LE/EECS 4443: Mobile User Interfaces (LAB)

Week 4: Layouts & User Interface (Building Blocks)

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Introduction

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

1. Understand Layouts
2. Determine how to select the best layout for your use-case
3. Determine how to select the best UI components for your use-case

Layouts: Definition

Remark

A layout defines the **structure** for a user interface in your app, such as in an activity. All elements in the layout are built using a **hierarchy** of View and ViewGroup objects.

- A View usually draws something the user can see and interact with.
- A ViewGroup is an invisible container that defines the layout structure for View and other ViewGroup objects.

Source: `https://developer.android.com/develop/ui/views/layout/declaring-layout`

Layouts: View & ViewGroup

- **Views** (Buttons, TextViews, Sliders, ...)
- **ViewGroups** (LinearLayout, RelativeLayout, ConstraintLayout,...)

Layouts: Instantiation

1. **XML (Layout)**
   - **Location:** *app* $\rightarrow$ *res* $\rightarrow$ *layout* $\rightarrow \cdots$
   - Good design, supporting **separation of concerns** and MVC paradigm
2. **Activity (Java)**
   - **Location:** *app* $\rightarrow$ *java* $\rightarrow$ *com*$\cdots \rightarrow \alpha$*Activity.java*
   - Instantiates Views at runtime
   - Not recommended as presentation and control become mixed/intertwined

Types of Layouts

1. **Static Layouts**
   - LinearLayout
   - RelativeLayout
2. **Dynamic Layouts**
   - ListView
   - GridView
   - RecyclerView

Static Layouts

1. LinearLayout
   - (+) Supports **layout weights** which dynamically assign available space to views based on priority
   - (+) Very simple design, supporting **vertical** and **horizontal** orientation modes.
   - (-) Nesting layouts leads to very poor performance
2. RelativeLayout
   - (+) Very simple and intuitive syntax
   - (-) Re-Organizing the Layout after an initial concept is very time-consuming
   - (-) Verbose Code in XML File

LinearLayout: Weights

Remark

LinearLayout also supports assigning a weight to individual children with the *android:layout_weight* attribute. This attribute assigns an **"importance"** value to a view in terms of how much space it occupies on the screen. A larger weight value lets it expand to fill the **remaining space** in the parent view. Child views can specify a weight value, and any remaining space in the view group is assigned to children proportionately, based on their declared weight. **The default weight is zero.**

Source: `https://developer.android.com/develop/ui/views/layout/linear`

LinearLayout: Weights (Example)

Example

- If there are three text fields and two of them declare a weight of 1, while the other is given no weight, then:
  - The third text field without weight doesn't grow. Instead, this third text field occupies only the area required by its content.
  - The other two text fields expand **equally** to fill the space **remaining** after all three fields are measured.

Source: https://stackoverflow.com/questions/39508909/understanding-androidlayout-weight

Static vs Dynamic Layouts

- Dynamic views are great for handling large amounts of data
- Improves **responsiveness** and **power consumption** compared to static views in many cases
- As you scroll, views are **recycled** and new information is loaded into the layout.
- **Note:** The data is loaded into the Dynamic View by leveraging an **Adapter**.

Adapters

- The Adapter acts as the **mediator** between the dynamic view and data source
- You may either use pre-existing adapters (ArrayAdapter, CursorAdapter, SimpleCursorAdapter) or create your own to interface with the Dynamic Layout.
- **Demo:** `https://github.com/stoyonaga/EECS4443_W24_Assets/tree/main/TA%20Demos/ArrayAdapter`
- **Demo:** `https://github.com/stoyonaga/EECS4443_W24_Assets/tree/main/TA%20Demos/GridView`

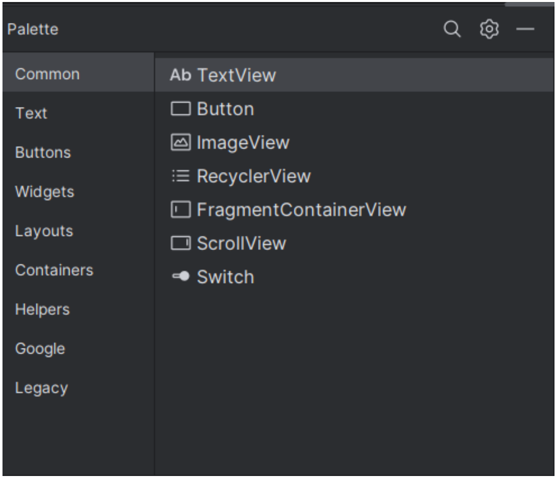
Introduction: UI Components

- There are a variety of components which can be used to achieve similar purposes / use-cases
  1. Spinners vs Checkboxes vs Radio Buttons
  2. Progress vs Activity Indicators
- **Gamer Move:** Pros will choose the best components which **minimize** user error $\wedge$ user footprint for a particular **task**.

UI Components: Optimal Selection

- Spinners are **optimal** if showing every applicable option at once is not necessary and space is very scarce.
- Checkboxes are **optimal** if a user is expected to select multiple options and there is a sufficient amount of space.
- Radiobuttons are **optimal** if a user is expected to select a singular option among a list of values and there is a sufficient amount of space.

Android Studio: Component Picker



Attributes: UI Components

- Each component (View, ViewGroup) have a set of attributes which allow you to finetune their **appearance** and **behaviour(s)**
- Within the layout (XML), they often have an appearance similar to *android:attribute* = *value*
- **Being able to choose correct and intuitive attributes to match a particular use-case is paramount!**

Conclusion

Remark

Thank you for your time!!
Do you have any questions? :)