LE/EECS 4443: Mobile User Interfaces (LAB)

Week 3: Human-Computer Interaction & Android Activities

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Introduction

By the end of this tutorial, you wil be able to...

1. Design a user study
2. Draft a research proposal
3. Understand the Android Activity Lifecycle

User Studies

- **User research** is a methodological approach to study target users under a constrained environment; we want to understand their needs, requirements, and grievances about a particular interaction.
- We also want to know which interaction is the, "best" among alternatives.

Prerequisite Knowledge

1. **Qualitative Data**
   - Non-numerical data typically obtained from open-ended responses (questionnaires, interviews or focus groups).
   - By obtaining qualitative data, we can understand how users interpret (think or feel about) a particular interaction.
2. **Quantitative Data**
   - Numerical data which focuses on well-defined performance metrics.
   - How well is the user doing? (e.g., accuracy)

Note: Both types of data are important! They give a better picture of the whole story. Does the user enjoy the interaction? Is it intuitive? Is it cumbersome?

Prerequisite Knowledge

1. **Nominal Data:** A type of categorical data representing codes that have no rank order.
2. **Ordinal Data:** A type of categorical data that associates order and rank to an attribute.
3. **Interval Data:** A type of quantitative data using a Likert Scale to measure the level of user "agreement" given a statement.
4. **Ratio Data:** A type of quantitative data measuring an attribute on a continuous non-discrete scale.

Designing a User Study

Some things you need to consider when designing your user study...

1. **Research Questions**
   1. Independent Variable(s)
   2. Dependent Variable(s)
   3. Null (H_0) & Alternative Hypothese (H_a)
2. **Method**
   - Study Design (Within, Between, Mixed)
   - Statistical Tests (Hypothesis Tests) $\rightarrow$ Parametric Data?

Designing a User Study

1. Make sure that your performance metrics are logged correctly in the application.
   - **Note:** You can save yourself some time by formatting the data in advance if you know what software you will use you carry out statistical testing!
2. Define a good well-defined experimental task that you expect to elicit reasonable change.
3. Build a robust methodology
   - Internal vs External Validity
   - Counterbalancing? (Randomization, Latin Square)
   - Learning Effect?
4. Make sure you are following established ethical guidelines (TCPS 2: CORE-2022)

Helpful Resources & Software

1. JASP - A Fresh Way to do Statistics
2. Getting Started with GoStats
3. How to write a technical paper or a research paper
4. Zotero: A Personal Research Assistant (Citation Manager)
5. Overleaf: A Collaborative Writing Environment (LaTeX)
6. How to Read a Paper
7. Professor MacLean's Tips on Writing Scientific papers Proposals (UBC)
8. Catchy Titles Are Good: But Avoid Being Cute
9. TCPS-2: CORE-2022 - Course on Research Ethics
10. Conducting Ethical User Research — IxDF

Activities & the Android Manifest

- Activities are declared as a children in the application tags.
- Intent filters are declared as children in the activity tags. They are used to define the capabilities of its parent component; what can it do? what resources can it pull from? is it the main activity?

Activities & The Android Manifest

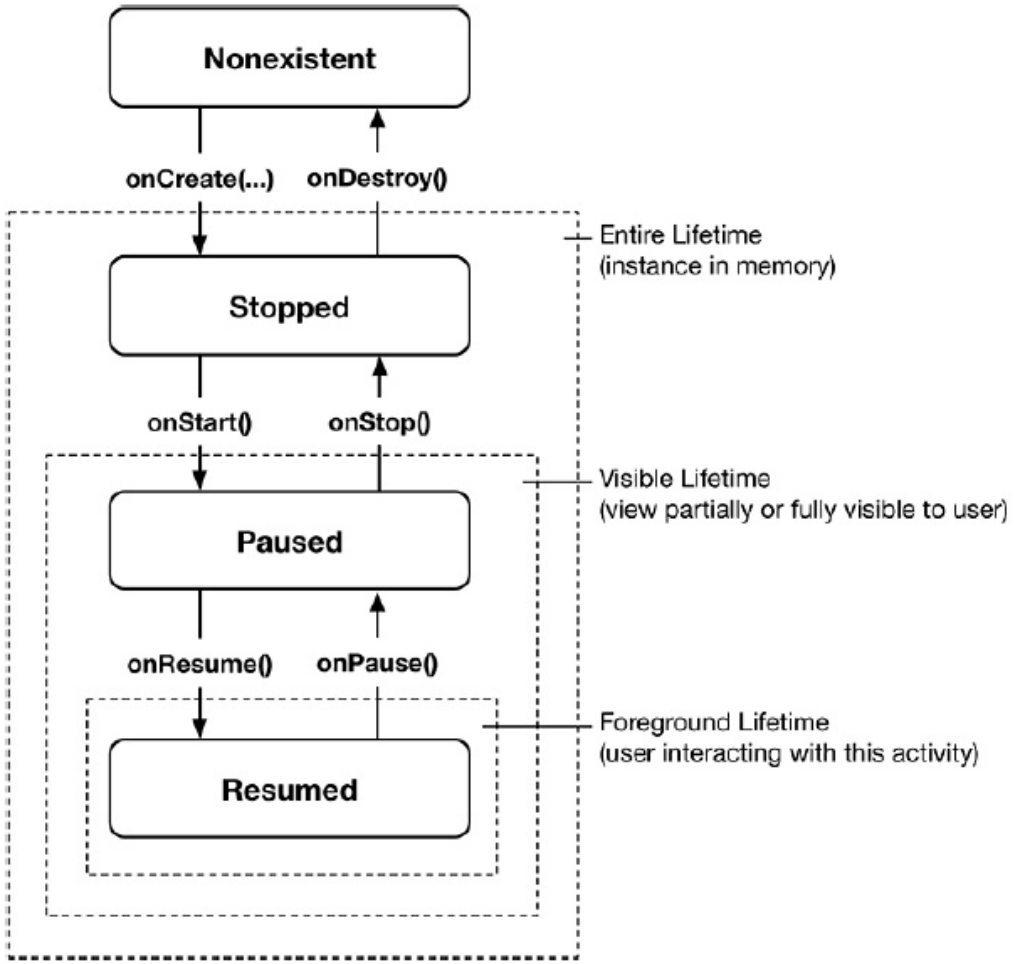
```
1  <?xml version="1.0" encoding="utf-8"?>
2  <manifest xmlns:android="http://schemas.android.com/apk/res/android"
3      xmlns:tools="http://schemas.android.com/tools">
4
5      <application
6          android:allowBackup="true"
7          android:dataExtractionRules="@xml/data_extraction_rules"
8          android:fullBackupContent="@xml/backup_rules"
9          android:icon="@mipmap/ic_launcher"
10         android:label="@string/app_name"
11         android:roundIcon="@mipmap/ic_launcher_round"
12         android:supportsRtl="true"
13         android:theme="@style/Theme.Material3.Dark"
14         tools:targetApi="31">
15         <activity
16             android:name=".CheatActivity"
17             android:exported="false" />
18         <activity
19             android:name=".QuizActivity"
20             android:exported="true">
21             <intent-filter>
22                 <action android:name="android.intent.action.MAIN" />
23
24                 <category android:name="android.intent.category.LAUNCHER" />
25             </intent-filter>
26         </activity>
27     </application>
```

Android Activity Lifecycle

- The Android Activity Lifecycle describes a set of states that an application transitions between from when it is first created to when it dies.
- An activity exists in a series of 4 states:
  1. Resumed
  2. Paused
  3. Stopped
  4. Destroyed (Non-Existent)
- We must **override** the default methods if we wish to change the generalized behaviour of our application. Do not call any of the activity lifecycle methods by yourself, ever.

Android Activity Lifecycle

Figure 3.1 Activity state diagram



Recovering from a Destroyed Activity

- An activity is destroyed under normal scenarios when:
  1. The user presses the back button
  2. The application changes orientation
  3. The stopped activity is killed by the OS to reclaim resources
- To restore your application, you must override:
  1. **onSaveInstanceState(@NonNull Bundle outState)**
  2. **onRestoreInstanceState(@NonNull Bundle savedInstanceState)**

Note: We use the bundle with key-value pairs to save and restore important information (e.g., variable value(s)).

Recovering from a Destroyed Activity

```
1     @Override
2     protected void onSaveInstanceState(@NonNull Bundle outState) {
3         super.onSaveInstanceState(outState);
4         outState.putInt(KEY_INDEX, mCurrentIndex);
5     }
6
7     @Override
8     protected void onRestoreInstanceState(@NonNull Bundle savedInstanceState) {
9         super.onRestoreInstanceState(savedInstanceState);
10        mCurrentIndex = savedInstanceState.getInt(KEY_INDEX);
11        updateQuestion();
12    }
```

Demo: GeoQuiz

Resources

1. Demo_Lifecycle.zip
2. Android Documentation on the Activity Lifecycle

Conclusion

Remark

Thank you for your time!
Questions?