The Key Technology Research of Balcony Farm APP System

Qi Yan[1,2, a]

[1]College of Information Science and Technology, Bohai University, Jinzhou 121000, China;

[2]Key Laboratory of Big Data in Digital Publishing, SAPPRFT, Bohai University, Jinzhou 121000, China.

[a]32392392@qq.com

Abstract. The hardware modules of the balcony farm system include McS-52, WIFI, temperature and humidity, relay, LCD1602, etc. The software is developed by eclipse, and the user interface is developed with technologies such as linear layout, GridView, Activity and Intent. Finally, the mobile APP can monitor the environment of vegetable cultivation in the balcony space and implement precise control according to the environmental requirements of crops.

Keywords: GridView; Activity; Intent; WIFI; MCS-52.

1. Introduction

Balcony agriculture refers to a kind of agricultural production that USES the space such as balcony of dweller, courtyard, housetop to undertake. Literature [1, 2] introduces that agricultural planting on balconies and roofs has been very common in some developed countries such as Europe, America and Japan. As early as 2009, the eu carried out a comprehensive analysis and layout plan for 12 key technologies, including identification technology, discovery and search engine technology, communication technology, software and algorithm, and energy storage technology. At present, Germany, the United Kingdom, the Netherlands, France and other European developed countries are doing their best to promote the development of agricultural Internet of things. Literature [3] introduced that in order to meet the greenhouse planting project, prewar company in the Netherlands developed a NutriFit precision irrigation and fertilization fully intelligent control system, which can automatically control the nutrient solution required by crops based on the growth and development characteristics and growth needs of different crops, so as to meet the optimal requirements of crop growth and development.

To sum up, European and American countries and regions attach great importance to the large-scale industrial application of agricultural Internet of things, transform high and new technologies into economic benefits, accumulate a lot of successful experience, pay attention to the research and development and use of agricultural sensors [4], pay attention to the construction of agricultural Internet of things standards, these experiences are worth learning.

2. Demand Analysis

Demand analysis is the foundation of system development, and the result of the software and hardware system is divided into two parts, the software is to develop the APP system, hardware system using MCS - 52 single chip microcomputer, the temperature and humidity sensors, LCD1602 LCD display, the WIFI module, relay and the LED module connected, can display the temperature and humidity in the LCD1602 LCD screen, can also through the APP shows, and control.

The main functions of the system include collecting temperature and humidity, turning on the fan, turning off the fan, turning on the LED light, turning off the LED light, and automatically controlling the fan and LED light according to the temperature and humidity data [5].

3. Key Technologies Involved in System Development

3.1 Android Program Development

In addition to displaying the temperature and humidity, the mobile phone APP also sends instructions to the WIFI module, which sends instructions to the MCU through the serial port. The MCU controls the switch on and off of the lamp and relay through the program, and the relay is used in the system to simulate the operation of the water pump.

Register the Activity in android manifest. xml, the main code is as follows:

```
<activity
        android:name="com.example.activity.MainActivity"
        android:label="@string/app_name">
<intent-filter>
<action android:name="android.intent.action.MAIN" />
<category android:name="android.intent.category.LAUNCHER" />
</intent-filter>
</activity>
```

GridView is mainly used in the program development for the main form design [6], the main code is as follows:

```
        gvInfo = (GridView) findViewById(R.id.gvInfo);
        Button xswsd = (Button) findViewById(R.id.xswsd);
        List<Map<String, Object>> listItems = new ArrayList<Map<String, Object>> ();
         For (int i = 0; i < images. length;i++){
   Map<String, Object> map = new HashMap<String, Object>();
   map.put("image", images[i]);
   map.put("title", titles[i]);
   listItems.add(map);
        }
        SimpleAdapter adapter = new SimpleAdapter (this, listItems,R.layout.gvitem,
     new String [] {"title","image"},
     new int [] {R.id. ItemTitle, R.id. ItemImage});
        gvInfo. setAdapter(adapter);
```

When multiple activities are called, the Intent is used to switch between different activities and transfer data.The corresponding main code is as follows:

```
Intent intent = new Intent (menu.this, Main.class);
startActivity(intent);
```

The mobile phone APP sends instructions to the relay module to control the light on and off.The code to turn on and off the relay light is as follows:

```
class jidianqikai implements OnClickListener
                {
            @Override
            public void onClick(View v) {
            if (isConnecting && mSocketClient != null)   {
                    new Thread () {
                    public void run () {
            String output = "%";
                try {
                    mPrintWriterClient.print(output);//
                    mPrintWriterClient.flush();
                    }
                catch (Exception e) {
                    Toast.makeText(mContext, " Mobile communication permission is not open "+
e.getMessage(), Toast.LENGTH_SHORT).show();
```

```
                    }
             };
          }. Start ();
    }
          if (mSocketClient == null) {
          Toast. makeText (mContext, "ununited", Toast. LENGTH_SHORT). show ();
                  }   } }
```

3.2 Main Hardware Module Development

After the WIFI module receives the instruction sent by the mobile APP, the MCU calls the serial port service sub-function to determine the received character [7], and then carries out corresponding processing. the serial port service sub-function is defined as follows:

```
void time () interrupt 4
{
      If (RI)
      {
      RI=0;
      Switch (SBUF)
          {
          case '@': led=0; break;//Received @ character from APP
          case '#': led=1; break;//Received # character from APP
          case '%':jdq=0;break;//Received % character from APP
          case '&':jdq=1;break;//Received &character from APP
          }
      }
}
```

In the program development of WIFI module, the serial port is used to send the function of serial port, and the serial port continuously sends the char array, and will stop when the termination number \0 is encountered. the serial port sending function is defined as follows.

```
void Uart1Sends (uchar *str)
{while(*str!='\0')
  {SBUF=*str;
      while(!TI);//Wait for the completion of the transmission signal TI=1 to appear
      TI=0;
      str++;
  }}
```

4. Summary

In this paper, the function of the system is first analyzed, and then eclipse and Keil uVision4 are used to develop the system. In combination with McS-52, WIFI, temperature and humidity modules and other control modules, the intelligent management of the balcony farm is realized.

Acknowledgements

201801083001,201801342002): Mobile Internet application development curriculum reform, Reform and practice of mobile application development course based on enterprise, Reform of integrated practical courses of the Internet of things.

References

[1]. Lovell S T. Multifunctional urban agriculture for sustainable land use planning in the United States [J]. Sustainability, 2010, 2(8): 2499-2522.

[2]. Cerovic Z G, Ghozlen N B, Milhade C, et al. Non-destructive diagnostic test for nitrogen nutrition of grapevine (Vitis vinifera L.) based on dualex leaf -clip measurements in the field[J]. Journal of Agricultural and Food Chemistry,2015,63(14): 3669-3680.

[3]. S'liwinska M, Wis'niewska P, Dymerski T, et al. Food analysis using artificial senses[J]. Journal of Agricultural and Food Chemistry,2014,62(7): 1423-1448.

[4]. E Xu, Yang Yuqiang, Ren Yongchang. A new method of attribute reduction based on information quantity in an incomplete system. Journal of software, 2012, 7(8): 1881-1888.

[5]. Yan Qi, The Modeling and Implementation of the Asset Management System of the Automobile Maintenance Shop Based on RFID,2016 International Conference on Education, Management Science and Economics (ICEMSE-16), Singapore, during Dec.26-28,2016(65):407-409.

[6]. Chen Jia, Li Shu Qiang. Android mobile development. Posts &Telecom Press,2016,106-116.

[7]. Xu E, Shuang Lin and Lulu Jin. Data Recovery Method for Seafood Quality Safety System Based on Rough Set Theory. International Journal of Security and Its Applications,2014,8(5): 195-202.