程序设计实训(Java)

个人报告

题　　目：　基于 ANDROID 开发的计算器

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目录

一、 课设角色

本人在项目中个人独立完成计算器 Android 客户端和服务器（用于计算器客户端更新用途）开发

二、需求分析

计算器是日常生活中十分便捷有效的工具，能实现加减乘除等简单运算。计算器可以大大的降低运算难度，提高准确率和精确率。而用户在使用是，也希望拥有一个良好的界面，简约美观的效果，能够实现快捷简单的操作，简单的加减乘除。而计算器也需要简洁大方，易于操作，直观明了，突出显示重要及出错信息。另外为了保证用户能够实时使用最新的版本，我在此软件此软件加入了更新机制。

三、采用何种技术实现

本算法通过采用了 Collection 集合类和 Stack 栈类,其中通过栈来分别存储后缀式和运算符。另外本算法的部分计算（比如乘方和开方），使用了 math 类实现的计算。计算式的部分字符处理通过使用 String 类实现了运算符的转义、特殊数值（π）的数值转换。

客户端的检查更新通过 Socket 实现，利用 TCP 通信完成客户端与服务器之间的数据交换。

Android 客户端通过 Android Studio 设计。

四、设计思想

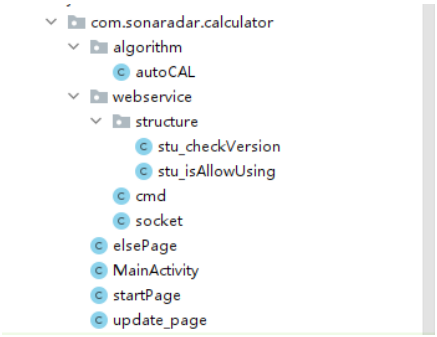
由于表达式由数字和运算符两部分，可以将运算符和数字作为两个整体。数字一般比较基本，不涉及顺序，但是部分数字有负号，需要通过转义字符~实现。而运算符涉及到优先级问题，在本程序中，加、减，乘、除、余，阶乘、乘方、开方，括号分别具有不同的优先级，需要

优先计算运算优先级高的算式。此外，由于日常用户会经常遇到进制转换、三角函数的计算等问题，本算法中提供了相应的计算方案。

五、具体实现

1.Android 客户端

项目结构：



代码：

```
package com.sonaradar.calculator.algorithm;

import java.util.Collections;
import java.util.Stack;

public class autoCAL {
    public static String getResult(String formula){
        return
String.valueOf(conversion(triangle_cal(format_changer(f
ormula))));
    }
    //通过使用栈来实现
    private Stack<String> postfixStack = new
Stack<String>();//存储后缀
    private Stack<Character> opStack = new
Stack<Character>();//存储运算符
    //外部调用这个方法
    public static double conversion(String expression) {
        double result = 0;
        autoCAL cal = new autoCAL();
        try {
            expression = transform(expression);//负号转义
```

```
            result = cal.calculate(expression);//计算结果调
用
        }
        catch (Exception e) {
            //报 NAN 错误，算不出来
            return 0.0 / 0.0;
        }
        return result;
    }

    //负数符号翻转为~，防止和减号弄混了
    private static String transform(String expression) {
        char[] arr = expression.toCharArray();
        for (int i = 0; i < arr.length; i++) {
            if (arr[i] == '-') {
                if (i == 0) {
                    arr[i] = '~';
                } else {
                    char c = arr[i - 1];
                    if (c == '+' || c == '-' || c == '*' || c
== '/' || c == '(' || c == 'E' || c == 'e'||c == '%'|| c
== '^'|| c == '!' || c == '$') {
                        arr[i] = '~';
                    }
                }
            }
        }
        if(arr[0]=='~'||arr[1]=='('){
            arr[0]='-';
            return "0"+new String(arr);
        } else{
            return new String(arr);
        }
    }

    //计算表达式
    private double calculate(String expression) {
        Stack<String> resultStack = new Stack<String>();
        prepare(expression);
        Collections.reverse(postfixStack);
        //将后缀式栈反转
        String firstValue, secondValue, currentValue;
        //参与计算的第一个值，第二个值和算术运算符
        while (!postfixStack.isEmpty()) {
            currentValue = postfixStack.pop();
```

```
            if (!isOperator(currentValue.charAt(0))) {
                //如果不是运算符则存入操作数栈中
                currentValue = currentValue.replace("~",
"-");
                resultStack.push(currentValue);
            } else {
                //如果是运算符则从操作数栈中取两个值和该数值一起参
与运算
                secondValue = resultStack.pop();
                firstValue = resultStack.pop();
                //将负数标记符改为负号
                firstValue = firstValue.replace("~", "-");
                secondValue = secondValue.replace("~", "-");
                String tempResult = calculate(firstValue,
secondValue, currentValue.charAt(0));
                resultStack.push(tempResult);
            }
        }
        return Double.valueOf(resultStack.pop());
    }

    //数据准备阶段将表达式转换成为后缀式栈
    private void prepare(String expression) {
        opStack.push(',');
        // 运算符放入栈底元素逗号，此符号优先级最低
        char[] arr = expression.toCharArray();
        int currentIndex = 0;
        // 当前字符的位置
        int count = 0;
        // 上次算术运算符到本次算术运算符的字符的长度便于或者之间
的数值
        char currentOp, peekOp;
        // 当前操作符和栈顶操作符
        for (int i = 0; i < arr.length; i++) {
            currentOp = arr[i];
            if (isOperator(currentOp)) {
                // 如果当前字符是运算符
                if (count > 0) {
                    postfixStack.push(new String(arr,
currentIndex, count));
                    // 取两个运算符之间的数字
                }
                peekOp = opStack.peek();
                if (currentOp == ')') {
```

```
                    // 遇到反括号则将运算符栈中的元素移除到后缀式
栈中直到遇到左括号
                    while (opStack.peek() != '(') {

postfixStack.push(String.valueOf(opStack.pop()));
                    }
                    opStack.pop();
                } else {
                    while (currentOp != '(' && peekOp != ','
&& compare(currentOp, peekOp)) {

postfixStack.push(String.valueOf(opStack.pop()));
                        peekOp = opStack.peek();
                    }
                    opStack.push(currentOp);
                }
                count = 0;
                currentIndex = i + 1;
            } else {
                count++;
            }
        }
        if (count > 1 || (count == 1
&& !isOperator(arr[currentIndex]))) {
            // 最后一个字符不是括号或者其他运算符的则加入后缀式栈
中
            postfixStack.push(new String(arr, currentIndex,
count));
        }
        while (opStack.peek() != ',') {

postfixStack.push(String.valueOf(opStack.pop()));
            // 将操作符栈中的剩余的元素添加到后缀式栈中
        }
    }

    //运算符号判断
    private Boolean isOperator(char c) {
        return c == '+' || c == '-' || c == '*' || c == '/'
|| c == '(' || c == ')'|| c == '%'|| c == '^'|| c == '!'
|| c == '$';
    }

    //优先级的注册与判断
    private Boolean compare(char cur, char peek) {
```

```
        // 如果是peek优先级高于cur，返回true，默认都是peek优先级要低
        switch (cur){
            case '+':
            case '-':cur=1;break;
            case '*':
            case '/':
            case '%':cur=2;break;
            case '^':
            case '$':
            case '!':cur=3;break;
            case '(':
            case ')':cur=0;break;
        }
        switch (peek){
            case '+':
            case '-':peek=1;break;
            case '*':
            case '/':
            case '%':peek=2;break;
            case '^':
            case '$':
            case '!':peek=3;break;
            case '(':
            case ')':peek=0;break;
        }
        Boolean result = false;
        if (peek >= cur) {
            result = true;
        }
        return result;
    }

    //简单运算处理
    private String calculate(String firstValue, String secondValue, char currentOp) {
        String result = "";
        switch (currentOp) {
            case '+':
                result = String.valueOf(Double.valueOf(firstValue) + Double.valueOf(secondValue));
                break;
            case '-':
                result =
```

```
String.valueOf(Double.valueOf(firstValue) -
Double.valueOf(secondValue));
                break;
            case '*':
                result =
String.valueOf(Double.valueOf(firstValue) *
Double.valueOf(secondValue));
                break;
            case '/':
                result =
String.valueOf(Double.valueOf(firstValue) /
Double.valueOf(secondValue));
                break;
            case '$'://开方
                result =
String.valueOf(Math.pow(Double.valueOf(secondValue),
(double)1/Double.valueOf(firstValue)));
                break;
            case '^':
                result =
String.valueOf(Math.pow(Double.valueOf(firstValue),Doub
le.valueOf(secondValue)));
                break;
            case '!':
                result =
String.valueOf(factorial(Integer.valueOf(firstValue)));
                break;
            case '%':
                result =
String.valueOf(Double.valueOf(firstValue) %
Double.valueOf(secondValue));
                break;
        }
        return result;
    }
    //阶乘计算
    private static long factorial(long number) {
        if (number <= 1)
            return 1;
        else
            return number * factorial(number - 1);
    }
    //对于一些符号的转换
    private static String format_changer(String formula){
        return
```

```
formula.replace("√","$").replace("!","!0").replace("×",
"*").replace("π",String.valueOf(Math.PI));
    }
    //三角函数计算
    private static String triangle_cal(String formula){
        if(formula.contains("sin")){
          return formula.replace("sin(" +
getSubString(formula,"sin(",")") +
")",String.valueOf(Math.sin(Double.valueOf(conversion(g
etSubString(formula,"sin(",")"))))));
        }
        if(formula.contains("cos")){
            return formula.replace("cos(" +
getSubString(formula,"cos(",")") +
")",String.valueOf(Math.cos(Double.valueOf(conversion(g
etSubString(formula,"cos(",")"))))));
        }
        if(formula.contains("tan")){
            return formula.replace("tan(" +
getSubString(formula,"tan(",")") +
")",String.valueOf(Math.tan(Double.valueOf(conversion(g
etSubString(formula,"tan(",")"))))));
        }
        return formula;
    }
    //取中间文本
    public static String getSubString(String text, String
left, String right) {
        String result = "";
        int zLen;
        if (left == null || left.isEmpty()) {
            zLen = 0;
        } else {
            zLen = text.indexOf(left);
            if (zLen > -1) {
                zLen += left.length();
            } else {
                zLen = 0;
            }
        }
        int yLen = text.indexOf(right, zLen);
        if (yLen < 0 || right == null || right.isEmpty()) {
            yLen = text.length();
        }
        result = text.substring(zLen, yLen);
```

```
        return result;
    }
    //转二进制
    public static String toBin(String num){
        try{
            return Integer.toBinaryString((int)
Math.round(Double.valueOf(num)));
        }catch (Exception e){
            return "NaN";
        }
    }
    //转八进制
    public static String toOct(String num){
        try{
            return Integer.toOctalString((int)
Math.round(Double.valueOf(num)));
        }catch (Exception e){
            return "NaN";
        }
    }
    //转 16 进制
    public static String toHex(String num){
        try{
            return Integer.toHexString((int)
Math.round(Double.valueOf(num)));
        }catch (Exception e){
            return "NaN";
        }
    }
}
package com.sonaradar.calculator.webservice.structure;

public class stu_checkVersion {
    //本类是用于存储检查最新版本时保存数据用途
    public int latestVersionCode = 0;//最新的版本代码
    public int requiredOldestVersionCode = 0;//最老允许使用
的版本代码
    public String downloadAddress = "";//新版本下载地址
    public stu_checkVersion(int LVC,int ROVC,String DA){//
这个功能是用来设置数据的，能方便点
        latestVersionCode = LVC;
        requiredOldestVersionCode = ROVC;
        downloadAddress = DA;
    }
}
```

```
package com.sonaradar.calculator.webservice.structure;
//这个类用来存储检查是否允许使用的
public class stu_isAllowUsing {
    public boolean isAllowUsing = false;//是否允许登录
    public String reason = "";//禁止登录的原因
    public stu_isAllowUsing(boolean IAU,String R){//和上一个一样，不讲了
        isAllowUsing = IAU;
        reason = R;
    }
}

package com.sonaradar.calculator.webservice;

import com.sonaradar.calculator.algorithm.autoCAL;
import
com.sonaradar.calculator.webservice.structure.stu_check
Version;
import
com.sonaradar.calculator.webservice.structure.stu_isAll
owUsing;

public class cmd {
    public static int myVersion = 110;//软件现行版本
    public static String da = "";//禁止登录的原因
    //发送检测更新命令，获取到最新版本号、可允许使用的最老版本号和新版本下载地址
    ///[checkversion]

///[checkversion]<latestversion:100><requiredoldestvers
ion:100><downaddress:****>
    public static stu_checkVersion checkVersion(){
        try{

            String str_return =
socket.Sender("[checkversion]");
            String lv =
autoCAL.getSubString(str_return,"<latestversion:",">");
            String rov =
autoCAL.getSubString(str_return,"<requiredoldestversion
:",">");
            String da =
autoCAL.getSubString(str_return,"<downaddress:",">");
            return new
stu_checkVersion(Integer.valueOf(lv),Integer.valueOf(ro
```

```
v),da);
        }catch (Exception e){e.printStackTrace();}
        return new stu_checkVersion(0,0,"");
    }
    //向服务器发送命令，请求是否可以使用软件，返回是否允许使用的布尔值和禁止登录的原因(如果禁止登录的话)
    ///[isallowusing]<version:100>
    ///[isallowusing]<status:accept/deny><reason:******>
    public static stu_isAllowUsing isAllowUsing(int versionCode){
        try{
            String str_return = socket.Sender("[isallowusing]<version:" + versionCode + ">");
            String status = autoCAL.getSubString(str_return,"<status:",">");
            String reason = autoCAL.getSubString(str_return,"<reason:",">");
            if(str_return.contains("accept")){
                return new stu_isAllowUsing(true,reason);
            }else{
                return new stu_isAllowUsing(false,reason);
            }
        } catch (Exception e) {}
        return new stu_isAllowUsing(false,"");
    }
}
package com.sonaradar.calculator.webservice;

import java.io.BufferedReader;
import java.io.BufferedWriter;
import java.io.IOException;
import java.io.InputStream;
import java.io.InputStreamReader;
import java.io.OutputStream;
import java.io.OutputStreamWriter;
import java.net.InetAddress;
import java.net.Socket;
import java.net.UnknownHostException;

public class socket {
    private static String serverdomain = "www.thundersoftware.top";//域名
    private static int serverport = 54300;///服务器端口
```

```
    private static int overTime = 5000;///超时设置时间
1s=1000
    //向服务器发送信息，服务器获取到信息本端再接受，返回值是接受到
的信息
    public static String Sender(String message){
        try {
            Socket s = new
Socket(getip(serverdomain),serverport);
            s.setSoTimeout(overTime);
            //构建
            InputStream is = s.getInputStream();
            OutputStream os = s.getOutputStream();
            BufferedWriter bw = new BufferedWriter(new
OutputStreamWriter(os));
            //向服务器端发送一条消息
            bw.write(message);
            System.out.println("[CAL-WS]Sending command to
server:"+message);
            bw.flush();
            //读取服务器返回的消息
            BufferedReader br = new BufferedReader(new
InputStreamReader(is));
            String mess = "";
            while (true) {
                String info = br.readLine();
                if (!info.isEmpty()) {
                    System.out.println("[CAL-WS]Received
command from server:"+info);
                    mess=info;
                    break;
                }
            }
            br.close();
            s.close();
            return mess;
        } catch (UnknownHostException e) {
            e.printStackTrace();
            System.out.println("[CAL-WS]Socket Error
UnknownHostException");
        } catch (IOException e) {
            e.printStackTrace();
            System.out.println("[CAL-WS]Socket Error
IOException");
        }
        return "";
```

```
    }
    ///域名转 ip
    public static String getip(String domain) {
        try {
            return
InetAddress.getByName(domain).getHostAddress();
        } catch (Exception e) {
            return "";
        }
    }
}
package com.sonaradar.calculator;

import androidx.appcompat.app.AppCompatActivity;

import android.app.Activity;
import android.app.AlertDialog;
import android.content.DialogInterface;
import android.content.Intent;
import android.content.SharedPreferences;
import android.os.Bundle;
import android.os.StrictMode;
import android.view.View;
import android.widget.Button;
import android.widget.TextView;
import android.widget.Toast;

import com.sonaradar.calculator.webservice.cmd;
import
com.sonaradar.calculator.webservice.structure.stu_check
Version;

public class elsePage extends AppCompatActivity {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        //页面初始化代码
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_else_page);
        //安卓 SDK 大于 9 时请求网络严苛模式可能会导致 socket 发不出
去，修改 policy 适用于数据请求量小的应用
        if (android.os.Build.VERSION.SDK_INT > 9) {
            StrictMode.ThreadPolicy policy = new
StrictMode.ThreadPolicy.Builder().permitAll().build();
            StrictMode.setThreadPolicy(policy);
```

```
        }
        //显示当前版本
        TextView txt_version =
(TextView)findViewById(R.id.txt_version);

txt_version.setText(String.valueOf(cmd.myVersion));
        //检测版本按钮
        Button btn_update = (Button)
findViewById(R.id.btn_update);
        btn_update.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                stu_checkVersion sc = cmd.checkVersion();
                cmd.da = sc.downloadAddress;
                //检测到新版本
                if(sc.latestVersionCode>cmd.myVersion){
                    AlertDialog.Builder builder = new
AlertDialog.Builder(elsePage.this);
                    builder.setTitle("检测到新版本!");
                    builder.setMessage("当前版本:" +
cmd.myVersion + "\n" +
                            "最新版本:" + sc.latestVersionCode
+ "\n" +
                            "最低可登录版本:" +
sc.requiredOldestVersionCode + "\n" +
                            "为了保证您的正常使用,请更新软件!");
                    builder.setPositiveButton("更新", new
DialogInterface.OnClickListener() {
                        @Override
                        public void onClick(DialogInterface
dialog, int which) {
                            //跳转到更新页面
                            Intent it = new
Intent(getApplicationContext(), update_page.class);//启动
MainActivity
                            startActivity(it);
                        }
                    });
                    builder.setNeutralButton("取消", new
DialogInterface.OnClickListener() {
                        @Override
                        public void onClick(DialogInterface
dialog, int which) {}
                    });
```

```
                builder.show();
            }else{
                //是最新版本
                AlertDialog.Builder builder = new
AlertDialog.Builder(elsePage.this);
                builder.setTitle("您的软件已是最新版本!");
                builder.setMessage("当前版本:" +
cmd.myVersion + "\n" +
                        "最低可登录版本:" +
sc.requiredOldestVersionCode + "\n" +
                        "最新版本:" + sc.latestVersionCode
+ "\n");
                builder.setPositiveButton("确认", new
DialogInterface.OnClickListener() {
                    @Override
                    public void onClick(DialogInterface
dialog, int which) {}});
                builder.show();
            }
        }
    });

    }
}
package com.sonaradar.calculator;

import androidx.appcompat.app.AppCompatActivity;

import android.content.Intent;
import android.os.Bundle;
import android.os.Handler;
import android.view.View;
import android.widget.Button;
import android.widget.ScrollView;
import android.widget.TextView;
import android.widget.Toast;

import com.sonaradar.calculator.algorithm.autoCAL;

public class MainActivity extends AppCompatActivity {

    public static boolean isGetresult = false;
    public static String formula = "";
    public static String M = "";
    @Override
```

```
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        ///控件注册
        Button num_0 =  (Button) findViewById(R.id.btn_0);
        Button num_1 =  (Button) findViewById(R.id.btn_1);
        Button num_2 =  (Button) findViewById(R.id.btn_2);
        Button num_3 =  (Button) findViewById(R.id.btn_3);
        Button num_4 =  (Button) findViewById(R.id.btn_4);
        Button num_5 =  (Button) findViewById(R.id.btn_5);
        Button num_6 =  (Button) findViewById(R.id.btn_6);
        Button num_7 =  (Button) findViewById(R.id.btn_7);
        Button num_8 =  (Button) findViewById(R.id.btn_8);
        Button num_9 =  (Button) findViewById(R.id.btn_9);
        Button char_percentage = (Button)
findViewById(R.id.btn_percentage);
        Button char_dot = (Button)
findViewById(R.id.btn_dot);
        Button char_plus = (Button)
findViewById(R.id.btn_plus);
        Button char_reduce = (Button)
findViewById(R.id.btn_reduce);
        Button char_multply = (Button)
findViewById(R.id.btn_muliply);
        Button char_devide = (Button)
findViewById(R.id.btn_devide);
        Button char_clear = (Button)
findViewById(R.id.btn_clear);
        Button char_remove = (Button)
findViewById(R.id.btn_remove);
        Button char_getresult = (Button)
findViewById(R.id.btn_getresult);
        Button char_sqrt = (Button)
findViewById(R.id.btn_sqrt);
        Button char_square = (Button)
findViewById(R.id.btn_square);
        Button char_sin = (Button)
findViewById(R.id.btn_sin);
        Button char_cos = (Button)
findViewById(R.id.btn_cos);
        Button char_tan = (Button)
findViewById(R.id.btn_tan);
        Button char_bin = (Button)
findViewById(R.id.btn_bin);
        Button char_oct = (Button)
```

```
findViewById(R.id.btn_oct);
        Button char_hex = (Button)
findViewById(R.id.btn_hex);
        Button char_set = (Button)
findViewById(R.id.btn_setm);
        Button char_m = (Button) findViewById(R.id.btn_m);
        Button char_factorial = (Button)
findViewById(R.id.btn_factorial);
        Button char_pi = (Button) findViewById(R.id.btn_pi);
        Button char_setM = (Button)
findViewById(R.id.btn_set);
        Button char_leftbracket = (Button)
findViewById(R.id.btn_leftbracket);
        Button char_rightbracket = (Button)
findViewById(R.id.btn_rightbracket);
        TextView txt_mainbar =
(TextView)findViewById(R.id.txt_mainbars);
        TextView txt_maindescribe =
(TextView)findViewById(R.id.txt_maindescribe);
        TextView txt_subbar =
(TextView)findViewById(R.id.txt_subbar);
        TextView txt_subdescribe =
(TextView)findViewById(R.id.txt_subdescribe);

        ///置低
        ScrollView sv =
(ScrollView)findViewById(R.id.scrollView2);
        Handler handler = new Handler();
        handler.post(new Runnable() {
            @Override
            public void run() {
                sv.fullScroll(ScrollView.FOCUS_DOWN);
            }
        });

        ///数字输入
        num_0.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("0");
            }
        });

        num_1.setOnClickListener(new
```

```
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("1");
            }
        });

        num_2.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("2");
            }
        });

        num_3.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("3");
            }
        });

        num_4.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("4");
            }
        });

        num_5.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("5");
            }
        });

        num_6.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("6");
            }
```

```
        });

        num_7.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("7");
            }
        });

        num_8.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("8");
            }
        });

        num_9.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("9");
            }
        });
        char_percentage.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("%");
            }
        });
        char_dot.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula(".");
            }
        });
        char_plus.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("+");
            }
```

```
        });
        char_reduce.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("-");
            }
        });
        char_multply.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("×");
            }
        });
        char_devide.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("/");
            }
        });
        char_clear.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                formula = "0";
                showFormula();
            }
        });
        char_sin.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("sin(");
            }
        });
        char_cos.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("cos(");
            }
        });
        char_tan.setOnClickListener(new
```

```
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("tan(");
            }
        });
        char_sqrt.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("√");
            }
        });
        char_square.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("^");
            }
        });
        char_factorial.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("!");
            }
        });
        char_pi.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("π");
            }
        });
        char_leftbracket.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                appendFormula("(");
            }
        });
        char_rightbracket.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
```

```
                appendFormula(")");
            }
        });
        //退格功能，遇到sin cos tan nan时自动全退
        char_remove.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                if(formula.length()>0){
                    try{

if(formula.substring(formula.length()-4,formula.length(
)).contains("sin(")||

formula.substring(formula.length()-4,formula.length()).
contains("cos(")||

formula.substring(formula.length()-4,formula.length()).
contains("tan(")
                        ){
                            formula =
formula.substring(0,formula.length()-4);
                        }else{
                            if(formula.contains("NaN")){
                                formula = "0";
                            }else{
                                formula =
formula.substring(0,formula.length()-1);
                            }
                        }
                    }catch (Exception e){
                        if(formula.contains("NaN")){
                            formula = "0";
                        }else{
                            formula =
formula.substring(0,formula.length()-1);
                        }
                    }
                }
                showFormula();
            }
        });
        //计算表达式，就是等号的功能，通过编的autocal算法实现
        char_getresult.setOnClickListener(new
View.OnClickListener() {
```

```
            @Override
            public void onClick(View v) {
                formula = autoCAL.getResult(formula);
                showFormula();
            }
        });
        //二进制转换
        char_bin.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                formula =
autoCAL.toBin(autoCAL.getResult(formula+"+0"));
                showFormula();
            }
        });
        //八进制转换
        char_oct.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                formula =
autoCAL.toOct(autoCAL.getResult(formula+"+0"));
                showFormula();
            }
        });
        //十六进制转换
        char_hex.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                formula =
autoCAL.toHex(autoCAL.getResult(formula+"+0"));
                showFormula();
            }
        });
        //计算机记忆功能，把数据记忆起来
        char_setM.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                M = formula;
                Toast.makeText(getApplicationContext(), "保
存数据成功:" + formula, Toast.LENGTH_LONG).show();
            }
```

```
        });
        //记忆输出功能
        char_m.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                formula += M;
                showFormula();
            }
        });
        //更新检测按钮
        char_set.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                Intent it = new
Intent(getApplicationContext(), elsePage.class);//启动
MainActivity
                startActivity(it);
            }
        });


    }
    //显示计算后得到的表达式
    public void showFormula(){
        try{
            TextView txt_mainbar =
(TextView)findViewById(R.id.txt_mainbars);
            TextView txt_subbar =
(TextView)findViewById(R.id.txt_subbar);
            if(formula.length()<=0){
                txt_mainbar.setText("0");
            }else{
                String tmp_result1 = formula;
                try{

if(tmp_result1.substring(tmp_result1.length()-2).equals
(".0")){

txt_mainbar.setText(tmp_result1.substring(0,tmp_result1
.length()-2));
                    }else{
                        txt_mainbar.setText(tmp_result1);
                    }
```

```
                }catch(Exception
e){txt_mainbar.setText(tmp_result1);}
            }
            String tmp_result = autoCAL.getResult(formula);
            try{

if(tmp_result.substring(tmp_result.length()-2).equals("
.0")){

txt_subbar.setText(tmp_result.substring(0,tmp_result.le
ngth()-2));
            }else{
                txt_subbar.setText(tmp_result);
            }
            }catch(Exception
e){txt_subbar.setText(tmp_result);}
        }catch (Exception e){}
    }
    //将数字或者运算符接到表达式后面
    public void appendFormula(String append_str) {
        if(formula.replace("0","") == ""){
            formula = append_str;
        }else{
            formula += append_str;
        }
        showFormula();
    }
}
package com.sonaradar.calculator;

import androidx.appcompat.app.AppCompatActivity;

import android.app.AlertDialog;
import android.content.DialogInterface;
import android.content.Intent;
import android.os.Bundle;
import android.widget.Toast;

import com.sonaradar.calculator.webservice.cmd;
import
com.sonaradar.calculator.webservice.structure.stu_check
Version;
import
com.sonaradar.calculator.webservice.structure.stu_isAll
owUsing;
```

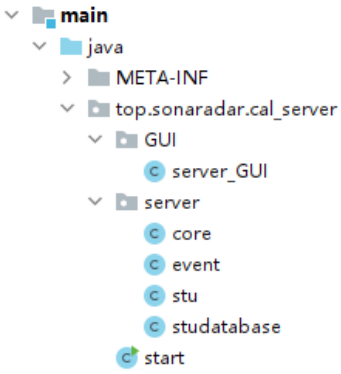
```
//这个页面是启动页，别问，就是用来水的
public class startPage extends AppCompatActivity {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_start_page);
        //检测是否允许使用
        stu_isAllowUsing si =
cmd.isAllowUsing(cmd.myVersion);
        if(si.isAllowUsing==true){
            //不能使用执行下面步骤
            AlertDialog.Builder builder = new
AlertDialog.Builder(startPage.this);
            builder.setTitle("服务器拒绝登录");
            builder.setMessage("原因:" + si.reason);
            builder.setPositiveButton("确认", new
DialogInterface.OnClickListener() {
                @Override
                public void onClick(DialogInterface dialog,
int which) {
                    System.exit(0);
                }
            });
            builder.setOnDismissListener(new
DialogInterface.OnDismissListener() {
                @Override
                public void onDismiss(final DialogInterface
arg0) {
                    System.exit(0);
                }
            });
            builder.show();
            return;
        }
        //检测可用的最低版本，判断能否使用
        stu_checkVersion sc = cmd.checkVersion();
        cmd.da = sc.downloadAddress;
        if(sc.requiredOldestVersionCode>cmd.myVersion){
            Thread myThread = new Thread() {//创建子线程
                @Override
                public void run() {
                    try {
                        sleep(3000);
                        Intent it = new
```

```
Intent(getApplicationContext(), update_page.class);//启动
MainActivity
                    startActivity(it);
                    finish();
                } catch (Exception e) {
                    e.printStackTrace();
                }
            }
        };
        myThread.start();
        return;
    }
    //载入到计算器页面
    Thread myThread = new Thread() {//创建子线程
        @Override
        public void run() {
            try {
                sleep(3000);
                Intent it = new
Intent(getApplicationContext(), MainActivity.class);//启
动MainActivity
                startActivity(it);
                finish();
            } catch (Exception e) {
                e.printStackTrace();
            }
        }
    };
    myThread.start();
  }
}
package com.sonaradar.calculator;

import android.content.Intent;
import android.net.Uri;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.Toast;

import androidx.appcompat.app.AppCompatActivity;

import com.sonaradar.calculator.webservice.cmd;
//这个页面是用来升级的，很简单的
public class update_page extends AppCompatActivity {
```

```
    public static String downaddress = cmd.da;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_update_page);
        Button qust_btn_update = (Button)
findViewById(R.id.button5);
        Button qust_btn_exitupdate = (Button)
findViewById(R.id.button6);
        qust_btn_update.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                try{
                    Intent intent= new Intent();

intent.setAction("android.intent.action.VIEW");
                    Uri content_url = Uri.parse(downaddress);
                    intent.setData(content_url);
                    startActivity(intent);
                }catch(Exception e){

Toast.makeText(getApplicationContext(),"无法打开网站:" +
downaddress,Toast.LENGTH_LONG).show();
                }
            }
        });
        qust_btn_exitupdate.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                System.exit(0);
            }
        });
    }
}
```

2.服务器端

项目结构：



代码：

```
package top.sonaradar.cal_server.GUI;

import top.sonaradar.cal_server.server.core;
import top.sonaradar.cal_server.server.stu;
import top.sonaradar.cal_server.server.studatabase;
import java.util.Scanner;

//服务器的命令行页面

public class server_GUI {
    //方便输出，不用 system.out.print 了
    private void print(String str){
        System.out.print("[CAL-SERVER]" + str);
    }
    //初始化显示
    public void init(){
        print("-----------------------------------\n");
        print("       CALCULATOR SERVER\n");
        print(" POWERED BY SONARADAR E-TRON INC.\n");
        print("-----------------------------------\n");
        print("You can enter command help for any help.\n");
        studatabase.getData();//读取数据
        core.setAddress(54300);//设置服务器端口
        Thread myThread = new Thread() {//以线程形式启动服务
器的 serversocket
            @Override
            public void run() {
                try {
                    core.Socket_Receiver();
                } catch (Exception e) {
                    e.printStackTrace();
                }
            }
        };
```

```
            myThread.start();//启动线程
            try{
                Thread.sleep(2000);
            }catch (Exception e){}
            command();//进入到命令识别部分
        }
        //命令识别
        public void command(){
            print("command>");
            Scanner sc = new Scanner(System.in);
            switch (sc.next()){
                case "set latestversion"://设置最新版本的代号
                case "latestversion":
                case "set lv":
                case "lv":setlv();break;
                case "set allowloginversion"://设置最老可使用版本
的代号
                case "allowloginversion":
                case "set alv":
                case "alv":setalv();break;
                case "set denyuserlogin"://是否允许用户使用
                case "denyuserlogin":
                case "set dul":
                case "dul":setdul();break;
                case "set downaddress"://设置新版本下载的网址
                case "downaddress":
                case "set da":
                case "da":setda();break;
                case "help":help();break;//显示帮助
                case "info":info();break;//显示服务器信息
                default: command();return;//未识别到命令
            }
        }
        public void setlv(){//设置最新版本的代号
            print("Enter Latest Version Code>");
            Scanner sc = new Scanner(System.in);
            stu.latestVersionCode=sc.nextInt();
            studatabase.setData();
            command();
            return;
        }
        public void setalv(){//设置最老可使用版本的代号
            print("Enter Allowing Login Version>");
            Scanner sc = new Scanner(System.in);
            stu.allowLoginVersion=sc.nextInt();
```

```
        studatabase.setData();
        command();
        return;
    }
    public void setdul(){//是否允许用户使用
        print("Enter whether deny user login(Y for yes,N for
no)>");
        Scanner sc = new Scanner(System.in);
        switch (sc.next()){
            case "y":
            case "Y":stu.denyAllUser=true;break;
            case "n":
            case "N":stu.denyAllUser=false;break;
        }
        studatabase.setData();
        command();
        return;
    }
    public void setda(){//设置新版本下载的网址
        print("Enter Download Address>");
        Scanner sc = new Scanner(System.in);
        stu.downAddress=sc.next();
        studatabase.setData();
        command();
        return;
    }
    public void help(){//显示帮助
        print("Command List:\n");
        print("lv - set latest version code\n");
        print("alv - set minium allowing login version
code\n");
        print("dul - set whether allowing user login\n");
        print("da - set download address\n");
        print("info - show config info\n");
        command();
        return;
    }
    public void info(){//显示服务器信息
        print("Config Information:\n");
        print("Latest Version
Code:"+stu.latestVersionCode+"\n");
        print("Allowing Login Version
Code:"+stu.allowLoginVersion+"\n");
        print("Deny All User:"+ (stu.denyAllUser ? "True" :
"False")+"\n");
```

```
            print("Download Address:"+stu.downAddress+"\n");
            command();
            return;
        }
    }
package top.sonaradar.cal_server.server;

import java.io.*;
import java.net.*;

//服务器核心部分

public class core{
    private static int Global_Port = 0;//服务器端口

    public static void setAddress(int myport) {//设置服务器
的端口
            Global_Port = myport;
            System.out.println("[CAL-SERVER]Set address port at:
" + Global_Port);
        }

    public static void Socket_Receiver() {//通过
serversocket 收发信息，收到信息后处理后发送到客户端
            try {
                ServerSocket serverSocket = new
ServerSocket(Global_Port);
                System.out.println("[CAL-SERVER]Receive socket
started!");
                Socket accept = serverSocket.accept();
            while (true) {
                        try{
                            BufferedInputStream
bufferedInputStream = new
BufferedInputStream(accept.getInputStream());
                            if
(bufferedInputStream.available() > 0) {
                                byte[] receive = new byte[1024];

bufferedInputStream.read(receive);

//System.out.println("[CAL-SERVER]Received command:" +
new String(receive));
                                BufferedOutputStream
bufferedOutputStream = new
```

```
BufferedOutputStream(accept.getOutputStream());
                        String response =
event.analysisCommand(new String(receive)) + "\n";

//System.out.println("[CAL-SERVER]Send command:" +
response);

bufferedOutputStream.write(response.getBytes());
                        bufferedOutputStream.flush();
                        accept = serverSocket.accept();
                    }
                }catch (Exception e){
                    e.printStackTrace();
                }
        }
        } catch (Exception k) {
            //System.out.println("[CAL-SERVER]Server
socket error");
        }

    }
    //截取子字符串，autocal 的
    public static String getSubString(String text, String
left, String right) {
        String result = "";
        int zLen;
        if (left == null || left.isEmpty()) {
            zLen = 0;
        } else {
            zLen = text.indexOf(left);
            if (zLen > -1) {
                zLen += left.length();
            } else {
                zLen = 0;
            }
        }
        int yLen = text.indexOf(right, zLen);
        if (yLen < 0 || right == null || right.isEmpty()) {
            yLen = text.length();
        }
        result = text.substring(zLen, yLen);
        return result;
    }
}
```

```
package top.sonaradar.cal_server.server;

//收到相应指令需要做出的反应事件集

public class event {
    public static String analysisCommand(String
str_cmd){//分析需要执行哪个命令
        String cmdName = core.getSubString(str_cmd,"[","]");
        switch (cmdName){
            case "checkversion"://检测新版本命令
                return checkVersion(str_cmd);
            case "isallowusing"://判断是否允许登录
                return isAllowLogin(str_cmd);
            default:break;
        }
        return "[command_notfound]";
    }
    ///样例格式
    private static String example(String str_cmd){
        return "";
    }
    //检测新版本命令
    private static String checkVersion(String str_cmd){
        return
"[checkversion]<latestversion:"+stu.latestVersionCode+"
><requiredoldestversion:"+stu.allowLoginVersion+"><down
address:"+stu.downAddress+">";
    }
    //判断是否允许登录
    private static String isAllowLogin(String str_cmd){
        int versionCode =
Integer.valueOf(core.getSubString(str_cmd,"<version:","
>"));
        if(versionCode<stu.allowLoginVersion){
            return
"[isallowusing]<status:deny><reason:version is too old>";
        }
        if(stu.denyAllUser==true){
            return
"[isallowusing]<status:deny><reason:server deny>";
        }
        return "[isallowusing]<status:accept><reason:>";
    }
}
```

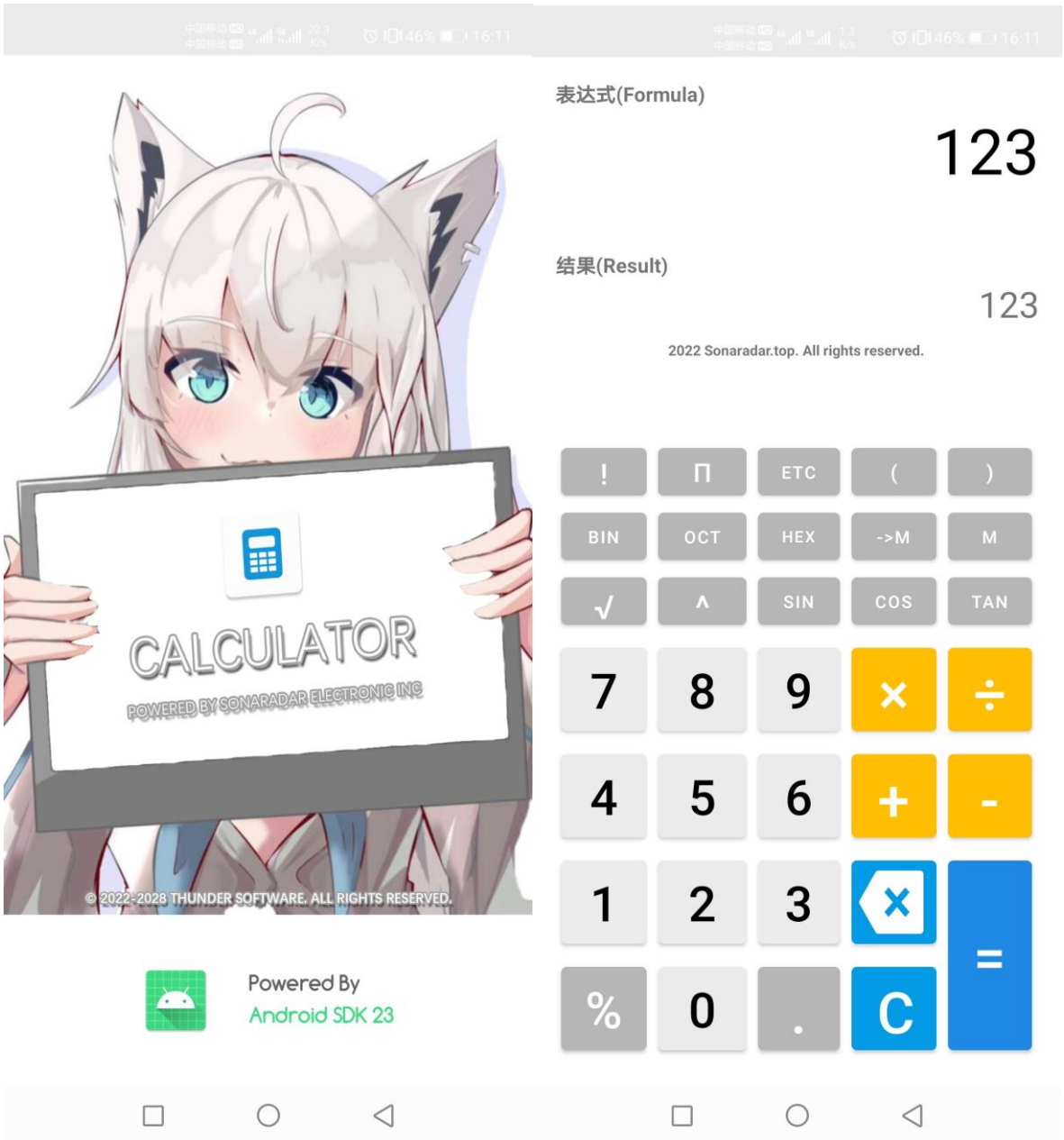
```
package top.sonaradar.cal_server.server;

//这个用来存储一些数据

public class stu {
    public static int latestVersionCode = 0;//最新版本代码
    public static int allowLoginVersion = 0;//最低可登录版本号
    public static boolean denyAllUser = false;//是否允许用户登录
    public static String downAddress = "";//新版本下载网址
    public static void setStu(int lvc,int alv,boolean adu,String da){//设置这些数据
        latestVersionCode = lvc;
        allowLoginVersion = alv;
        denyAllUser=adu;
        downAddress = da;
    }
}
package top.sonaradar.cal_server.server;

import java.io.*;
import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.ResultSet;
import java.sql.Statement;
import java.util.Properties;

public class studatabase {
        public static void setData(){//存储 stu 中的所有数据
            try {
                int lvc=stu.latestVersionCode;
                int alv=stu.allowLoginVersion;
                int adu= stu.denyAllUser ? 1 : 0;
                String da = stu.downAddress;
                writeTxt(System.getProperty("user.dir") + "/" + "latestVersion.txt",String.valueOf(lvc));
                writeTxt(System.getProperty("user.dir") + "/" + "allowLoginVersion.txt",String.valueOf(alv));
                writeTxt(System.getProperty("user.dir") + "/" + "denyAllUser.txt",String.valueOf(adu));
                writeTxt(System.getProperty("user.dir") + "/" + "downAddress.txt",da);
            } catch (Exception e) {}
        }
```

```
        public static void getData(){//保存 stu 中的所有数据
            try {
                String latestVersion =
readTxt(System.getProperty("user.dir") + "/" +
"latestVersion.txt");
                String allowLoginVersion =
readTxt(System.getProperty("user.dir") + "/" +
"allowLoginVersion.txt");
                String denyAllUser =
readTxt(System.getProperty("user.dir") + "/" +
"denyAllUser.txt");
                String downAddress =
readTxt(System.getProperty("user.dir") + "/" +
"downAddress.txt");

stu.setStu(Integer.valueOf(latestVersion),Integer.value
Of(allowLoginVersion),Integer.valueOf(denyAllUser)==1,d
ownAddress);
            } catch (Exception e) {}
        }
    private static String readTxt(String txtPath) {//读取
txt 中的文本
        File file = new File(txtPath);
        if(file.isFile() && file.exists()){
            try {
                FileInputStream fileInputStream = new
FileInputStream(file);
                InputStreamReader inputStreamReader = new
InputStreamReader(fileInputStream);
                BufferedReader bufferedReader = new
BufferedReader(inputStreamReader);
                StringBuffer sb = new StringBuffer();
                String text = null;
                while((text = bufferedReader.readLine()) !=
null){
                    sb.append(text);
                }
                return sb.toString();
            } catch (Exception e) {
                e.printStackTrace();
            }
        }
        return null;
    }
    private static void writeTxt(String txtPath,String
```

```
content){//写入文本到 txt
        FileOutputStream fileOutputStream = null;
        File file = new File(txtPath);
        try {
            if(file.exists()){
                file.createNewFile();
            }
            fileOutputStream = new FileOutputStream(file);
            fileOutputStream.write(content.getBytes());
            fileOutputStream.flush();
            fileOutputStream.close();
        } catch (Exception e) {
            e.printStackTrace();
        }

    }

}
package top.sonaradar.cal_server;

import top.sonaradar.cal_server.GUI.server_GUI;
import top.sonaradar.cal_server.server.stu;
import top.sonaradar.cal_server.server.studatabase;

public class start {
    public static void main(String args[]){
        server_GUI sg =new server_GUI();
        sg.init();
    }
}
```

六、运行截图

1.Android 客户端




CALCULATOR - Etcetera
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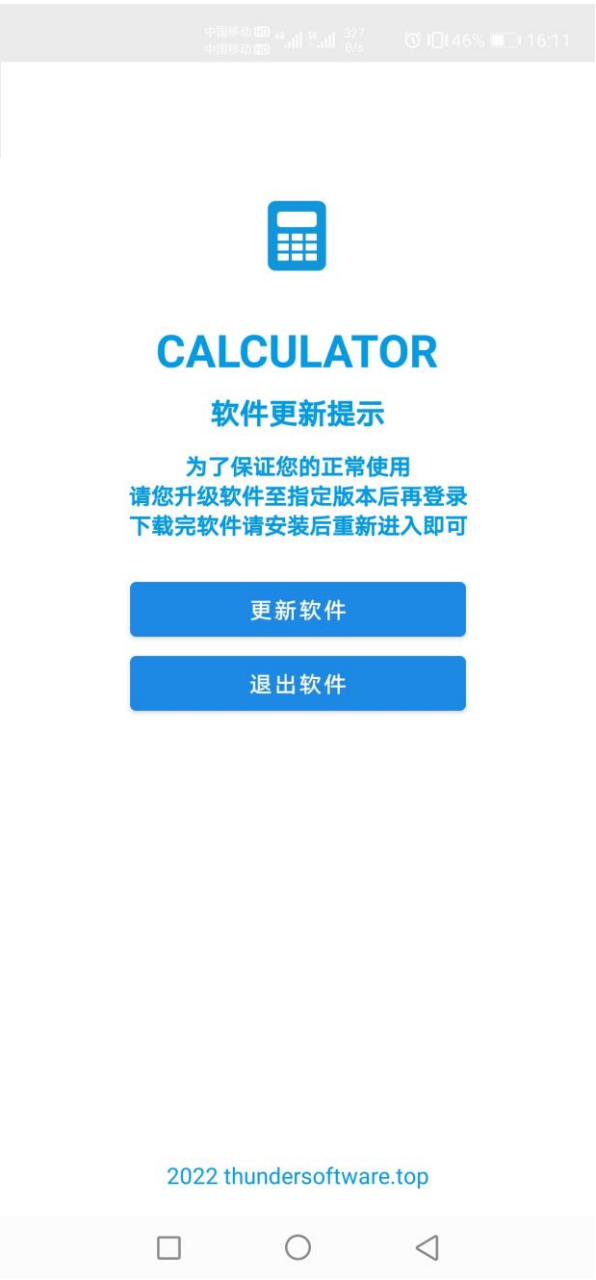
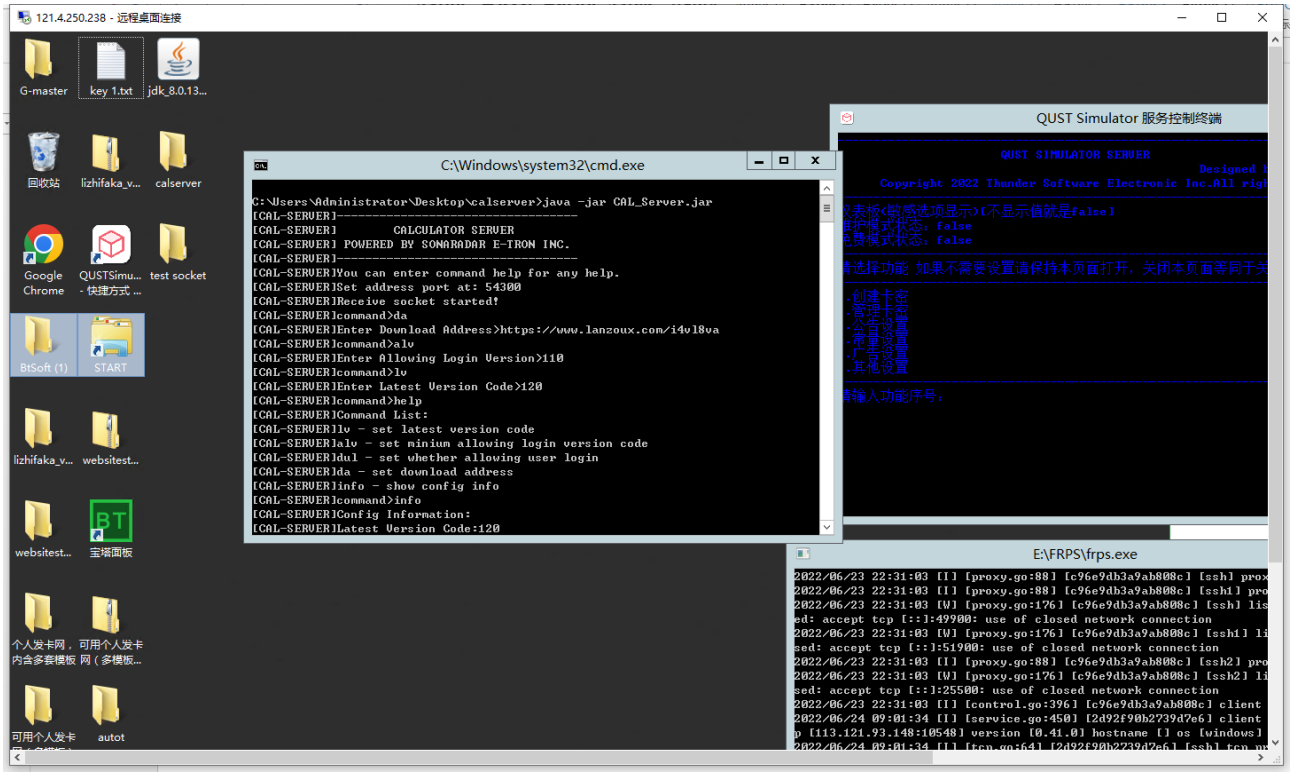
Application Information
VERSION
110
Developed By
Sonaradar
Electronic Inc
GUI Designer
Sonaradar
检测更新


CALCULATOR
软件更新提示
为了保证您的正常使用
请您升级软件至指定版本后再登录
下载完软件请安装后重新进入即可
更新软件
退出软件
2022 thundersoftware.top

2.服务器



上图为服务器端在腾讯云轻量服务器部署的运行截图

七、所分配任务完成情况

本项目中，我实际承担的任务是计算器整体的设计。计算器表达式算法能够计算带括号和更多运算符（取余、三角函数等）计算。功能层次上已经完成，但是部分细节问题需要继续完善。页面设计部分由于相对布局部分地方使用不够完善，实际在小于 5.5 英寸的手机测试下界面会冲突。服务器由于采用的是 socket 的简单通信，只能满足少量用户使用，若同时使用可能会导致服务器无法对客户端做出响应。客户端更新这个功能经过测试没啥大问题，基本挺正常的。

八、存在的问题

在本算法中，计算后的表达式如果为整数，运算结果实际会显示带一个小数位的数。对于三

角函数，仅能进行简单的一次三角函数计算，如果嵌套三角函数计算则无法计算。而进制转换仅能在计算完成后将结果转换为对应进制。对于如果没有写完的表达式，该算法会判断该表达式不成立，只有等到表达式全部写完才能运算，缺少更完善的实时计算预览显示。

九、个人体会

通过本次课题设计，本人认为计算器的设计并非是一个简单的项目，存在些许难度。

计算器不仅仅是简单的将给出的两个数通过计算得出结果。由于计算表达式涉及运算符众多，需要考虑运算优先级，如何设置检查优先级和数字与运算符分离都是本次项目的难点。而网上相关资料较少，部分功能基本无法查找相应资料，大部分时间需要自行尝试进行设计。而由于数学运算中部分算式是不成立（如 X/0 型）或者表达式压根不合法（如+ + --323），需要算法进行识别，而这又是项目的一个难点。

十、参考文献

1. Java 实现表达式计算求值

https://blog.csdn.net/a1439775520/article/details/96763582

2. 类集--Collections 工具类， 栈操作：Stack(理解)， 属性操作类：Properties（重点）

https://blog.csdn.net/a584898/article/details/81037514

3. java 表达式计算_基于 Java 语言的表达式计算

https://blog.csdn.net/weixin_35257663/article/details/114032323