = new XMLEncoder(new
BufferedOutputStream(new FileOutputStream("Lab15.xml"))))
						{
							encoder.writeObject(container);
							System.out.println("Serialization successful.\n");
						}
						catch(Exception ex)
						{
							System.out.println(ex.getMessage() + "\n");
						}
						break;
					case 3:
						break;
					default:
						System.out.println("Wrong command.\n");
						break;
					}
					break;
				case 7:
					System.out.println("Choose the method");
					System.out.println("1. Standard deserialization");
					System.out.println("2. XML deserialization");
					System.out.println("3. End");
					System.out.println("Enter your option");
					option2 = inInt.nextInt();
					System.out.println();
					switch(option2)
					{
					case 1:
						try(ObjectInputStream ois = new ObjectInputStream(new
BufferedInputStream(new FileInputStream("Lab15.ser"))))
						{
							container.clear();
							container = (ArrayList<Client>) ois.readObject();
							System.out.println("Deserialization successful.\n");
						}
```

```
								catch(Exception ex)
								{
									System.out.println(ex.getMessage());
								}
								break;
							case 2:
								try(XMLDecoder decoder = new XMLDecoder(new
BufferedInputStream(new FileInputStream("Lab15.xml"))))
								{
									container.clear();
									container = (ArrayList<Client>) decoder.readObject();
									System.out.println("Deserialization successful.\n");
								}
								catch(IOException ex)
								{
									System.out.println(ex.getMessage());
								}
								break;
							case 3:
								break;
							default:
								System.out.println("Wrong command.\n");
								break;
							}
							break;
						case 8:
							System.out.println("There is/are " + container.size() + " elements in a
container\n");
							break;
						case 9:
							if(container.size() == 0)
							{
								System.out.println("Empty container.\n");
								break;
							}
							System.out.println("Choose the method:");
							System.out.println("1. Sort by ID");
							System.out.println("2. Sort by registration date");
							System.out.println("3. Sort by count of client's hobbies");
							System.out.println("4. Sort by count of partner's hobbies");
							System.out.println("Enter your option:");
							option = inInt.nextInt();
							System.out.println();
							switch (option)
							{
							case 1:
								container.sort(new IdComparator());
								System.out.println("Container sorted\n");
								break;
							case 2:
								container.sort(new RegistrationDateComparator());
								System.out.println("Container sorted\n");
								break;
							case 3:
								container.sort(new ClientHobbiesComparator());
								System.out.println("Container sorted\n");
								break;
							case 4:
								container.sort(new PartnerHobbiesComparator());
								System.out.println("Container sorted\n");
```

```
                        break;
                    default:
                        System.out.println("Wrong command\n");
                        break;
                    }
                    break;
                case 10:
                    if(container.size() == 0)
                    {
                        System.out.println("Empty container.\n");
                        break;
                    }
                    System.out.println("Enter the max age difference (max 9 years):");
                    maxAge = inInt.nextInt();
                    if(maxAge > 9)
                    {
                        System.out.println("\nYou enter wrong max age.\n");
                        break;
                    }
                    System.out.println();
                    String str = "^([" + 0 + "-" + maxAge + "])";
                    Pattern patternAgeDifference = Pattern.compile(str);
                    Pattern patternHobbyRuns = Pattern.compile("^(Morning runs)");
                    Pattern patternMale = Pattern.compile("^(Male)");
                    Pattern patternFemale = Pattern.compile("^(Female)");
                    Matcher matcherHobby1, matcherHobby2, matcherAge,
matcherGenderMale, matcherGenderFemale;
                    ArrayList<Integer> positions = new ArrayList<>();
                    boolean hobbyCheck1 = false, foundCouple = false;
                    for(int i = 0; i < container.size(); i++)
                    {
                        clientHobbies =
container.get(i).getInformation().getClientHobby();
                        partnerHobbies =
container.get(i).getRequirements().getPartnerHobby();
                        if(clientHobbies.length != 0 && partnerHobbies.length != 0)
                        {
                            for(int a = 0; a < clientHobbies.length; a++)
                            {
                                matcherHobby1 =
patternHobbyRuns.matcher(clientHobbies[a]);
                                if(matcherHobby1.matches())
                                {
                                    hobbyCheck1 = true;
                                    break;
                                }
                            }
                            if(hobbyCheck1 == true)
                                for(int b = 0; b < partnerHobbies.length; b++)
                                {
                                    matcherHobby2 =
patternHobbyRuns.matcher(partnerHobbies[b]);
                                    if(matcherHobby2.matches())
                                        positions.add(i);
                                }
                        }
                    }
                    int num = 1;
                    if(!positions.isEmpty())
                        for(int i = 0; i < container.size(); i++)
                        {
                            if(positions.contains(i))
                                for(int j = i + 1; j < container.size(); j++)
                                    if(positions.contains(j))
                                    {
                                        int        ageDifference        =
Math.abs(container.get(i).getInformation().getAge() - container.get(j).getInformation().getAge());
                                        matcherAge                    =
patternAgeDifference.matcher(Integer.toString(ageDifference));
                                        if(matcherAge.matches())
                                        {

    matcherGenderMale = patternMale.matcher(container.get(i).getClientGender());

    if(matcherGenderMale.matches())
                                            {

    matcherGenderFemale = patternFemale.matcher(container.get(j).getClientGender());

    if(matcherGenderFemale.matches())
                                                {

    System.out.println("Couple " + num + ":\n" + container.get(i).toString() + "\n" + container.get(j).toString()
+ "\n");

    foundCouple = true;

    num++;
                                                }
                                            }
                                            else
                                            {

    matcherGenderMale = patternMale.matcher(container.get(j).getClientGender());

    if(matcherGenderMale.matches())
                                                {

    System.out.println("Couple " + num + ":\n" + container.get(i).toString() + "\n" + container.get(j).toString()
+ "\n");

    foundCouple = true;

    num++;
                                                }
                                            }

                                        }
                                    }
                        }
                    if(foundCouple != true)
                        System.out.println("There is no matching couples.\n");
                    break;
                case 11:
                    final int ARR_SIZE = 10000;
                    final int NUMBER_OF_THREADS;
                    final int NUMBER_OF_ITERATIONS;
                    int option1;
                    long time1, time2;
                    System.out.println("Adding new elements...");
                    for(int i = 0; i < ARR_SIZE; i++)
                    {
                        String[] hobbies = {Integer.toString(i)};
                        info = new InfoAboutYourself(Integer.toString(i), i, i,
Integer.toString(i), hobbies);
                        requirements = new PartnerRequirements(Integer.toString(i), i,
i, hobbies);
                        date = new GregorianCalendar();
                        container.add(new Client(Integer.toString(i), i, date, info,
requirements));
                    }
                    printAll(container);
                    System.out.println("Calculations:");
                    System.out.println("1. Parallel");
                    System.out.println("2. Serial");
                    option1 = inInt.nextInt();
                    System.out.println();
                    if(option1 != 1 && option1 != 2)
                    {
                        System.out.println("You have entered the wrong command");
                        break;
                    }
                    if(option1 == 1)
                    {
                        NUMBER_OF_THREADS = 3;
                        NUMBER_OF_ITERATIONS = 1;
                    }
                    else
                    {
                        NUMBER_OF_THREADS = 1;
                        NUMBER_OF_ITERATIONS = 3;
                    }
                    MyThread[] threads = new MyThread[NUMBER_OF_THREADS];
                    try
                    {
                        for(int i = 0; i < NUMBER_OF_THREADS; i++)
                        {
                            threads[i] = new MyThread(container, "Thread " +
(i+1), NUMBER_OF_ITERATIONS);
                            threads[i].thread.start();
                        }
                        time1 = System.currentTimeMillis();
                        for(int i = 0; i < NUMBER_OF_THREADS; i++)
                            threads[i].thread.join();
                        time2 = System.currentTimeMillis();
                        System.out.println("Time result: " + (double)(time2 -
time1)/1000 + " seconds");
                    }
                    catch(InterruptedException ex)
                    {
                        System.out.println("Thread has been interrupted.");
                    }
                    System.out.println();
                    container.clear();
                    break;
                case 0:
                    endCheck = false;
                    container.clear();
                    inInt.close();
                    inStr.close();
```

```
					break;
				default:
					System.out.println("Wrong command\n");
					break;
				}
			}
			System.out.println("End.");
		}

		public static int indexGenerator(ArrayList<Client> arr)
		{
			arr.sort(new IdComparator());
			int index = 1;
			for(int i = 0; i < arr.size(); i++)
				if(index == arr.get(i).getId())
					index++;
				else
					return index;
			return index;
		}

		public static int intRegexCheck(int value, Pattern pattern)
		{
			Matcher matcher;
			Scanner in = new Scanner(System.in);
			boolean ready = false;
			do
			{
				matcher = pattern.matcher(Integer.toString(value));
				if(!matcher.matches())
				{
					System.out.println("You've entered the wrong data. Try again:");
					value = in.nextInt();
				}
				else
					ready = true;
			}
			while(!ready);
			return value;
		}

		public static String stringRegexCheck(String value, Pattern pattern)
		{
			Matcher matcher;
			Scanner in = new Scanner(System.in);
			boolean ready = false;
			do
			{
				matcher = pattern.matcher(value);
				if(!matcher.matches())
				{
					System.out.println("You've entered the wrong data. Try again:");
					value = in.nextLine();
				}
				else
					ready = true;
			}
			while(!ready);
			return value;
		}
		public static void printAll(ArrayList<Client> arr)
		{
			for(Client a : arr)
				a.print();
			System.out.println();
		}
	}
```

Клас Client

```
	package ua.khpi.oop.zanochkyn15;

	import java.io.Serializable;
	import java.util.Comparator;
	import java.util.GregorianCalendar;
	import ua.khpi.oop.zanochkyn10.InfoAboutYourself;
	import ua.khpi.oop.zanochkyn10.PartnerRequirements;

	public class Client implements Serializable
	{
		private static final long serialVersionUID = 8633968308489911794L;

		/*
		 * Змінні
		 */
		private String gender;
		private int id;
		private GregorianCalendar registrationDate;
		private InfoAboutYourself information;
		private PartnerRequirements requirements;

		/*
		 * Конструктори класу
		 */
		public Client(String gender, int id, GregorianCalendar date, InfoAboutYourself info, 
PartnerRequirements requirements)
		{
			this.gender = gender;
			this.id = id;
			this.registrationDate = date;
			this.information = info;
			this.requirements = requirements;
		}

		public Client()
		{

		}
		/*
		 * Геттери та сеттери
		 */
		public String getClientGender()
		{
			return gender;
		}

		public void setClientGender(String gender)
		{
			this.gender = gender;
		}

		public int getId()
		{
			return id;
		}

		public void setId(int id)
		{
			this.id = id;
		}

		public GregorianCalendar getDate()
		{
			return registrationDate;
		}

		public void setDate(GregorianCalendar date)
		{
			this.registrationDate = date;
		}

		public InfoAboutYourself getInformation()
		{
			return information;
		}

		public void setInformation(InfoAboutYourself info)
		{
			this.information = info;
		}

		public PartnerRequirements getRequirements()
		{
			return requirements;
		}

		public void setRequirements(PartnerRequirements requirements)
		{
			this.requirements = requirements;
		}

		@Override
		public String toString()
		{
			return "ID - " + id + "\nRegistration date - " + registrationDate.getTime() + "\nGender - " 
+ gender + "\n\n" +
						"Information about yourself:\nName - " + getInformation().getName() + 
"\nAge - " + getInformation().getAge() +
						"\nHeight - " + getInformation().getHeight() + "\nEye colour - " + 
getInformation().getEyeColour() +
						"\nHobbies - " + hobbiesToString(getInformation().getClientHobby()) + 
"\n\n" +
						"Partner requirements:\nGender - " + 
getRequirements().getPartnerGender() + "\nMin age - " + getRequirements().getMinAge() +
						"\nMax age - " + getRequirements().getMaxAge() + "\nHobbies - " + 
hobbiesToString(getRequirements().getPartnerHobby()) +
						"\n---------------------------------------";
		}
```

```
        public void print()
        {
            System.out.println("ID - " + id + "\nRegistration date - " + registrationDate.getTime() +
"\nGender - " + gender + "\n\n" +
                    "Information about yourself:\nName - " + getInformation().getName() +
"\nAge - " + getInformation().getAge() +
                    "\nHeight - " + getInformation().getHeight() + "\nEye colour - " +
getInformation().getEyeColour() +
                    "\nHobbies - " + hobbiesToString(getInformation().getClientHobby()) +
"\n\n" +
                    "Partner requirements:\nGender - " +
getRequirements().getPartnerGender() + "\nMin age - " + getRequirements().getMinAge() +
                    "\nMax age - " + getRequirements().getMaxAge() + "\nHobbies - " +
hobbiesToString(getRequirements().getPartnerHobby()) +
                    "\n---------------------------------------");
        }

        public String hobbiesToString(String[] arr)
        {
            int size = arr.length;
            if(size == 0)
                return "No hobbies";
            StringBuilder sb = new StringBuilder();
            int i = 1;
            for(String temp : arr)
            {
                if(i != size)
                    sb.append(temp + ", ");
                else
                    sb.append(temp);
                i++;
            }
            return sb.toString();
        }
    }

    class RegistrationDateComparator implements Comparator<Client>
    {
        public int compare(Client o1, Client o2)
        {
            if(o1.getDate().getTimeInMillis() > o2.getDate().getTimeInMillis())
                return 1;
            else if(o1.getDate().getTimeInMillis() < o2.getDate().getTimeInMillis())
                return -1;
            else
                return 0;
        }
    }

    class ClientHobbiesComparator implements Comparator<Client>
    {
        public int compare(Client o1, Client o2)
        {
            if(o1.getInformation().getClientHobby().length >
o2.getInformation().getClientHobby().length)
                return 1;
            else if(o1.getInformation().getClientHobby().length <
o2.getInformation().getClientHobby().length)
                return -1;
```

```
			else
				return 0;
		}
	}

	class PartnerHobbiesComparator implements Comparator<Client>
	{
		public int compare(Client o1, Client o2)
		{
			if(o1.getRequirements().getPartnerHobby().length                    >
o2.getRequirements().getPartnerHobby().length)
				return 1;
			else            if(o1.getRequirements().getPartnerHobby().length            <
o2.getRequirements().getPartnerHobby().length)
				return -1;
			else
				return 0;
		}
	}

	class IdComparator implements Comparator<Client>
	{
		public int compare(Client o1, Client o2)
		{
			if(o1.getId() > o2.getId())
				return 1;
			else if(o1.getId() < o2.getId())
				return -1;
			else
				return 0;
		}
	}
```

Клас MyThread

```
	package ua.khpi.oop.zanochkyn15;

	import java.util.ArrayList;

	public class MyThread implements Runnable
	{
		private boolean isActive;
		Thread thread;
		private ArrayList<Client> container;
		private int time;

		MyThread(ArrayList<Client> container, String name, int time)
		{
			this.container = container;
			isActive = true;
			thread = new Thread(this, name);
			this.time = time;
		}

		void disable()
		{
			isActive = false;
		}

		@Override
		public void run()
		{
			long countTime = 0;
			long temp = 0;
			for(int i = 0; i < time; i++)
			{
				try
				{
					temp = count();
				}
				catch (InterruptedException e)
				{
					e.printStackTrace();
				}
				countTime += temp;
			}
			System.out.println("Time spent: " + countTime + " milliseconds");
		}

		private long count() throws InterruptedException
		{
			long count = 0;
			long begin = System.currentTimeMillis();
			Thread.currentThread().sleep(1000);
			for(Client i : container)
				if(isActive)
					count += i.getInformation().getAge();
				else
				{
					System.out.println(Thread.currentThread().getName()      +      "      was
stopped.");
					return -1;
				}
			System.out.println(Thread.currentThread().getName() + ": " + count);
			System.out.println(Thread.currentThread().getName() + " finished");
			return (System.currentTimeMillis() - begin);
		}
	}
```

3 ВАРІАНТИ ВИКОРИСТАННЯ

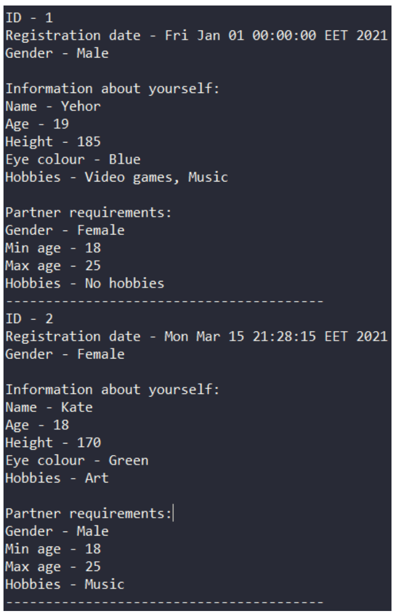
Можливість виконання програми в автоматичному режимі, якщо ввести у командному рядку аргументи –a або –auto та у діалоговому режимі – аргументи –d або –dialog.

У діалоговому режимі було розроблено меню, яке дозволяє користувачу:

1. Вивести усі елементи у консоль (1 команда меню) ;
2. Додати елемент у контейнер (2 команда меню);
3. Видалити елемент з контейнеру (3 команда меню);
4. Редагувати один з елементів (4 команда меню);

5. Очистити контейнер (5 команда меню);
6. Серіалізувати контейнер у файл (6 команда меню);
7. Десеріалізувати контейнер (7 команда меню);
8. Визначити кількість елементів у контейнері (8 команда меню);
9. Сортування контейнера (9 команда меню);
10. Знайти всі комбінації пар (10 команда меню);
11. Виконати завдання з потоками (11 команда меню);
12. Закінчити виконання програми (0 команда меню).

4 РЕЗУЛЬТАТИ РОБОТИ ПРОГРАМИ



```
ID - 1
Registration date - Fri Jan 01 00:00:00 EET 2021
Gender - Male

Information about yourself:
Name - Yehor
Age - 19
Height - 185
Eye colour - Blue
Hobbies - Video games, Music

Partner requirements:
Gender - Female
Min age - 18
Max age - 25
Hobbies - No hobbies
----------------------------------------
ID - 2
Registration date - Mon Mar 15 21:28:15 EET 2021
Gender - Female

Information about yourself:
Name - Kate
Age - 18
Height - 170
Eye colour - Green
Hobbies - Art

Partner requirements:
Gender - Male
Min age - 18
Max age - 25
Hobbies - Music
----------------------------------------
```

Рисунок 15.1 – Результат роботи програми у середовищі Eclipse

Висновок

Під час виконання лабораторної роботи було набуто навички роботи з колекціями та їх обробкою в середовищі Eclipse IDE.