EE317 - Application Design: Music Player

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Part 1 - Introduction

In the era of mobile big data, mobile applications have been integrated with our lives, providing us with a lot of convenience. For example, people can directly buy goods on many online shopping apps, saving the trouble of offline purchases; people can also communicate with friends and classmates in real time on chat apps, and the accuracy of message transmission guarantees people's communication needs .

On the other hand, people also have a strong demand for a platform that can store large amount of music sources which can entertain themselves. Nowadays, music player applications like NetEase and QQ music are making a great impact on people by now. Therefore, it is a good problem for us to practice.

In this paragraph, I will cover the latter parts of the report. In the second part, I will introduce how I designed the user interface of this music player app, and give the corresponding display; in the third part, I will introduce how the music player app implements logical operations, and demonstrate some real-scene tests. In the fourth part, I will focus on demonstration on real mobile phones.

Part 2 - User Interface

In Part 2, I will guide you through how I designed the user interface and present you the final version.

For the user interface design, *Linear layout* is used for the general interface, containing the playing interface and the song list interface. Specifically, in the song list, we use *Recycler View* to display the songs that can be played. The related codes are presented as the following.

activity_main.xml:

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".MainActivity"
    android:orientation="vertical">
    <TextView
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:text="Song List"
        android:textAllCaps="false"
        android:fontFamily="@font/gothicb"
```

```
        android:textColor="#FF8C94"
        android:textSize="25sp"
        android:gravity="center"
        android:background="#FFD3B6"/>
    <androidx.recyclerview.widget.RecyclerView
        android:id="@+id/rv"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:background="#FFECDA"/>
</LinearLayout>
```

As for the playing interface, there exist some buttons, image view boxes and text view boxes, so we adopt *linear layout* with *relative layout* inside. Besides, a seek bar is adopted to display the current playing progress. The full-edition code will be released at Appendix. The related codes are presented as the following.

activity_song1.xml:

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:background="#7CEBFFFA"
    tools:context=".SongActivity1"
    android:orientation="vertical">
    <TextView
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:fontFamily="@font/gothicb"
        android:id="@+id/name"
        android:text="Song of PIAO"
        android:gravity="center"
        android:layout_marginTop="35dp"
        android:textColor="#07689f"
        android:textSize="30sp"/>

    <TextView
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:text="PIAO"
        android:id="@+id/singer"
        android:fontFamily="@font/gothici"
        android:gravity="center"
        android:layout_marginTop="3dp"
        android:textColor="#07689f"
        android:textSize="20sp"/>

    <ImageView
        android:id="@+id/iv_cover"
        android:layout_width="260dp"
        android:layout_height="260dp"
        android:layout_gravity="center_horizontal"
        android:layout_marginTop="40dp"
```

```
        android:src="@drawable/cover" />

    <SeekBar
        android:id="@+id/sb"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:maxHeight="10.0dp"
        android:minHeight="10.0dp"
        style="@style/CustomSeekbarStyle"
        android:thumb="@drawable/sb_thumb"
        android:layout_marginTop="40dp"/>

    <RelativeLayout
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:layout_margin="10dp">

        <TextView
            android:id="@+id/tv_progress"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:fontFamily="@font/gothici"
            android:text="00:00"
            android:textColor="@color/black"
            android:textSize="16sp" />
        <TextView
            android:id="@+id/tv_total"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:fontFamily="@font/gothici"
            android:text="04:50"
            android:layout_alignParentRight="true"
            android:textSize="16sp"
            android:textColor="@color/black"/>

    </RelativeLayout>
    <LinearLayout
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:orientation="horizontal"
        android:layout_margin="5dp">
        <Button
            android:id="@+id/btn_play"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:background="@drawable/shape"
            android:fontFamily="@font/gothicb"
            android:textAllCaps="false"
            android:text="Start"
            android:textColor="#07689f"
            android:textSize="15sp"
            android:layout_weight="1"
            android:layout_margin="5dp"/>
        <Button
            android:id="@+id/btn_pause"
```

```
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:background="@drawable/shape"
            android:fontFamily="@font/gothicb"
            android:textAllCaps="false"
            android:text="Pause"
            android:textColor="#07689f"
            android:textSize="15sp"
            android:layout_weight="1"
            android:layout_margin="5dp"/>
        <Button
            android:id="@+id/btn_continue"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:textAllCaps="false"
            android:background="@drawable/shape"
            android:fontFamily="@font/gothicb"
            android:text="Continue"
            android:textSize="15sp"
            android:textColor="#07689f"
            android:layout_weight="1"
            android:layout_margin="5dp"/>
        <Button
            android:id="@+id/btn_exit"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:background="@drawable/shape"
            android:textAllCaps="false"
            android:fontFamily="@font/gothicb"
            android:text="Exit"
            android:textColor="#07689f"
            android:textSize="15sp"
            android:layout_margin="5dp"
            android:layout_weight="1"/>

    </LinearLayout>

</LinearLayout>
```

Since the original seek bar is not beautiful, I choose to use a more elegant design of the seek bar.

seekbar_progress_drawable.xml (to change the background color of the seek bar):

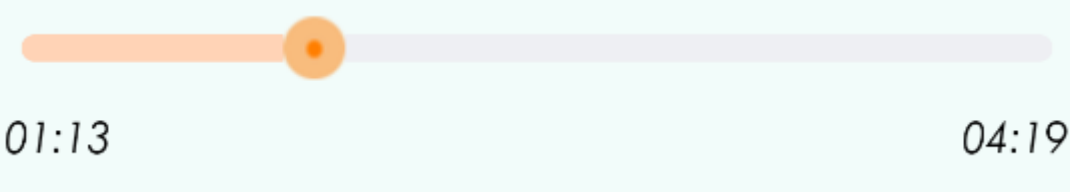
```
<?xml version="1.0" encoding="utf-8"?>
<layer-list xmlns:android="http://schemas.android.com/apk/res/android">
    <!--定义seekbar滑动条的底色-->
    <item android:id="@android:id/background">
        <shape>
            <corners android:radius="5dp" />
            <gradient
                android:angle="270"
                android:centerColor="#eeeff3"
                android:centerY="0.75"
                android:endColor="#eeeff3"
                android:startColor="#eeeff3" />
```

```
        </shape>
    </item>
    <!--定义seekbar滑动条进度颜色-->
    <item android:id="@android:id/progress">
        <clip>
            <shape>
                <corners android:radius="5dp"/>
                <solid android:color="#FFD3B6"/>
            </shape>
        </clip>
    </item>
</layer-list>
```

sb_thumb.xml (to change the thumb):

```
<?xml version="1.0" encoding="utf-8"?>
<selector xmlns:android="http://schemas.android.com/apk/res/android">
    <item android:state_pressed="true"
android:drawable="@drawable/seekbar_thumb_pressed"/>
    <item android:state_pressed="false"
android:drawable="@drawable/seekbar_thumb_normal"/>
</selector>
```

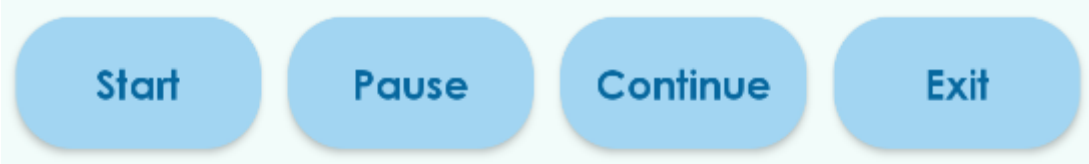
Finally, the seek bar design is shown as the following.



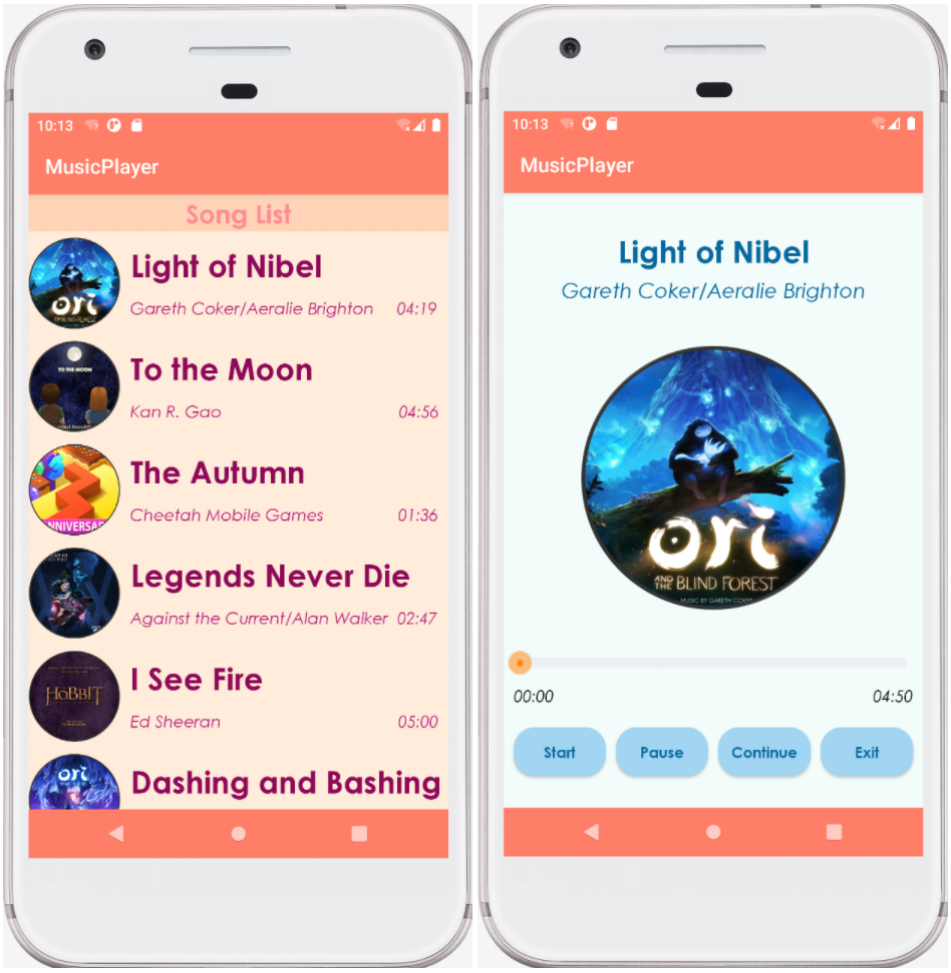
As for the color choices, I designed a button style and be called by the buttons using `android:background="@drawable/shape"`.

```
<?xml version="1.0" encoding="utf-8"?>
<shape xmlns:android="http://schemas.android.com/apk/res/android"
    android:padding="16dp"
    android:shape="rectangle">
    <solid android:color="#a2d5f2" />
    <stroke
        android:width="1dp"
        android:color="#a2d5f2" />
    <corners android:radius="20dp" />
</shape>
```

The button design is shown as the following.



Finally, I adapted the size of the buttons to display perfectly on my virtual device *Pixel API 30*. The presentation of the user interface is given below.



Part 3 - Implementation of Music Player Function

In Part 3, I will show you how I implemented the operations and functions for the music player. This part will be divided into 2 subsections: Button Functions and Page Jumping.

3.1 - Button Functions

The codes related to button functions:

```
@Override
public void onClick(View view) {
    switch (view.getId()){
        case R.id.btn_play:
            //播放音乐
            control.play(song_index);
            //光盘开始转
            animator.start();
            break;
        case R.id.btn_pause:
            //停止播放音乐
            control.pausePlay();
            //光盘停止转
```

```
            animator.pause();
            break;
        case R.id.btn_continue:
            //继续播放音乐
            control.continuePlay();
            //光盘继续转
            animator.resume();
            break;
        case R.id.btn_exit:
            finish();
            break;
    }
}
```

3.2 - Page Jumping

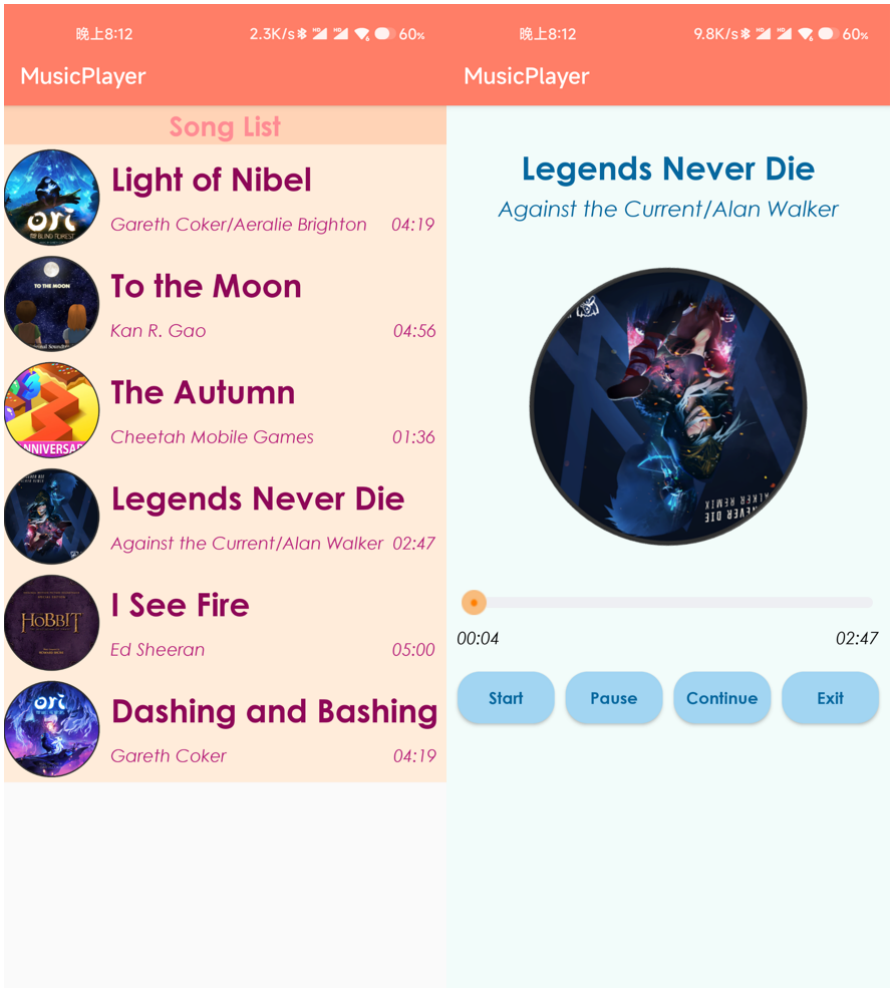
The related codes:

```
@Override
//给每个itemView赋具体的内容
public void onBindViewHolder(@NonNull MyHolder holder,
@SuppressLint("RecyclerView") int position) {
    holder.miv_image.setBackgroundResource(images[position]);
    holder.mtv_name.setText(names[position]);
    holder.mtv_singer.setText(singers[position]);

    holder.itemView.setOnClickListener(new View.OnClickListener() {
        @Override
        public void onClick(View view) {
            Intent intent = null;
            song_index = position;
            intent=new Intent(MainActivity.this,SongActivity1.class);
            startActivity(intent);
        }
    });

}
```

To be mentioned, the real device function presentation will be recorded in a video. It will be attached in the assignment submission file.

Part 4 - Real Device Presentation

The following tests are based on Mi 11, MIUI 13 system. Due to resolution problems, there may exists a blank area on the bottom. But all the buttons and functions can be executed correctly.



For more detailed contents, please refer to the attached presentation video.

Appendix - All Codes

Java program for song list `MainActivity.java`:

```java
package com.example.musicplayer;

import androidx.annotation.NonNull;
import androidx.appcompat.app.AppCompatActivity;
import androidx.recyclerview.widget.LinearLayoutManager;
import androidx.recyclerview.widget.RecyclerView;
import androidx.recyclerview.widget.StaggeredGridLayoutManager;

import android.annotation.SuppressLint;
import android.content.Intent;
import android.graphics.Rect;
import android.os.Bundle;
import android.os.Handler;
import android.provider.ContactsContract;
import android.view.View;
import android.view.ViewGroup;
import android.widget.ImageView;
import android.widget.TextView;
import android.widget.Toast;

import java.util.zip.Inflater;
```

```
22
23  public class MainActivity extends AppCompatActivity {
24      private RecyclerView mrv;
25      public static int song_index = 0;
26
27      private int[] images=
    {R.drawable.cover,R.drawable.cover2,R.drawable.cover3,R.drawable.cover4,R.d
    rawable.cover5,R.drawable.cover6};
28      private String[] names={"Light of Nibel","To the Moon","The
    Autumn","Legends Never Die","I See Fire","Dashing and Bashing"};
29      private String[] singers={"Gareth Coker/Aeralie Brighton     04:19",
30                                "Kan R. Gao
       04:56",
31                                "Cheetah Mobile Games                01:36",
32                                "Against the Current/Alan Walker  02:47",
33                                "Ed Sheeran
       05:00",
34                                "Gareth Coker
    04:19"};
35
36      @Override
37      protected void onCreate(Bundle savedInstanceState) {
38          super.onCreate(savedInstanceState);
39          setContentView(R.layout.activity_main);
40          mrv = findViewById(R.id.rv);
41          mrv.setLayoutManager(new
    LinearLayoutManager(MainActivity.this,LinearLayoutManager.VERTICAL,false));
42          mrv.setAdapter(new MyAdapter());
43          mrv.addItemDecoration(new MyDecoration());
44
45      }
46
47
48      private class MyAdapter extends RecyclerView.Adapter<MyHolder> {
49          @NonNull
50          @Override
51          //把item_layout布局转成视图
52          public MyHolder onCreateViewHolder(@NonNull ViewGroup parent, int
    viewType) {
53              View v =
    View.inflate(MainActivity.this,R.layout.item_layout,null);
54              MyHolder myHolder = new MyHolder(v);
55              return myHolder;
56          }
57
58          @Override
59          //给每个itemView赋具体的内容
60          public void onBindViewHolder(@NonNull MyHolder holder,
    @SuppressLint("RecyclerView") int position) {
61              holder.miv_image.setBackgroundResource(images[position]);
62              holder.mtv_name.setText(names[position]);
63              holder.mtv_singer.setText(singers[position]);
64
65              holder.itemView.setOnClickListener(new View.OnClickListener() {
66                  @Override
```

```
                public void onClick(View view) {
                    Intent intent = null;
                    song_index = position;
                    intent=new
Intent(MainActivity.this,SongActivity1.class);
                    startActivity(intent);
                }
            });

        }

        @Override
        public int getItemCount() {
            return images.length;
        }
    }

    private class MyHolder extends RecyclerView.ViewHolder {
        private ImageView miv_image;
        private TextView mtv_name,mtv_info,mtv_singer;
        public MyHolder(@NonNull View itemView) {
            super(itemView);
            miv_image = itemView.findViewById(R.id.iv_image);
            mtv_singer = itemView.findViewById(R.id.tv_singer);
            mtv_name = itemView.findViewById(R.id.tv_name);
        }
    }
    //自定义了一个ItemDecoration类
    private class MyDecoration extends RecyclerView.ItemDecoration {
        @Override
        public void getItemOffsets(@NonNull Rect outRect, @NonNull View
view, @NonNull RecyclerView parent, @NonNull RecyclerView.State state) {
            super.getItemOffsets(outRect, view, parent, state);
            outRect.set(0,15,0,15);
        }
    }
}
```

Java program for song playing interface `SongActivity1.java`:

```
package com.example.musicplayer;

import static com.example.musicplayer.MainActivity.song_index;

import androidx.annotation.NonNull;
import androidx.appcompat.app.AppCompatActivity;

import android.animation.ObjectAnimator;
import android.content.ComponentName;
import android.content.Intent;
import android.content.ServiceConnection;
import android.media.MediaPlayer;
import android.os.Bundle;
```

```
import android.os.Handler;
import android.os.HandlerThread;
import android.os.IBinder;
import android.os.Looper;
import android.os.Message;
import android.view.View;
import android.view.animation.LinearInterpolator;
import android.widget.Button;
import android.widget.ImageView;
import android.widget.SeekBar;
import android.widget.TextView;

import com.example.musicplayer.MusicService;

import java.util.Timer;

public class SongActivity1 extends AppCompatActivity{
    private ImageView iv_cover;
    private static SeekBar sb;
    private static TextView tv_progress,tv_total, tv_name, tv_singer;
    private Button btn_play,btn_pause,btn_continue,btn_exit;

    public String[] name = {"Light of Nibel","To the Moon","The Autumn","Legends Never Die","I See Fire","Dashing and Bashing"};
    public String[] singer = {"Gareth Coker/Aeralie Brighton","Kan R. Gao","Cheetah Mobile Games","Against the Current/Alan Walker","Ed Sheeran","Gareth Coker"};

    private ObjectAnimator animator; //声明一个动画组件ObjectAnimator

    private MusicService.MusicControl control;//声明MusicService中的音乐控制器

    private ServiceConnection connection = new ServiceConnection() { //声明服务连接
        @Override
        public void onServiceConnected(ComponentName componentName, IBinder iBinder) {
            control = (MusicService.MusicControl) iBinder;//实例化control。
        }
        @Override
        public void onServiceDisconnected(ComponentName componentName) {

        }
    };


    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_song1);
        init();
    }
    public void init(){
        iv_cover = findViewById(R.id.iv_cover);
        sb = findViewById(R.id.sb);
```

```
64          tv_progress = findViewById(R.id.tv_progress);
65          tv_total = findViewById(R.id.tv_total);
66          tv_name = findViewById(R.id.name);
67          tv_singer = findViewById(R.id.singer);
68
69          btn_play = findViewById(R.id.btn_play);
70          btn_pause = findViewById(R.id.btn_pause);
71          btn_continue = findViewById(R.id.btn_continue);
72          btn_exit = findViewById(R.id.btn_exit);
73
74          OnClick monclick = new OnClick();
75          btn_play.setOnClickListener(monclick);
76          btn_pause.setOnClickListener(monclick);
77          btn_continue.setOnClickListener(monclick);
78          btn_exit.setOnClickListener(monclick);
79
80          //执行动画的对象是iv_cover，// 动画效果是0-360°旋转（用的是浮点数，所以加个
    f）。
81          animator = ObjectAnimator.ofFloat(iv_cover,"rotation",0.0f,360.0f);
82          animator.setDuration(10000); //旋转一周的时长，单位是毫秒，此处设置了10s
83          animator.setInterpolator(new LinearInterpolator());//设置匀速转动
84          animator.setRepeatCount(-1);//设置循环，此处设置的是无限循环。如果是正值，
    意味着转动多少圈。
85
86          //声明一个意图，该意图进行服务的启动，意思是将MusicService里面的服务要传到主程
    序这里来。
87          Intent mintent = new Intent(SongActivity1.this,MusicService.class);
88          bindService(mintent,connection,BIND_AUTO_CREATE);//建立意图中
    MainActivity与MusicService两对象的服务连接
89
90          switch (song_index){
91              case 0:
92                  iv_cover.setImageResource(R.drawable.cover);
93                  break;
94              case 1:
95                  iv_cover.setImageResource(R.drawable.cover2);
96                  break;
97              case 2:
98                  iv_cover.setImageResource(R.drawable.cover3);
99                  break;
100             case 3:
101                 iv_cover.setImageResource(R.drawable.cover4);
102                 break;
103             case 4:
104                 iv_cover.setImageResource(R.drawable.cover5);
105                 break;
106         }
107
108         tv_name.setText(name[song_index]);
109         tv_singer.setText(singer[song_index]);
110         seekBarListener msbListener = new seekBarListener();
111         sb.setOnSeekBarChangeListener(msbListener);
112
113     }
114     // 设置播放、暂停、继续和退出按钮的监听（或点击）事件
```

```
    class OnClick implements View.OnClickListener{

        @Override
        public void onClick(View view) {
            switch (view.getId()){
                case R.id.btn_play:
                    //播放音乐
                    control.play(song_index);
                    //光盘开始转
                    animator.start();
                    break;
                case R.id.btn_pause:
                    //停止播放音乐
                    control.pausePlay();
                    //光盘停止转
                    animator.pause();
                    break;
                case R.id.btn_continue:
                    //继续播放音乐
                    control.continuePlay();
                    //光盘继续转
                    animator.resume();
                    break;
                case R.id.btn_exit:
                    finish();
                    break;

            }
        }
    }

    @Override
    protected void onDestroy() {
        control.stopPlay();
        unbindService(connection);
        super.onDestroy();

    }

    //Handler主要用于异步消息的处理，在这里是处理子线程MusicService传来的消息
    public static Handler handler = new Handler(Looper.getMainLooper()){

        @Override
        public void handleMessage(@NonNull Message msg) {
            //super.handleMessage(msg);
            Bundle bundle = msg.getData();
            int duration = bundle.getInt("duration");//把音乐时长放在bundle里
            int currentDuration = bundle.getInt("currentDuration");//把音乐
当前播放时长放在bundle里

            sb.setMax(duration);
            sb.setProgress(currentDuration);

            //显示总时长
            int minite = duration / 1000 /60;
```

```
            int second = duration / 1000 % 60;
            String strMinite = "";
            String strSecond = "";
            if (minite < 10){
                strMinite = "0" +minite;
            }else {
                strMinite = minite + "";
            }
            if (second < 10){
                strSecond = "0" + second;
            }else {
                strSecond = second + "";
            }
            tv_total.setText(strMinite + ":" + strSecond);


            //显示播放时长
            minite = currentDuration / 1000 /60;
            second = currentDuration / 1000 % 60;

            if (minite < 10){
                strMinite = "0" +minite;
            }else {
                strMinite = minite + "";
            }
            if (second < 10){
                strSecond = "0" + second;
            }else {
                strSecond = second + "";
            }
            tv_progress.setText(strMinite + ":" + strSecond);
        }
    };

    //给进度条设置监听
    class seekBarListener implements SeekBar.OnSeekBarChangeListener {
        @Override
        //进度条行进过程的监听
        public void onProgressChanged(SeekBar seekBar, int i, boolean b) {
            if (i == seekBar.getMax()){
                animator.pause();
            }
            if (b){//判断是否来自用户
                control.seekTo(i);
            }
        }

        @Override
        //用户开始滑动进度条的监听
        public void onStartTrackingTouch(SeekBar seekBar) {
            control.pausePlay();
            animator.pause();
        }

        @Override
```

```
        //用户停止滑动进度条的监听
        public void onStopTrackingTouch(SeekBar seekBar) {
            control.continuePlay();
            animator.resume();
        }
    }
}
```

Music Service `MusicService.java`:

```
package com.example.musicplayer;

import android.app.Service;
import android.content.Intent;
import android.media.MediaPlayer;
import android.os.Binder;
import android.os.Build;
import android.os.Bundle;
import android.os.IBinder;
import android.os.Message;

import androidx.annotation.Nullable;

import java.util.Timer;
import java.util.TimerTask;

/**
 * 在这里设置音乐播放功能的服务
 *
 */

public class MusicService extends Service {

    // 设置两个成员变量
    private MediaPlayer player;//多媒体对象
    private Timer timer;//时钟
    private int[] songs = {R.raw.song1, R.raw.song2, R.raw.song3,
R.raw.song4, R.raw.song5, R.raw.song6};

    public MusicService(){};//一个空的构造函数（为什么放？ ）

    @Nullable
    @Override
    public IBinder onBind(Intent intent) {
        return new MusicControl();//这样的话，绑定服务的时候，可以把音乐控制器实例
化。
    }

    @Override
    public void onCreate() {
        super.onCreate();
        player = new MediaPlayer();//实例化多媒体
    }
```

```
42
43      @Override
44      public int onStartCommand(Intent intent, int flags, int startId) {
45          return super.onStartCommand(intent, flags, startId);
46      }
47
48      @Override
49      public void onDestroy() {
50          super.onDestroy();
51      }
52      //创建一个内部类MusicControl，功能是让主程序控制sevise里面的多媒体对象。IBinder
是Binder的子类，因此要返回MusicControl给IBinder。
53      class MusicControl extends Binder{
54          public void play(int index) {
55              try{
56                  player.reset();//重置音乐播放器
57                  player = MediaPlayer.create(getApplicationContext(),
songs[index]); //加载多媒体文件
58                  player.start(); //开始播放音乐
59                  addTimer();//添加计时器
60              }catch (Exception exception) {//catch用来处理播放时产生的异常
61                  exception.printStackTrace();
62              }
63          }
64          public void pausePlay(){
65              player.pause();    //暂停播放
66          }
67          public void continuePlay(){
68              player.start();   //继续播放
69          }
70          public void stopPlay(){
71              player.stop();
72              player.release();
73              try {
74                  timer.cancel();
75              }catch (Exception e){
76                  e.printStackTrace();
77              }
78          }
79          public void seekTo(int progress){
80              player.seekTo(progress);//设置播放位置播放
81          }
82      }
83
84      //添加计时器，计时器是一个多线程的东西，用于设置音乐播放器中的进度条信息
85      public void addTimer(){
86          if (timer == null){
87              timer = new Timer();
88              TimerTask task = new TimerTask() {
89                  @Override
90                  public void run() { //run就是多线程的一个东西
91                      if (player == null) return; //如果player没有实例化，就退
出。
92                      int duration = player.getDuration();//获取歌曲总长度
93                      int currentDuration = player.getCurrentPosition();
```

```
                    //将音乐的总时长、播放时长封装到消息对象中去；
                    Message message =
SongActivity1.handler.obtainMessage();
                    Bundle bundle = new Bundle();
                    bundle.putInt("duration",duration);
                    bundle.putInt("currentDuration",currentDuration);
                    message.setData(bundle);//使用bundle给主线程发消息

                    //将消息添加到主线程中
                    SongActivity1.handler.sendMessage(message);

                }
            };
            //开始计时任务后5ms，执行第一次任务，以后每500ms执行一次任务
            timer.schedule(task, 5,500);
        }
    }
}
```