Department of CSE
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UCS 1711 - Mobile Application Development Lab

Exercise 7: External Storage File I/O

Aim:

To develop a native application that reads and persistently writes content to a file stored in the external storage media of the device.

Code - External Storage: Main Activity:

```
1  package com.example.externalstorage;
2
3  import androidx.appcompat.app.AppCompatActivity;
4  import androidx.core.app.ActivityCompat;
5
6  import android.Manifest;
7  import android.os.Bundle;
8  import android.os.Environment;
9  import android.view.View;
10 import android.widget.Button;
11 import android.widget.EditText;
12 import android.widget.TextView;
13 import android.widget.Toast;
14
15 import java.io.BufferedReader;
16 import java.io.File;
17 import java.io.FileOutputStream;
18 import java.io.FileReader;
19
20 public class MainActivity extends AppCompatActivity {
21
22     @Override
23     protected void onCreate(Bundle savedInstanceState) {
24         super.onCreate(savedInstanceState);
25         setContentView(R.layout.activity_main);
26
27         final EditText writeFileText = findViewById(R.id.writeFileText);
28         final EditText readFileText = findViewById(R.id.readFileText);
29         final EditText writeContentsText = findViewById(R.id.
    writeContentsText);
30         final TextView readContentsText = findViewById(R.id.
    readContentsText);
31         final Button readButton = findViewById(R.id.readButton);
32         final Button writeButton = findViewById(R.id.writeButton);
33         final File sdCard = Environment.getExternalStorageDirectory();
34
35         //Request for the read/write permissions to the external storage
    from the user
36         ActivityCompat.requestPermissions(this, new String[]
37                 {Manifest.permission.READ_EXTERNAL_STORAGE, Manifest.
    permission.WRITE_EXTERNAL_STORAGE
38                 }, 1);
39
40         writeButton.setOnClickListener(new View.OnClickListener() {
41             @Override
42             public void onClick(View v) {
43                 String writeFileName = writeFileText.getText().toString();
```

```
44              String writeContents = writeContentsText.getText().
    toString();
45
46              //File Write Logic
47              try {
48                  File file = new File(getExternalFilesDir(null),
    writeFileName);
49                  FileOutputStream fileOutputStream = new
    FileOutputStream(file);
50                  fileOutputStream.write(writeContents.getBytes());
51                  fileOutputStream.close();
52
53                  Toast successToast = Toast.makeText(MainActivity.this,
     "File Written Successfully!", Toast.LENGTH_SHORT);
54                  successToast.show();
55              } catch (Exception e) {
56                  Toast errorToast = Toast.makeText(MainActivity.this, e
    .getMessage(), Toast.LENGTH_SHORT);
57                  errorToast.show();
58              }
59          }
60      });
61
62      readButton.setOnClickListener(new View.OnClickListener() {
63          @Override
64          public void onClick(View v) {
65
66              String readFileName = readFileText.getText().toString();
67
68              //File Read Logic
69              try{
70                  String buffer, readContents = "";
71                  File file = new File(getExternalFilesDir(null),
    readFileName);
72                  BufferedReader bufferedReader = new BufferedReader(new
     FileReader(file));
73
74                  while((buffer = bufferedReader.readLine()) != null){
75                      //Read till the bufferedReader gets characters
76                      readContents += buffer;
77                  }
78
79                  readContentsText.setText(readContents);
80
81                  Toast successToast = Toast.makeText(MainActivity.this,
     "File Read Successfully!", Toast.LENGTH_SHORT);
82                  successToast.show();
83
84              } catch (Exception e) {
85                  Toast errorToast = Toast.makeText(MainActivity.this, e
    .getMessage(), Toast.LENGTH_SHORT);
```

```
86                         errorToast.show();
87                 }
88             }
89         });
90     }
91 }
```

Code - External Storage: Main Activity Layout:

```xml
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout 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">

    <TextView
        android:id="@+id/textView"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="20dp"
        android:fontFamily="@font/chivo"
        android:text="SD Card - Write"
        android:textColor="?android:attr/textColorPrimary"
        android:textSize="20sp"
        android:textStyle="bold"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />

    <TextView
        android:id="@+id/textView2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="10dp"
        android:layout_marginTop="75dp"
        android:fontFamily="@font/chivo"
        android:text="Enter File Name:"
        android:textColor="?android:attr/textColorPrimary"
        android:textSize="16sp"
        android:textStyle="bold"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/textView" />

    <EditText
        android:id="@+id/writeFileText"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="55dp"
        android:ems="10"
        android:fontFamily="@font/chivo"
        android:hint="File.txt"
        android:inputType="textPersonName"
        android:textColor="?android:attr/textColorPrimary"
```

```xml
            app:layout_constraintEnd_toEndOf="parent"
            app:layout_constraintStart_toEndOf="@+id/textView2"
            app:layout_constraintTop_toBottomOf="@+id/textView" />

    <TextView
        android:id="@+id/textView3"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="10dp"
        android:layout_marginTop="50dp"
        android:fontFamily="@font/chivo"
        android:text="Enter Contents:"
        android:textColor="?android:attr/textColorPrimary"
        android:textSize="16sp"
        android:textStyle="bold"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/textView2" />

    <EditText
        android:id="@+id/writeContentsText"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="30dp"
        android:ems="10"
        android:fontFamily="@font/chivo"
        android:gravity="start|top"
        android:hint="Hello World!"
        android:inputType="textMultiLine"
        android:textColor="?android:attr/textColorPrimary"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toEndOf="@+id/textView2"
        app:layout_constraintTop_toBottomOf="@+id/writeFileText" />

    <TextView
        android:id="@+id/textView4"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="30dp"
        android:fontFamily="@font/chivo"
        android:text="SD Card - Read"
        android:textColor="?android:attr/textColorPrimary"
        android:textSize="20sp"
        android:textStyle="bold"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/writeButton" />

    <TextView
        android:id="@+id/textView5"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
```
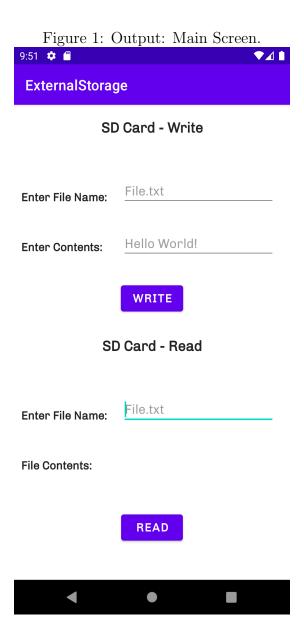
```
 98          android:layout_marginStart="10dp"
 99          android:layout_marginTop="75dp"
100          android:fontFamily="@font/chivo"
101          android:text="Enter File Name:"
102          android:textColor="?android:attr/textColorPrimary"
103          android:textSize="16sp"
104          android:textStyle="bold"
105          app:layout_constraintStart_toStartOf="parent"
106          app:layout_constraintTop_toBottomOf="@+id/textView4" />
107
108      <EditText
109          android:id="@+id/readFileText"
110          android:layout_width="wrap_content"
111          android:layout_height="wrap_content"
112          android:layout_marginTop="55dp"
113          android:ems="10"
114          android:fontFamily="@font/chivo"
115          android:hint="File.txt"
116          android:inputType="textPersonName"
117          android:textColor="?android:attr/textColorPrimary"
118          app:layout_constraintEnd_toEndOf="parent"
119          app:layout_constraintStart_toEndOf="@+id/textView5"
120          app:layout_constraintTop_toBottomOf="@+id/textView4" />
121
122      <TextView
123          android:id="@+id/textView6"
124          android:layout_width="wrap_content"
125          android:layout_height="wrap_content"
126          android:layout_marginStart="10dp"
127          android:layout_marginTop="50dp"
128          android:fontFamily="@font/chivo"
129          android:text="File Contents:"
130          android:textColor="?android:attr/textColorPrimary"
131          android:textSize="16sp"
132          android:textStyle="bold"
133          app:layout_constraintStart_toStartOf="parent"
134          app:layout_constraintTop_toBottomOf="@+id/textView5" />
135
136      <TextView
137          android:id="@+id/readContentsText"
138          android:layout_width="200dp"
139          android:layout_height="wrap_content"
140          android:layout_marginTop="50dp"
141          android:fontFamily="@font/chivo"
142          android:textColor="?android:attr/textColorPrimary"
143          android:textSize="16sp"
144          app:layout_constraintEnd_toEndOf="parent"
145          app:layout_constraintStart_toEndOf="@+id/textView5"
146          app:layout_constraintTop_toBottomOf="@+id/readFileText" />
147
148      <Button
```

```
149         android:id="@+id/readButton"
150         android:layout_width="wrap_content"
151         android:layout_height="wrap_content"
152         android:fontFamily="@font/chivo"
153         android:text="Read"
154         android:textColor="@color/design_default_color_on_primary"
155         android:textSize="16sp"
156         android:textStyle="bold"
157         app:layout_constraintBottom_toBottomOf="parent"
158         app:layout_constraintEnd_toEndOf="parent"
159         app:layout_constraintStart_toStartOf="parent"
160         app:layout_constraintTop_toBottomOf="@+id/readContentsText" />
161
162     <Button
163         android:id="@+id/writeButton"
164         android:layout_width="wrap_content"
165         android:layout_height="wrap_content"
166         android:layout_marginTop="30dp"
167         android:fontFamily="@font/chivo"
168         android:text="Write"
169         android:textSize="16sp"
170         android:textStyle="bold"
171         app:layout_constraintEnd_toEndOf="parent"
172         app:layout_constraintStart_toStartOf="parent"
173         app:layout_constraintTop_toBottomOf="@+id/writeContentsText" />
174
175 </androidx.constraintlayout.widget.ConstraintLayout>
```
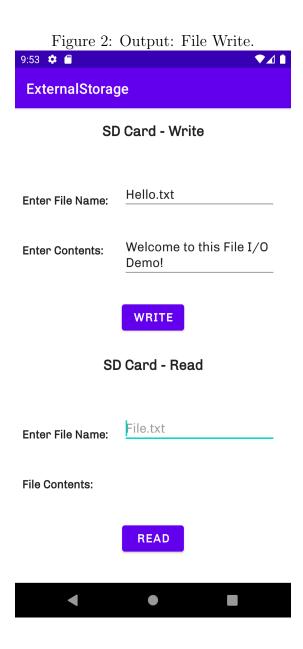
Code - External Storage: Android Manifest XML:

```xml
1  <?xml version="1.0" encoding="utf-8"?>
2  <manifest xmlns:android="http://schemas.android.com/apk/res/android"
3      package="com.example.externalstorage">
4
5      <!--Permissions required for file I/O -->
6      <uses-permission android:name="android.permission.
       WRITE_EXTERNAL_STORAGE"/>
7      <uses-permission android:name="android.permission.
       READ_EXTERNAL_STORAGE"/>
8      <uses-permission android:name="android.permission.
       MANAGE_EXTERNAL_STORAGE"/>
9
10     <application
11         android:allowBackup="true"
12         android:icon="@mipmap/ic_launcher"
13         android:label="@string/app_name"
14         android:roundIcon="@mipmap/ic_launcher_round"
15         android:supportsRtl="true"
16         android:theme="@style/Theme.ExternalStorage">
17         <activity
18             android:name=".MainActivity"
19             android:exported="true">
20             <intent-filter>
21                 <action android:name="android.intent.action.MAIN" />
22
23                 <category android:name="android.intent.category.LAUNCHER"
       />
24             </intent-filter>
25         </activity>
26         <meta-data
27             android:name="preloaded_fonts"
28             android:resource="@array/preloaded_fonts" />
29     </application>
30
31 </manifest>
```
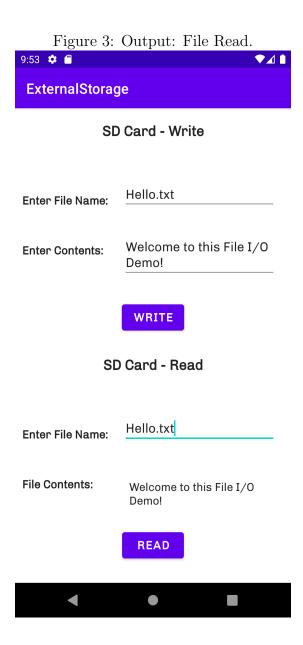
Output: Main Screen:

Figure 1: Output: Main Screen.

Output: File Write:

Figure 2: Output: File Write.

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Output: File Read:

Figure 3: Output: File Read.

Learning Outcome:

- I learnt how to set application permissions for **READ, WRITE & MANAGE EXTERNAL STORAGE** using the AndroidManifest.xml file.

- I learnt how to obtain permissions from the user through the UI using **requestPermissions()** method under the **ActivityCompat** class.

- I learnt how to do **File Write & File Read** using **File**, **FileOutputStream** and **BufferedReader** objects.

- I understood about the different types of exceptions that can be thrown by the usage of methods under these objects, like **FileNotFoundException & IOException**.

- I understood how Android fine-grains its app permissions to get access to various resources like the SD Card, Location etc.

- I implemented the **File I/O** successfully and was able to view the created files via the File Explorer as well, which was persistently created under the **Android/data/app-package-name** directory.