Hello Android
CS 236503
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Based on the Official Android Development Guide

About the course(s)

• 236503, 3 points
• 236603, 2 points

Grade based on your work and project’s quality

Final exam, based on the lectures
About the lectures

• Android development (coding)
• Android design (screens & navigation)
• Agile software development
  • Scrum process
  • Relevant XP practices

Final exam will be based on these 3 topics

About Android

• A mobile operating system developed by Google
• The most popular mobile OS
• Based on the Linux kernel
• Designed primarily for smartphones and tablets
• Further developed for Android TV, Android Auto, and Android Wear
Android version history

• Android’s versions evolve rapidly
• Current version is Android 8.0 ("Oreo")
• Each version is associated with an API level

Oreo has API level 26 or 27

Why is the “versions” issue so important? Since we want our apps to support as many devices as possible. Check out the version dashboard

Release notes

How Android SHOULD NOT Be Studied

• Do a first “Hello World” example
• Then ask fellows from StackOverflow...

This is a great site but you should first be familiar with the key official guides
A better approach would be...

http://developer.android.com/

And other Resources, e.g.,
CODEPATH
AndroidHive
Vogella

Our development tools

Development Environment

Version Control, Project Management

Backend
Android Studio

• The official android development environment
• Replaces Eclipse
• Based on the IntelliJ IDEA
• Operates on top of Android SDK tools

Java JDK should be installed before installing Android Studio

Make sure you install Android Studio 3

Staying up-to-date

• Update Android Studio and SDK tools regularly
• Open the SDK Manager to update the Android SDK and get new packages
An Android Project

• Contains all files and resources that comprise an Android app
• A project is built into a single **apk** file that is installed on a device

Create New Project (1)
Create New Project (2)

Create New Project (3)
Running your app on a real device

• Enable **USB debugging** and connect your device
• “No Connected Device”? might need to **install a driver**
• For Samsung devices, installing **KIES** may do the job
• Select the project and click **Run**

Note: Setting/Developer Options is by default hidden, and may be revealed **using a secret code**

Android Emulator

• The Android Emulator **simulates a device** and displays it on your development computer
• The emulator supports various devices such as Android phone, tablet, Android Wear, and Android TV

- It may take time for the emulator to initially show up
- An alternative (non-official) emulator is **GenyMotion**

Android emulator: change BIOS settings

• We got this error while trying to initially operate the Android Emulator

![Image of Troubleshooting message]

• The error means that we should modify some BIOS settings
• So we entered BIOS => Security, and enabled both VT-d feature, and Intel Virtualization Technology

An Android Screen (Activity)

• An application component with which users can interact in order to do something
• E.g., dial the phone, take a photo, send an email, view a map
• In Android, a screen is mapped to an Activity component that has
  • A corresponding layout XML file
  • A corresponding Java file
We’ll now review key project’s components

AndroidManifest.xml

build.gradle

- **Gradle** is used to compile and build the app
- A **build.gradle** for each module and for the entire project
- Usually we’ll use the module’s build.gradle

A module is a container for your app’s source code. Usually we’ll use a project with one module however additional modules may be added, e.g., to support new devices such as Android Wear or Android TV. Read more.
Resources (res) folder

- drawable-<density>/
- layout/
- menu/
- mipmap/
- values/

res/ is a commonly used directory that we’ll explore later on

App color customization

- App colors can be customized in styles.xml and colors.xml files
- There are additional color attributes we’ll cover later on
- Use e.g. this site to choose a color palette that you like
Building a Simple User Interface

- The task
  - Main activity with a text field and a button
  - Pressing the button displays the text in a second activity

The tutorial has changed and now uses the GUI builder. We will learn the classical “text-based” approach.

http://developer.android.com/training/basics/firstapp/

Graphical User Interface of an Activity

- Hierarchy of View and ViewGroup objects
  - View – e.g., buttons, text fields
  - ViewGroup – containers defining the layout, e.g., LinearLayout
- Android UI is mostly defined in XML
Linear Layout

• **LinearLayout** is a subclass of **ViewGroup**
• Lays out child views in either a **vertical** or **horizontal** orientation

```xml
<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:orientation="horizontal"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    app:layout_behavior="@string/appbar_scrolling_view_behavior"
    tools:showIn="@layout/activity_my"/>
</LinearLayout>
```

Add a text field (EditText)

```xml
<EditText android:id="@+id/edit_message"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:hint="@string/edit_message" />
```

• What is the meaning of **@string/edit_message**?
• How to resolve the compilation error?
String Resources

- **Always** specify *UI strings* as resources
  - Allow to manage all UI text in a single location
  - Straightforward localization

Add a Button

- Why no **android:id** for the button?
- Should the resulting layout be improved?
Improved Layout

- Note the use of **0dp** in `layout_width`
- Improved performance since calculation of `wrap_content` is not needed

```
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:orientation="horizontal"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    app:layout_behavior="android.support.design.widget.TintBehavior"
    tools:showIn="@layout/activity_my">
    <EditText android:id="@+id/edit_message"
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:padding="1"
        android:hint="Enter a message" />
    <Button
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_weight="1"
        android:text="@string/button_send" />
</LinearLayout>
```

Starting Another Activity – **onClick** event

- **The task:** start a new activity when the user presses the button

```
<Button
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:onClick="sendMessage" />
</LinearLayout>
```
Creating a Java Method Handler

- The method’s signature must be
  - public
  - void
  - single View Parameter

Building an Intent

- An Intent can carry data types as key-value pairs called extras
- Note the use of this as first Context parameter. Second parameter is the class of the target Activity

```java
public static final String EXTRA_MESSAGE = "com.mycompany.myfirstapp.MESSAGE";
```
Creating the Second Activity

- **Hierarchical Parent** adds Up Navigation (API 16+)
- The `<meta-data>` element adds support for older versions

Java code of the second activity

- Every Activity is invoked by an Intent
- Note how the layout is created programmatically
Layout of the second activity

Relative Layout

- A very powerful utility for designing a user interface
- By default, all child views are drawn at the top-left of the layout
- The desired position of each view is defined using the various layout properties
- Views are positioned relative to other view and to the parent view

See RelativeLayout.LayoutParams for all attributes available
Getting a Result from an Activity

• You can start another activity and receive a result back
• You can get result from your own activities or from other apps
• The basic flow
  • ActivityOne calls `startActivityForResult()`
  • ActivityTwo sends the result as another `Intent` object
  • ActivityOne receives it in the `onActivityResult()` callback

For example, your app can start a camera app and receive the captured photo as a result

https://developer.android.com/training/basics/intents/result.html

Example: ActivityOne starts ActivityTwo

```java
public void onClick(View view) {
    Intent i = new Intent(this, ActivityTwo.class);
    i.putExtra("Value1", "This value one for ActivityTwo");
    i.putExtra("Value2", "This value two ActivityTwo");
    // set the request code to any code you like,
    // you can identify the callback via this code
    startActivityForResult(i, REQUEST_CODE);
}
```

• You can specify a request code to determine which activity was started (if multiple activities may be started)

Example taken from:
http://www.vogella.com/tutorials/AndroidIntent/article.html#retrieving-result-data-from-a-sub-activity
An activity can be closed via the back button of the phone. In this case the `finish()` method is performed.

Once the activity finishes, the `onActivityResult()` method in the calling activity is called.

RESULT_OK and RESULT_CANCELED are constants in Activity class.

ActivityOne handles the result.