Міністерство освіти і науки України
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Факультет інформатики та обчислювальної техніки

Кафедра інформатики та програмної інженерії

Звіт

з лабораторної роботи № 1.2
з дисципліни «Основи програмування – 2.
Метидології програмування»

«Бінарні файли»

Варіант 13

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Київ 2022

Лабораторна робота 1.2
Бінарні файли

Варіант 13

Створити файл з інформацією про телефонні переговори: номер телефону, початок та кінець переговорів (за шаблоном - ГГ.ХХ). Розрахувати оплату за переговори, вважаючи, що хвилина розмови вдень (з 9:00 до 20:00) коштує 1,5 грн.,а в вночі -- 0,90 грн. Видалити з файлу дані про розмови тривалістю менше 3 хв.

Код програми

C#

Program.cs

```
using System;

using System.Collections.Generic;


namespace Lab1._2

{

    class Program

    {

        static void Main(string[] args)

        {

            const string filePath = "conversations.bat";

            bool appendOrNot = Operations.ChooseAppendOrNot(filePath);

            List<CallInfo> callList = Operations.InputInfo();

            Operations.SaveInfo(filePath, callList, appendOrNot);


            List<CallInfo> newCallList = Operations.ReadInfo(filePath);

            Operations.ShowInfo(newCallList);


            newCallList = Operations.DeleteShortest(newCallList);

            Operations.SaveInfo(filePath, newCallList, false);


            List <CallInfo>finalCallList = Operations.ReadInfo(filePath);

            Operations.ShowInfo(finalCallList);

        }

    }

}
```

Callinfo.cs

```
using System;

using System.Collections.Generic;

using System.Text;


namespace Lab1._2

{

    class CallInfo

    {

        private string phoneNumber;

        private string startTime;

        private string endTime;



        public CallInfo(string phoneNumber, string startTime, string endTime)

        {

            this.phoneNumber = phoneNumber;

            this.startTime = startTime;

            this.endTime = endTime;

        }


        public  string GetPhoneNumber()

        {

            return phoneNumber;

        }


        public string GetStartMinute()

        {

            return startTime;

        }


        public string GetEndMinute()

        {

            return endTime;

        }
```

```
public int Duration
{
    get
    {
        int startMinute = ConvertStringTimeToMinutes(startTime);
        int endMinute = ConvertStringTimeToMinutes(endTime);

        if (startMinute > endMinute)
        {
            return endMinute + 24 * 60 - startMinute;
        }
        return endMinute - startMinute;
    }
}

public float Payment
{
    get
    {
        float price = 0;
        int totalDurationNight = 0;
        int totalDurationDay = 0;
        //int duration = Duration;
        float priceDay = 1.5f;
        float priceNight = 0.9f;

        const int zeroMinuteOfTheDay = 0;
        const int lastMinuteOfTheDay = 24 * 60;

        int startT = ConvertStringTimeToMinutes(startTime);
        int endT = ConvertStringTimeToMinutes(endTime);

        if (startT <= endT)
        {
```

```
                    GetNightAndDayDuration(startT, endT, out totalDurationNight, out 
totalDurationDay);
                }
                else
                {
                    GetNightAndDayDuration(startT, lastMinuteOfTheDay, out int 
firstDurationNight, out int firstDurationDay);
                    GetNightAndDayDuration(zeroMinuteOfTheDay, endT, out int 
secondDurationNight, out int secondDurationDay);
                    totalDurationDay = firstDurationDay + secondDurationDay;
                    totalDurationNight = firstDurationNight + secondDurationNight;
                }

                price = totalDurationNight * priceNight + totalDurationDay * priceDay;
                return price;
            }
        }

        public static bool TryCreateFromString(string line, out CallInfo result)
        {
            string[] elements = line.Split(' ');
            if (elements.Length != 3)
            {
                result = null;
                return false;
            }
            else if (!IsPhoneNumberValid(elements[0]))
            {
                result = null;
                return false;
            }
            else if (!IsTimeValid(elements[1]) || !IsTimeValid(elements[2]))
            {
                result = null;
                return false;
            }

            result = new CallInfo(elements[0], elements[1], elements[2]);
```

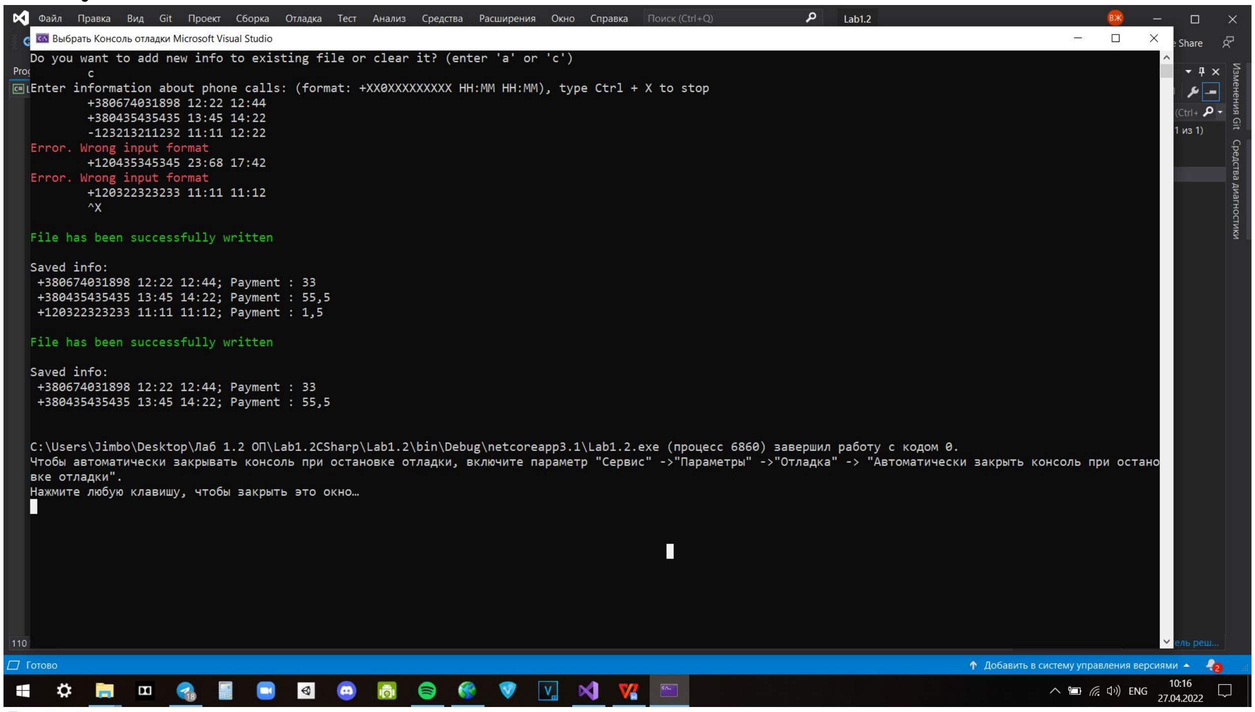
```
    return true;
}

private static bool IsPhoneNumberValid(string number)
{
    if (number.Length != 13)
    {
        return false;
    }
    if (number[0] != '+')
    {
        return false;
    }
    if (number[3] != '0')
    {
        return false;
    }
    for (int i = 1; i < number.Length; i++)
    {
        if (!Char.IsDigit(number[i]))
        {
            return false;
        }
    }
    return true;
}

private static bool IsTimeValid(string time)
{
    if (time.Length != 5 || time[2] != ':')
    {
        return false;
    }
    for (int i = 0; i < time.Length; i++)
    {
        if (i != 2 && !char.IsDigit(time[i]))
```

```
                {
                    return false;
                }
            }
            string[] digits = time.Split(':');
            int hours = Convert.ToInt32(digits[0]);
            int minutes = Convert.ToInt32(digits[1]);
            if (hours > 23 || minutes > 59)
            {
                return false;
            }
            return true;
        }

        private static int ConvertStringTimeToMinutes(string time)
        {
            string[] digits = time.Split(':');
            int hours = Convert.ToInt32(digits[0]);
            int minutes = Convert.ToInt32(digits[1]);
            return hours * 60 + minutes;
        }

        private static void GetNightAndDayDuration(int startT, int endT, out int
durationNight, out int durationDay)
        {
            durationNight = 0;
            durationDay = 0;

            int nightTime = 20 * 60;
            int dayTime = 9 * 60;

            if (startT == endT)
            {
                durationNight = 0;
                durationDay = 0;
            }
            else if (startT < dayTime && endT < dayTime)
            {
                durationNight = endT - startT;
            }
            else if (startT < dayTime && endT > dayTime && endT < nightTime)
            {
                durationNight = dayTime - startT;
                durationDay = endT - dayTime;
            }
            else if (startT < dayTime && endT >= nightTime)
            {
                durationNight = dayTime - startT + endT - nightTime;
                durationDay = nightTime - dayTime;
            }
            else if (startT >= dayTime && startT < nightTime && endT < nightTime)
            {
                durationDay = endT - startT;
            }
            else if (startT >= dayTime && startT < nightTime && endT >= nightTime)
            {
                durationDay = nightTime - startT;
                durationNight = endT - nightTime;
            }
            else if (startT >= nightTime)
            {
                durationNight = endT - startT;
            }
        }

    }
}
```

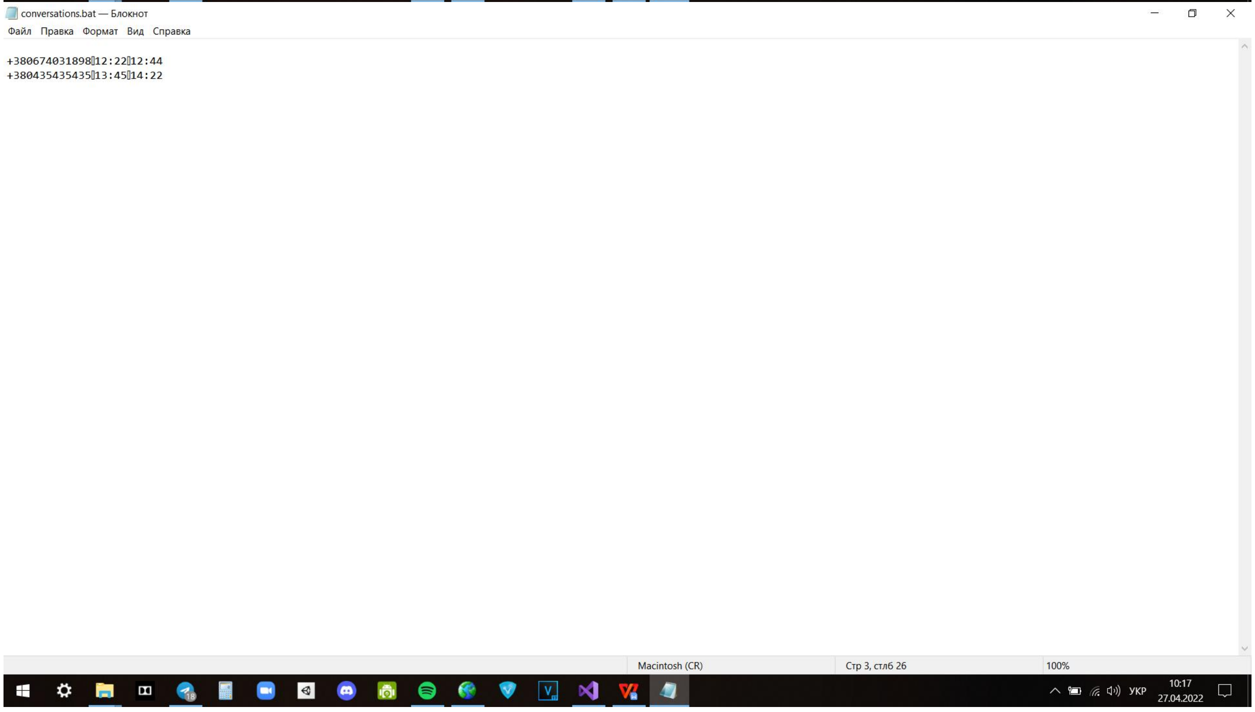
Operations.cs

```
using System;

using System.Collections.Generic;

using System.IO;

using System.Text;


namespace Lab1._2

{

    class Operations

    {

        public static List<CallInfo> InputInfo()

        {

            List<CallInfo> infoList = new List<CallInfo>();

            Console.WriteLine("Enter information about phone calls: (format: 
+XX0XXXXXXXXX HH:MM HH:MM), type Ctrl + X to stop");

            string exitLine = "\u0018";

            while (true)

            {

                Console.Write("\t");

                string line = Console.ReadLine();

                if (line == exitLine)

                {

                    Console.WriteLine();

                    return infoList;

                }

                else if (CallInfo.TryCreateFromString(line, out CallInfo result))

                {

                    infoList.Add(result);

                }

                else

                {

                    Console.ForegroundColor = ConsoleColor.Red;

                    Console.WriteLine("Error. Wrong input format");

                    Console.ForegroundColor = ConsoleColor.Gray;

                }

            }
        }

        public static bool ChooseAppendOrNot(string path)
        {

            if (File.Exists(path))
            {
                while (true)
                {
                    Console.WriteLine("Do you want to add new info to existing file or
clear it? (enter 'a' or 'c')");
                    Console.Write("\t");
                    string input = Console.ReadLine();
                    if (input == "a")
                    {
                        return true;
                    }
                    else if (input == "c")
                    {
                        return false;
                    }
                    else
                    {
                        Console.ForegroundColor = ConsoleColor.Red;
                        Console.WriteLine("Wrong symbol. Try again");
                        Console.ForegroundColor = ConsoleColor.Gray;
                    }
                }
            }
            return true;
        }

        public static void SaveInfo(string path, List<CallInfo> infoList, bool
appendOrNot)
        {
            if (!appendOrNot)
            {
                File.Delete(path);
            }
            using (BinaryWriter writer = new BinaryWriter(File.Open(path,
FileMode.Append)))
            {
                foreach (CallInfo callInfo in infoList)
                {
                    writer.Write(callInfo.GetPhoneNumber());
                    writer.Write(callInfo.GetStartMinute());
                    writer.Write(callInfo.GetEndMinute());
                }
            }

            Console.ForegroundColor = ConsoleColor.Green;
            Console.WriteLine("File has been successfully written");
            Console.ForegroundColor = ConsoleColor.Gray;
            Console.WriteLine();
        }

        public static List<CallInfo> ReadInfo(string path)
        {
            List<CallInfo> infoList = new List<CallInfo>();
            using (BinaryReader reader = new BinaryReader(File.Open(path, FileMode.Open)))
            {
                while (reader.PeekChar() > -1)
                {
                    string number = reader.ReadString();
                    string startTime = reader.ReadString();
                    string endTime = reader.ReadString();
                    infoList.Add(new CallInfo(number, startTime, endTime));
                }
            }
            return infoList;
        }

        public static void ShowInfo(List<CallInfo>info)
        {
            Console.WriteLine("Saved info: ");
            for (int i = 0; i < info.Count; i++)
            {
                Console.WriteLine($" {info[i].GetPhoneNumber()} {info[i].GetStartMinute()}
{info[i].GetEndMinute()}; Payment : {info[i].Payment}");
            }
            Console.WriteLine();
        }

        public static List<CallInfo> DeleteShortest(List<CallInfo> info)
        {
            for (int i = 0; i < info.Count; i++)
            {
                if (info[i].Duration < 3)
                {
                    info.Remove(info[i]);
                    i--;
                }
            }
            return info;
        }

    }
}
```

Тестування:


Файл Правка Вид Git Проект Сборка Отладка Тест Анализ Средства Расширения Окно Справка
Поиск (Ctrl+Q)
Lab1.2
Выбрать Консоль отладки Microsoft Visual Studio
Готово
Добавить в систему управления версиями
ENG
10:16
27.04.2022

```
Do you want to add new info to existing file or clear it? (enter 'a' or 'c')
        c
Enter information about phone calls: (format: +XX0XXXXXXXXX HH:MM HH:MM), type Ctrl + X to stop
        +380674031898 12:22 12:44
        +380435435435 13:45 14:22
        -123213211232 11:11 12:22
Error. Wrong input format
        +120435345345 23:68 17:42
Error. Wrong input format
        +120322323233 11:11 11:12
        ^X

File has been successfully written

Saved info:
 +380674031898 12:22 12:44; Payment : 33
 +380435435435 13:45 14:22; Payment : 55,5
 +120322323233 11:11 11:12; Payment : 1,5

File has been successfully written

Saved info:
 +380674031898 12:22 12:44; Payment : 33
 +380435435435 13:45 14:22; Payment : 55,5


C:\Users\Jimbo\Desktop\Лаб 1.2 ОП\Lab1.2CSharp\Lab1.2\bin\Debug\netcoreapp3.1\Lab1.2.exe (процесс 6860) завершил работу с кодом 0.
Чтобы автоматически закрывать консоль при остановке отладки, включите параметр "Сервис" ->"Параметры" ->"Отладка" -> "Автоматически закрыть консоль при остано
вке отладки".
Нажмите любую клавишу, чтобы закрыть это окно…
```



```
+38067403189812:2212:44
+38043543543513:4514:22
```

Python

main.py

```python
from module1 import *

path = "conversations.bat"
choose_append_or_not(path)
list_of_calls = input_info()

write_info(path, list_of_calls)
new_list_of_calls = read_info(path)

print("Written file is: ")
show_info(new_list_of_calls)
delete_shortest(new_list_of_calls)

write_without_shortest(path, new_list_of_calls)
final_list_of_calls = read_info(path)
print("Final file without short calls is: ")
show_info(final_list_of_calls)
```

module1.py

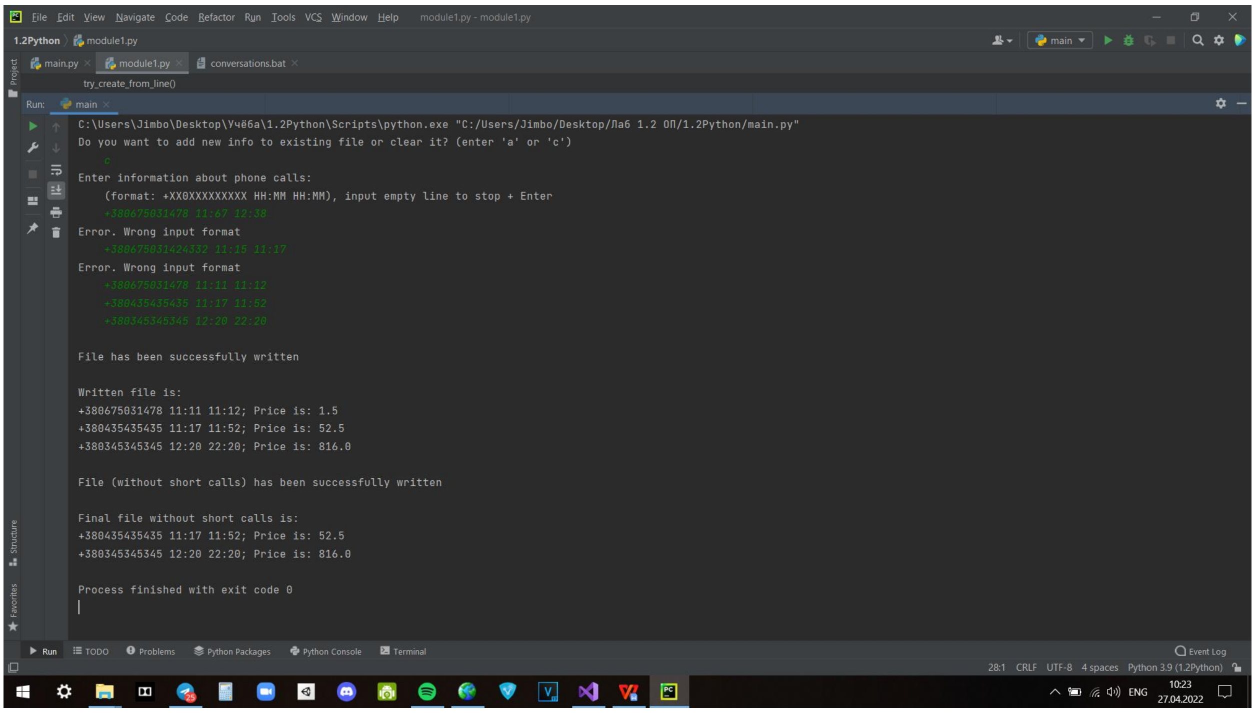
```python
import pickle


def choose_append_or_not(path):
    input_mode = str(input("Do you want to add new info to existing file or clear it? (enter 'a' or 'c') \n \t"))
    while True:
        if input_mode == "a":
            break
        elif input_mode == "c":
            open(path, "wb").close()
            break
        else:
            input_mode = str(input("Wrong symbol. Try again: \n \t"))


def input_info():
    info = []
    line = input('''Enter information about phone calls:
    (format: +XX0XXXXXXXXX HH:MM HH:MM), input empty line to stop + Enter  \n \t''')
    while line:
        if try_create_from_line(line):
            info.append(line)
        else:
            print("Error. Wrong input format")
        line = input("\t")
    return info


def try_create_from_line(line):
    elements = line.split()
    if len(elements) != 3:
        return False
    elif not is_phone_number_valid(elements[0]):
        return False
    elif not (is_time_valid(elements[1]) & is_time_valid(elements[2])):
        return False

    return True
```

```python
def write_info(path, info):
    saved_info = []
    try:
        with open(path, "rb") as file:
            saved_info = pickle.load(file)
    except:
        pass
    for call in info:
        elements = call.split()
        call_info = {
            "phone_number": elements[0],
            "start_time": elements[1],
            "end_time": elements[2]
        }
        saved_info.append(call_info)
    with open(path, "wb") as file:
        pickle.dump(saved_info, file)
        print("File has been successfully written \n")


def write_without_shortest(path, info):
    with open(path, "wb") as file:
        pickle.dump(info, file)
    print("\nFile (without short calls) has been successfully written \n")


def read_info(path):
    with open(path, "rb") as file:
        info = pickle.load(file)
    return info


def show_info(info):
    for calls in info:
        print(f'{calls["phone_number"]} {calls["start_time"]} {calls["end_time"]}; '
              f'Price is: {get_price(calls["start_time"], calls["end_time"])}')


def get_price(start_time, end_time):
    price = 0
    total_duration_night = 0
    total_duration_day = 0
    price_day = 1.5
    price_night = 0.9

    zero_minute_of_the_day = 0
    last_minute_of_the_day = 24*60

    start_t = convert_time_into_minutes(start_time)
    end_t = convert_time_into_minutes(end_time)

    if start_t <= end_t:
        total_duration_day, total_duration_night = get_night_and_day_duration(start_t, end_t)
    else:
        first_duration_day, first_duration_night = get_night_and_day_duration(start_t, last_minute_of_the_day)
        second_duration_day, second_duration_night = get_night_and_day_duration(zero_minute_of_the_day, end_t)
        total_duration_day = first_duration_day + second_duration_day
        total_duration_night = first_duration_night + second_duration_night

    price = total_duration_night * price_night + total_duration_day * price_day
    return price
```

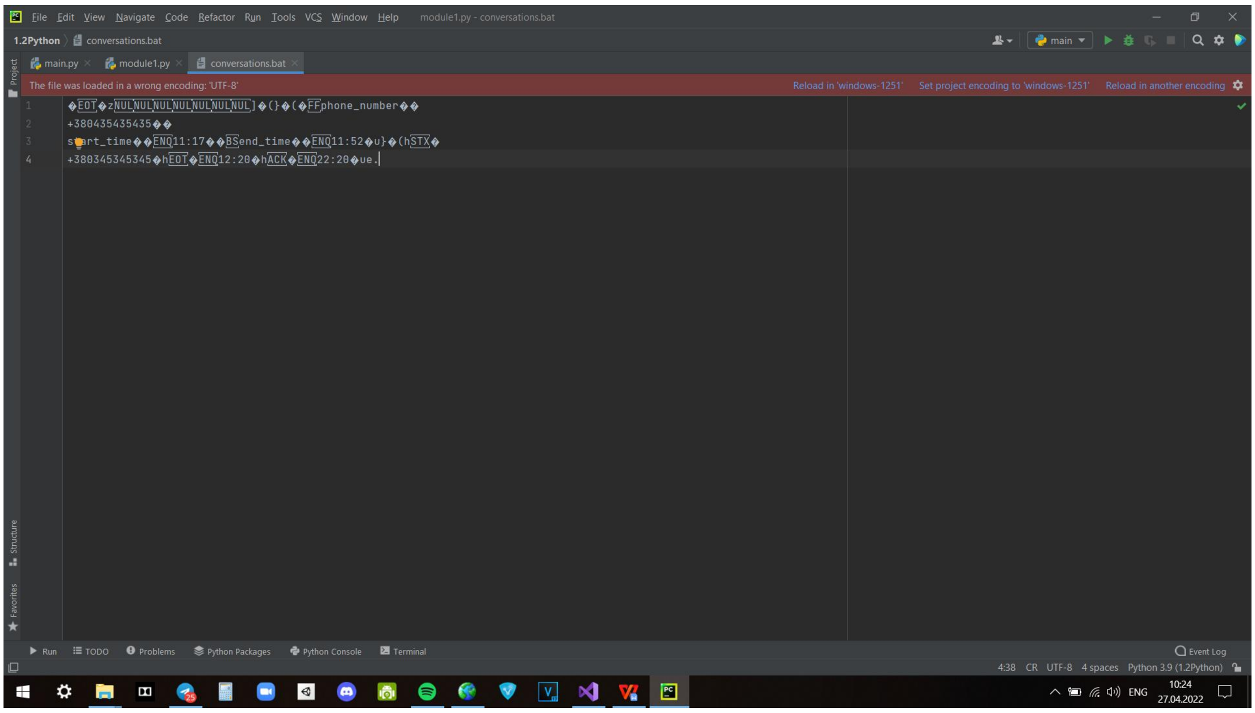
```python
def get_night_and_day_duration(start_t, end_t):
    duration_night = 0
    duration_day = 0

    night_time = 20 * 60
    day_time = 9 * 60
    if start_t == end_t:
        duration_night = 0
        duration_day = 0
    elif start_t < end_t < day_time:
        duration_night = end_t - start_t
    elif (start_t < day_time) & (day_time < end_t < night_time):
        duration_night = day_time - start_t
    elif (start_t < day_time) & (end_t >= night_time):
        duration_night = day_time - start_t + end_t - night_time
        duration_day = night_time - day_time
    elif (start_t >= day_time) & (start_t < end_t < night_time):
        duration_day = end_t - start_t
    elif (day_time <= start_t < night_time) & (end_t >= night_time):
        duration_day = night_time - start_t
        duration_night = end_t - night_time
    elif start_t >= night_time:
        duration_night = end_t - start_t

    return duration_day, duration_night


def delete_shortest(info):
    for calls in info:
        if get_duration(calls["start_time"], calls["end_time"]) < 3:
            info.remove(calls)


def get_duration(start_time, end_time):
    start_t = convert_time_into_minutes(start_time)
    end_t = convert_time_into_minutes(end_time)
    if start_t > end_t:
        return end_t + 24 * 60 - start_t
    return end_t - start_t


def convert_time_into_minutes(line):
    digits = line.split(":")
    return int(digits[0]) * 60 + int(digits[1])


def is_phone_number_valid(line):
    if len(line) != 13:
        return False
    if line[3] != '0':
        return False

    edited_line = line.replace('+', '1')
    if not edited_line.isdigit():
        return False

    return True


def is_time_valid(time):
    if (len(time) != 5) | (time[2] != ':'):
```

```
    return False

edited_time = time.replace(':', '1')
if not edited_time.isdigit():
    return False

digits = time.split(':')
if (int(digits[0]) > 23) | (int(digits[1]) > 59):
    return False

return True
```

Тестування:



```
C:\Users\Jimbo\Desktop\Учёба\1.2Python\Scripts\python.exe "C:/Users/Jimbo/Desktop/Лаб 1.2 ОП/1.2Python/main.py"
Do you want to add new info to existing file or clear it? (enter 'a' or 'c')
    c
Enter information about phone calls:
    (format: +XX0XXXXXXXXX HH:MM HH:MM), input empty line to stop + Enter
    +380675031478 11:67 12:38
Error. Wrong input format
    +380675031424332 11:15 11:17
Error. Wrong input format
    +380675031478 11:11 11:12
    +380435435435 11:17 11:52
    +380345345345 12:20 22:20

File has been successfully written

Written file is:
+380675031478 11:11 11:12; Price is: 1.5
+380435435435 11:17 11:52; Price is: 52.5
+380345345345 12:20 22:20; Price is: 816.0

File (without short calls) has been successfully written

Final file without short calls is:
+380435435435 11:17 11:52; Price is: 52.5
+380345345345 12:20 22:20; Price is: 816.0

Process finished with exit code 0
```



The file was loaded in a wrong encoding: 'UTF-8'

```
�EOT�zNULNULNULNULNULNULNUL]�(}�(�FFphone_number��
+380435435435��
start_time��ENQ11:17��BSend_time��ENQ11:52�u}�(hSTX�
+380345345345�hEOT�ENQ12:20�hACK�ENQ22:20�ue.
```

Висновки:

На цій лабораторній роботі я застосував на практиці знання щодо створення та обробки бінарних файлів данних на двох мовах програмування та побачив відмінності в їх реалізації.