《Java 技术》实验报告

实验三： **2020 年 6 月 3 日**

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课程名称	Java 技术	实验项目名称	基于 GUI 的网络通信设计			指导教师		
教师评语		教师签名： 年 月 日						

一、实验目的

1. 掌握 Java 中 GUI 程序的编写，包括事件监听机制。
2. 掌握 Java 的网络通信编程，ServerSocket，Socket 类的使用。
3. 掌握 Java 中多线程的编程，Thread 类，Runnable 接口的使用。
4. 掌握用面向对象的方法分析和解决复杂问题。

二、实验原理

1 编写程序完成以下功能：

1. 设计一个基于 GUI 的客户-服务器的通信应用程序，如图 1，图 2 所示。

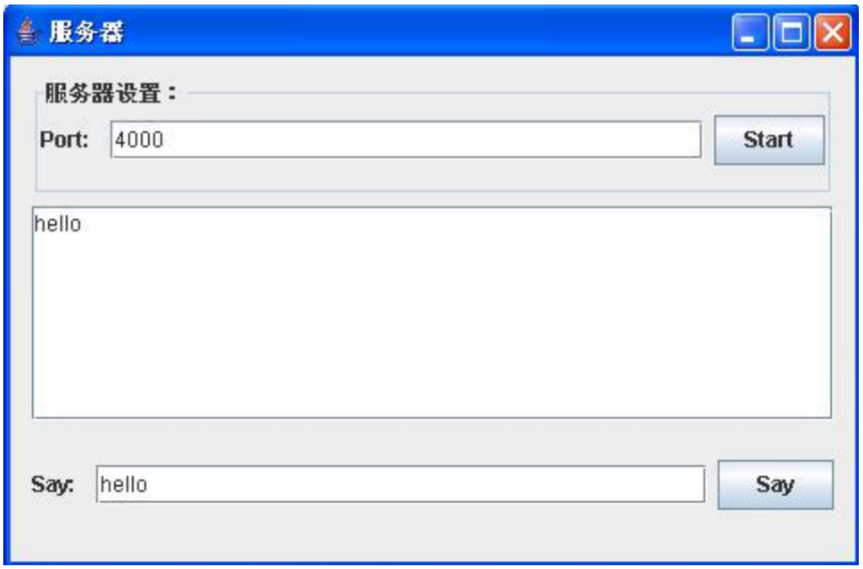


图 1 Socket 通信服务器端界面

图 2 Socket 通信客户端界面

2. 图 1 为 Socket 通信服务器端界面，点击该界面中的【Start】按钮，启动服务器监听服务（在图 1 界面中间的多行文本区域显示“Server starting…”字样）。图 2 为 Socket 通信客户端界面，点击该界面中的【Connect】按钮与服务器建立链接，并在图 2 所示界面中间的多行文本区域显示“Connect to server…”字样，当服务器端监听到客户端的连接后，在图 1 界面中间的多行文本区域追加一行“Client connected…”字样，并与客户端建立 Socket 连接。

3. 当图 1 所示的服务器端和图 2 所示的客户机端建立 Socket 连接后，编程实现服务端、客户端之间的“单向通信”：在客户端的输入界面发送消息，在服务端接收该消息，并将接收到对方的数据追加显示在多行文本框中。

三、使用硬件、软件环境

Windows10，内存 8g，硬盘 1TB，JDK1.8，eclipse

四、实验过程、步骤及原始记录(算法、原程序、测试结果，分析等)

客户端：

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.ActionEvent;
import java.awt.event.ActionListener;
import java.io.*;
import java.net.Socket;

public class Client {
    private static Socket socket = null;
    public static void main(String[] args){
        JFrame.setDefaultLookAndFeelDecorated(true);
        JFrame frame = new JFrame("客户端");
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        frame.setResizable(false);
        frame.setBounds(300, 200, 500, 300);
```

```
        frame.setLayout(new BorderLayout(10, 0));

        JPanel northPanel = new JPanel();
        JLabel ipLabel = new JLabel("Server Ip: ");
        JTextField ipField = new JTextField(10);
        JLabel portLabel = new JLabel("Server Port: ");
        JTextField portField = new JTextField(6);
        northPanel.setBorder(BorderFactory.createTitledBorder("客户机设置: "));
        JButton connectBtn = new JButton("Connect");
        northPanel.add(ipLabel);
        northPanel.add(ipField);
        northPanel.add(portLabel);
        northPanel.add(portField);
        northPanel.add(connectBtn);

        JPanel centerPanel = new JPanel();
        JTextArea area = new JTextArea(10, 35);
        area.setMargin(new Insets(10, 10, 10, 10));
        area.setEnabled(false);
        centerPanel.add(area);

        JPanel southPanel = new JPanel();
        JLabel sayLabel = new JLabel("Say: ");
        JTextField sayField = new JTextField(30);
        JButton sayBtn = new JButton("Say");
        southPanel.add(sayLabel);
        southPanel.add(sayField);
        southPanel.add(sayBtn);

        frame.add(northPanel, BorderLayout.NORTH);
        frame.add(centerPanel, BorderLayout.CENTER);
        frame.add(southPanel, BorderLayout.SOUTH);

        frame.setVisible(true);

        connectBtn.addActionListener(new ActionListener() {
            @Override
            public void actionPerformed(ActionEvent e) {
                area.append("Connect to server…\n");
                try {
                    socket = new Socket(ipField.getText(),
Integer.parseInt(portField.getText()));
                }catch (IOException ex){
                    ex.printStackTrace();
```

```
                }
                new Thread(new Runnable() {
                    @Override
                    public void run() {
                        try {
                            while(true){
                                BufferedReader br = new BufferedReader(new
InputStreamReader(socket.getInputStream()));
                                String res = null;
                                while((res = br.readLine()) != null){
                                    area.append(res + "\n");
                                }
                            }
                        } catch (IOException ex) {
                            ex.printStackTrace();
                        }
                    }
                }).start();
            }
        });

        sayBtn.addActionListener(new ActionListener() {
            @Override
            public void actionPerformed(ActionEvent e) {
                try{
                    PrintWriter pw = new PrintWriter(socket.getOutputStream());
                    pw.println(sayField.getText());
                    pw.flush();
                    area.append(sayField.getText() + "\n");
                }catch (IOException ex){
                    ex.printStackTrace();
                }
            }
        });
    }
```

服务器端：

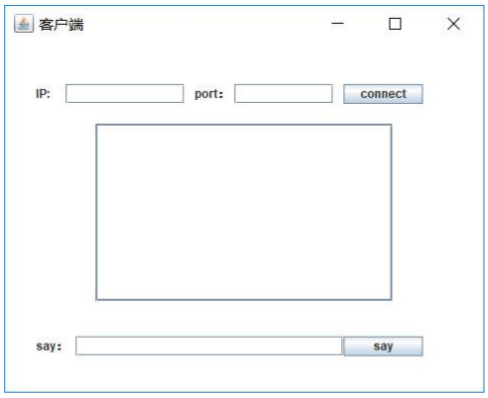
```
import javax.swing.*;
import java.awt.*;
import java.awt.event.ActionEvent;
import java.awt.event.ActionListener;
import java.io.*;
import java.net.ServerSocket;
import java.net.Socket;
```

```
public class Server {
    private static ServerSocket serverSocket = null;
    private static Socket socket = null;
    public static void main(String[] args){
        JFrame.setDefaultLookAndFeelDecorated(true);
        JFrame frame = new JFrame("服务端");
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        frame.setResizable(false);
        frame.setBounds(300, 200, 500, 300);
        frame.setLayout(new BorderLayout(10, 0));

        JPanel northPanel = new JPanel();
        JLabel portLabel = new JLabel("Port: ");
        JTextField portField = new JTextField(28);
        northPanel.setBorder(BorderFactory.createTitledBorder("服务器设置: "));
        JButton startBtn = new JButton("Start");
        northPanel.add(portLabel);
        northPanel.add(portField);
        northPanel.add(startBtn);

        JPanel centerPanel = new JPanel();
        JTextArea area = new JTextArea(10, 35);
        area.setMargin(new Insets(10, 10, 10, 10));
        area.setEnabled(false);
        centerPanel.add(area);

        JPanel southPanel = new JPanel();
        JLabel sayLabel = new JLabel("Say: ");
        JTextField sayField = new JTextField(30);
        JButton sayBtn = new JButton("Say");
        southPanel.add(sayLabel);
        southPanel.add(sayField);
        southPanel.add(sayBtn);

        frame.add(northPanel, BorderLayout.NORTH);
        frame.add(centerPanel, BorderLayout.CENTER);
        frame.add(southPanel, BorderLayout.SOUTH);

        frame.setVisible(true);

        startBtn.addActionListener(new ActionListener() {
            @Override
            public void actionPerformed(ActionEvent e) {
```

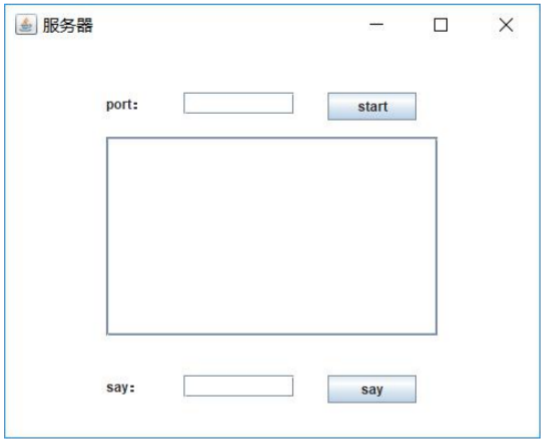
```
                area.append("Server starting…\n");
                new Thread(new Runnable() {
                    @Override
                    public void run() {
                        try {
                            serverSocket = new
ServerSocket(Integer.parseInt(portField.getText()));
                            socket = serverSocket.accept();
                            area.append("Client connected…\n");
                            while(true){
                                BufferedReader br = new BufferedReader(new
InputStreamReader(socket.getInputStream()));
                                String res = null;
                                while((res = br.readLine()) != null){
                                    area.append(res + "\n");
                                }
                            }
                        } catch (IOException ex) {
                            ex.printStackTrace();
                        }
                    }
                }).start();
            }
        });

        sayBtn.addActionListener(new ActionListener() {
            @Override
            public void actionPerformed(ActionEvent e) {
                try{
                    PrintWriter pw = new PrintWriter(socket.getOutputStream());
                    pw.println(sayField.getText());
                    pw.flush();
                    area.append(sayField.getText() + "\n");
                }catch (IOException ex){
                    ex.printStackTrace();
                }
            }
        });
    }
}
```

程序截图：

客户端：



服务器端：



五、实验结论、分析、思考题与心得体会

1. 实验心得：

通过此次实验掌握了图形界面的设计，掌握了各种组件的设计如何进行布局，学会了如何布置监听器，通过 Socket 网络通信实现网络通信，掌握了多线程变成方法。

2. 双向通信的功能

服务端：

```
import java.awt.BorderLayout;
import java.awt.Dimension;
import java.awt.Toolkit;
import java.awt.event.ActionEvent;
import java.awt.event.ActionListener;
import java.io.BufferedReader;
import java.io.IOException;
import java.io.InputStreamReader;
import java.io.PrintWriter;
import java.net.ServerSocket;
import java.net.Socket;
import javax.swing.JButton;
import javax.swing.JFrame;
import javax.swing.JPanel;
import javax.swing.JScrollPane;
import javax.swing.JSplitPane;
```

```
import javax.swing.JTextArea;

public class ChatFrameServer{

    private PrintWriter pw;
    private JFrame frame;
    private JPanel pane_buttom;
    private JSplitPane pane_center;

    //显示内容的文本框，输入内容的文本框，发送内容按钮
    private JScrollPane pane_showWindow;
    private JScrollPane pane_inputWindow;
    private JTextArea area_showWindow;
    private JTextArea area_inputWindow;

    private JButton btn_send;

    private Dimension dimension;//用于设置 area_showWindow 可拖拉的大小

    //初始化
    public ChatFrameServer() {
        frame = new JFrame();
        pane_buttom = new JPanel();
        pane_showWindow = new JScrollPane();
        pane_inputWindow = new JScrollPane();
        area_showWindow = new JTextArea();
        area_inputWindow = new JTextArea();
        pane_center = new JSplitPane(JSplitPane.VERTICAL_SPLIT, false, pane_showWindow,
pane_inputWindow);
        btn_send = new JButton("发送");

        dimension = new Dimension(50, 300);

    }

    //调用方法显示窗口
    public void showFrame(){
        initFrame();
        initChatTextArea();
        initButton();
        btn_send();
        socket();
    }
```

```
//主窗体
public void initFrame(){
    frame.setTitle("服务端");
    int width = (int)Toolkit.getDefaultToolkit().getScreenSize().getWidth();
    int height = (int)Toolkit.getDefaultToolkit().getScreenSize().getHeight();
    frame.setBounds(width / 2, height / 2, 400, 450);
    frame.setVisible(true);
}

//内容显示文本框和输入内容文本框
private void initChatTextArea(){
    //取得视图焦点
    pane_showWindow.getViewport().add(area_showWindow);
    pane_inputWindow.getViewport().add(area_inputWindow);
    //将显示文本域设置为不可编辑
    area_showWindow.setEditable(false);
    //设置显示文本域可拖拉的大小
    pane_showWindow.setMinimumSize(dimension);
    frame.add(pane_center, BorderLayout.CENTER);
}

//发送文件，发送内容按钮
public void initButton(){
    pane_buttom.add(btn_send);
    frame.add(pane_buttom, BorderLayout.SOUTH);
}


private void btn_send(){
    btn_send.addActionListener(new ActionListener() {

        @Override
        public void actionPerformed(ActionEvent e) {
            String info = area_inputWindow.getText();
            area_showWindow.append("服务端： "+info+"\r\n");
            pw.println(info);
            area_inputWindow.setText("");
        }
    });
}
private void socket(){
    ServerSocket ss;
    try {
        ss = new ServerSocket(9988);
```

```
                //等待连接 客户端
                Socket s=ss.accept();
                InputStreamReader isr=new InputStreamReader(s.getInputStream());
                BufferedReader br=new BufferedReader(isr);
                //PrintWriter 必须和 socket 有密切的关系
                pw=new PrintWriter(s.getOutputStream(),true);

                //读取从客户端法发来的信息
                while(true) {
                    //读取从客户端发来的信息
                    String info=br.readLine();
                    //在文本栏里显示
                    area_showWindow.append("客户端:"+info+"\r\n");
                }
            } catch (IOException e) {
                e.printStackTrace();
            }
        }
        public static void main(String[] args) {
            ChatFrameServer chat = new ChatFrameServer();
            chat.showFrame();
        }
}
```

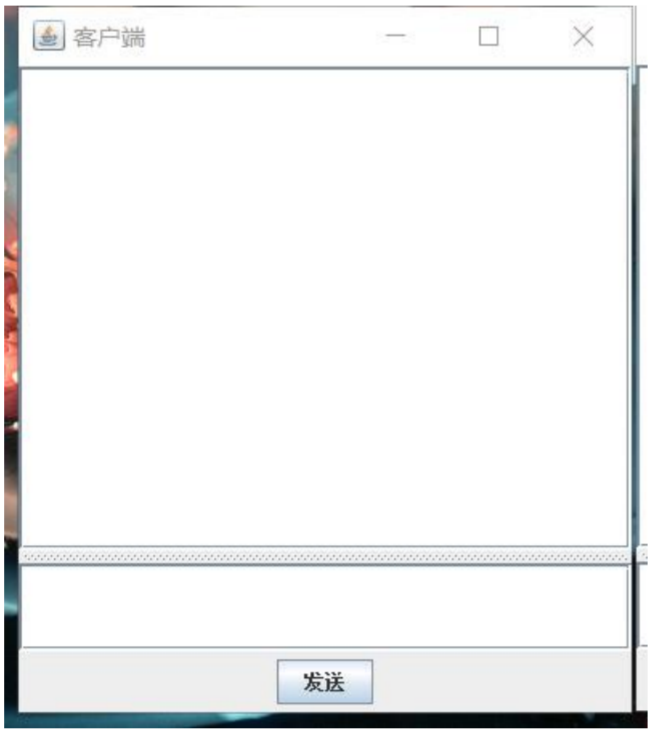
客户端：

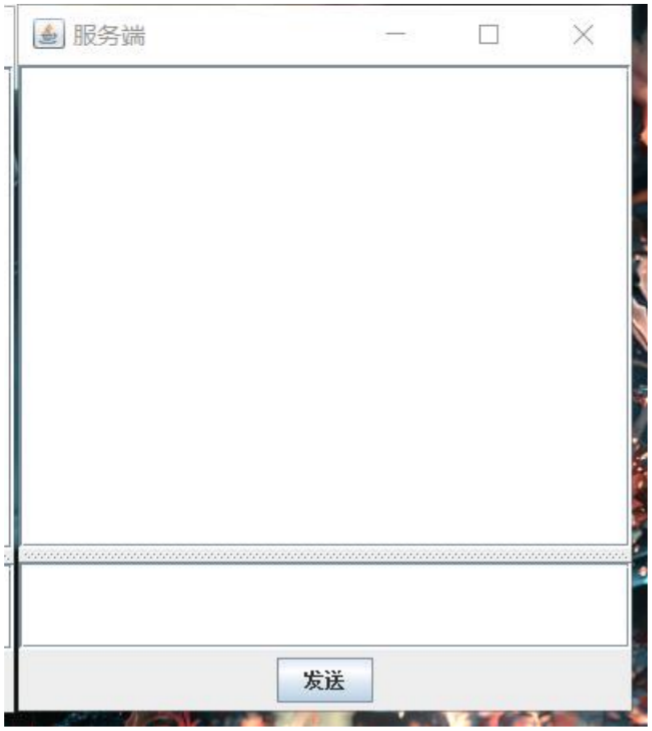
```
import java.awt.BorderLayout;
import java.awt.Dimension;
import java.awt.Toolkit;
import java.awt.event.ActionEvent;
import java.awt.event.ActionListener;
import java.io.BufferedReader;
import java.io.IOException;
import java.io.InputStreamReader;
import java.io.PrintWriter;
import java.net.Socket;
import java.net.UnknownHostException;
import javax.swing.JButton;
import javax.swing.JFrame;
import javax.swing.JPanel;
import javax.swing.JScrollPane;
import javax.swing.JSplitPane;
import javax.swing.JTextArea;
```

```
public class ChatFrame{
    private PrintWriter pw;
    private JFrame frame;
    private JPanel pane_buttom;
    private JSplitPane pane_center;

    //显示内容的文本框，输入内容的文本框,发送内容按钮
    private JScrollPane pane_showWindow;
    private JScrollPane pane_inputWindow;
    private JTextArea area_showWindow;
    private JTextArea area_inputWindow;

    private JButton btn_send;

    private Dimension dimension;//用于设置 area_showWindow 可拖拉的大小


    //初始化
    public ChatFrame() {
        frame = new JFrame();
        pane_buttom = new JPanel();
        pane_showWindow = new JScrollPane();
        pane_inputWindow = new JScrollPane();
        area_showWindow = new JTextArea();
        area_inputWindow = new JTextArea();
        pane_center = new JSplitPane(JSplitPane.VERTICAL_SPLIT, false, pane_showWindow,
pane_inputWindow);
        btn_send = new JButton("发送");

        dimension = new Dimension(50, 300);
    }

    //调用方法显示窗口
    public void showFrame(){
        initFrame();
        initChatTextArea();
        initButton();
        btn_send();
        socket();
    }

    //主窗体
    public void initFrame(){
        frame.setTitle("客户端");
```

```
        int width = (int)Toolkit.getDefaultToolkit().getScreenSize().getWidth();
        int height = (int)Toolkit.getDefaultToolkit().getScreenSize().getHeight();
        frame.setBounds(width / 2, height / 2, 400, 450);
        frame.setVisible(true);
    }

    //内容显示文本框和输入内容文本框
    private void initChatTextArea(){
        //取得视图焦点
        pane_showWindow.getViewport().add(area_showWindow);
        pane_inputWindow.getViewport().add(area_inputWindow);
        //将显示文本域设置为不可编辑
        area_showWindow.setEditable(false);
        //设置显示文本域可拖拉的大小
        pane_showWindow.setMinimumSize(dimension);
        frame.add(pane_center, BorderLayout.CENTER);
    }

    //发送文件，发送内容按钮
    public void initButton(){
        pane_buttom.add(btn_send);
        frame.add(pane_buttom, BorderLayout.SOUTH);
    }

    private void btn_send(){
        btn_send.addActionListener(new ActionListener() {

            @Override
            public void actionPerformed(ActionEvent e) {
                String info = area_inputWindow.getText();
                area_showWindow.append("客户端：  "+info+"\r\n");
                pw.println(info);
                area_inputWindow.setText("");
            }
        });
    }

    private void socket(){
        try {
            Socket s = new Socket("127.0.0.1",9988);
            InputStreamReader isr=new InputStreamReader(s.getInputStream());
            BufferedReader br=new BufferedReader(isr);
            pw=new PrintWriter(s.getOutputStream(),true);
            while(true){
```

```
                    //不停地读取从服务器端发来的信息
                    String info=br.readLine();
                    area_showWindow.append("服务端：  "+info+"\r\n");
                }
            } catch (UnknownHostException e) {
                e.printStackTrace();
            } catch (IOException e) {
                e.printStackTrace();
            }
        }
        public static void main(String[] args) {
            ChatFrame chat = new ChatFrame();
            chat.showFrame();
        }
}
```




服务端
发送