IM2073 Introduction to Design and Project
Mobile (Android) Programming Module

1. Objective

This project module lets you "experience" mobile programming on Android platform.

2. Schedule

You have 4 practical sessions (of 3 hours each) to complete the project.

The instructions are available online @ https://www3.ntu.edu.sg/home/ehchua/programming/index.html under "IM2073 Mobile (Android) Programming".

Skip the "optional" sections in the articles.

** Install the necessary software in your laptop (take a look at the preparations needed for each session below) and bring along your laptop for each session. This way, you can continue your learning and team assignment mini-project outside class hours.

Assumption: you must have already installed JDK 21 (https://www3.ntu.edu.sg/home/ehchua/programming/howto/JDK_HowTo.html)

Session #1 (Individual or in pair if you cannot install Android Studio):

Preparations needed before you come to class

1. Download and install Android Studio IDE and Android SDK**.** Refer to: https://www3.ntu.edu.sg/home/ehchua/programming/android/Android_HowTo.html, and do Step 0, 1 and 2 under Section 2: Installing "Android Studio IDE" and "Android SDK".
   You can install the latest version if you wish to do so.
   **** Do download and install before you come to class. This is because it will take a long time to download and install, and if many of you download at the same time in the Lab, the download time will even be longer.**
2. Good to read through the descriptive parts/theory from the following. We will focus on the programming parts in class:
   https://www3.ntu.edu.sg/home/ehchua/programming/android/Android_HowTo.html
   https://www3.ntu.edu.sg/home/ehchua/programming/android/Android_BasicsUI.html
3. And even better if you can try out parts of Section 3: Write your First Android App from https://www3.ntu.edu.sg/home/ehchua/programming/android/Android_HowTo.html before you come to class.

Tasks to do during Lesson time

1. Do "How to Install Android Studio IDE & SDK and Get Started" @ https://www3.ntu.edu.sg/home/ehchua/programming/android/Android_HowTo.html:
   a. Section 3.1: Hello-World – Step 1 to 3
   b. Section 3.2: Hello-World "by Coding"
   c. Section 3.3: Hello-World using "XML Layout" – all steps

2. Do "Android Basics: User Interfaces and Activities" @ https://www3.ntu.edu.sg/home/ehchua/programming/android/Android_BasicsUI.html
   a. Section 5.1: Example 1. Views (TextView, RadioButton, Button) and ViewGroup (LinearLayout) – all steps
   b. Section 5.2: Example 2. Relative Layout – all steps
   c. Section 5.4: Example 3. Using the Graphical Layout Tool

3. Proceed with tasks for the next Session if you have the time and capacity to do so.

Session #2 (Individual or in pair if you cannot install Android Studio):

Preparations needed before you come to class

1. Good to read through the descriptive parts/theory from the following. We will focus on the programming parts in class:
   https://www3.ntu.edu.sg/home/ehchua/programming/android/Android_Webview.html
   https://www3.ntu.edu.sg/home/ehchua/programming/android/Android_Networking.html

Tasks to do during Lesson time

1. Do "Android Basics: User Interfaces and Activities" @ https://www3.ntu.edu.sg/home/ehchua/programming/android/Android_BasicsUI.html
   a. Section 5.5: Example 4: Simple Calculator– all steps
   b. Section 6.1: Example 5: Using an Intent to Start a Second Activity – all steps
   c. Section 6.2: Example 6: Returning Result from Second Activity – all steps

2. Do "Building Webapps with WebView" @ https://www3.ntu.edu.sg/home/ehchua/programming/android/Android_Webview.html
   a. Section 1.1: Example 1: Two Activities– Step 1 to 5
   b. Section 1.2: Example 2: One Activity – all steps

3. Do "Android Networking" @ https://www3.ntu.edu.sg/home/ehchua/programming/android/Android_Networking.html
   a. Section 1.2: Example 1: Send an HTTP Request and Check the Response Code

Session #3 (In your team of two, as a Pair): Mobile/Web Project

Preparations needed before you come to class

Revise what you have learnt from Session #1 and #2, to prepare for your team assignment mini-project.

Tasks to do during Lesson time

In this team assignment mini-project, we shall combine webapp and mobile app to develop a mobile "Clicker" system.

Use Case

1. Instructor shows a MCQ with options.
2. Students select an option from their mobile devices.
3. Instructor displays the statistics on his console.

Hints:

1. Refer to your "ebookshop" case study, in particular, the section on "Processing the Order".

2. Create a MySQL table to capture the responses from the students.

   Assume that there are many questions with any number of responses (a, b, c,...). Create two columns: `questionNo`, and `choice`.

Table: responses	
questionNo (int)	**choice (VARCHAR(1))**
...	...
...	...

   Whenever a response is received, you shall insert a new record into the table for that `questionNo` and `choice`, via SQL statement:

```
INSERT INTO responses (questionNo, choice) VALUES (8, '?');
```

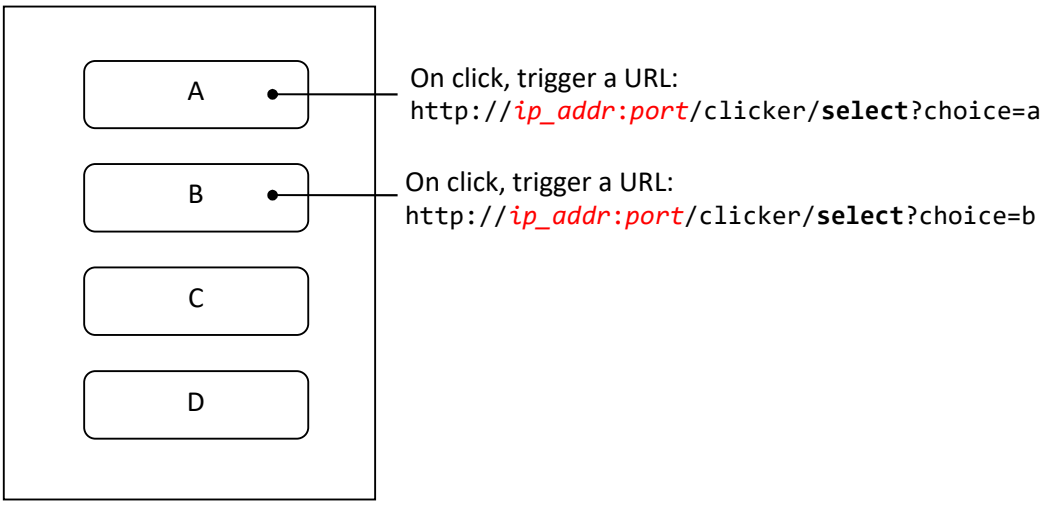
   You shall get the selected `choice` (`'?'`) from the GET request parameter (to be explained later). Hardcode the `questionNo` (says 8), to begin with.

   To count the number of `'b'` response for a particular `questionNo`, use SQL statement:

```
SELECT count(*) FROM responses WHERE questionNo=8 AND choice='b';
```

3. Under Tomcat, setup up a webapp called "`clicker`".

4. Write an Android app (as client) for the users:



   Take note that each of buttons trigger the same URL, but differentiated by the GET request parameter "`choice=?`".

5. Write a servlet, which maps to URL "**`/select`**", to capture the choice and store in the database table.

```
// Step 3 & 4 of the database servlet
// Assume that the URL is http://ip-addr:port/clicker/select?choice=x
// Assume that the questionNo is 8

String choice = request.getParameter("choice");
```

```
String sqlstr = "INSERT INTO responses (questionNo, choice) VALUES (8, '"
      + choice + "')";

int count = stmt.executeUpdate(sqlStr);   // run the SQL statement
```

Testing:
First, we shall test the servlet from a browser (before triggering it from an Android device). Issue URL `http://localhost:`*`port`*`/clicker/`**`select`**`?choice=a` from a *browser*. Check your MySQL database to ensure that a record inserted. Check the tomcat console for error messages, if needed.

Next, trigger the servlet from the Android emulator/device by pushing a button (the app that you wrote in Step 4), which issues URL `http://`*`ip_addr:port`*`/clicker/`**`select`**`?choice=a`. You cannot use `localhost` on Android emulator/device as it refers to the emulator/device. Find the IP address of your tomcat server via command "`ipconfig`" (Windows) or "`ifconfig`" (MacOS). Observe the response and check your MySQL database to ensure that a record inserted.

6. Provide a URL (e.g., `http://`*`ip_addr:port`*`/clicker/`**`display`**) for instructor to display the statistics. You need to write a servlet, which maps to URL "**`/display`**", to query for the number of each response.

   You could display the statistics in a table. (**Bonus**: But it would be nicer to show it in a bar chart (google "HTML bar char")).

   Try this query on your `mysql` client:
   ```
   SELECT choice, COUNT(*) AS count FROM responses
     WHERE questionNo=8 GROUP BY choice;
   ```

7. Of course, the instructor shall be able to show the question on a web browser, before the students click the choices. This completes the use case.

8. Extra Credits:
   - Create an activity for students to log-in to the system.
   - Keeping track of questions, e.g., in the MCQ panel, create two buttons "Start" and "Stop" and capture all responses between the start and stop times, for that particular question.
   - User (mobile phone) registration.
   - Students can also send additional comment.
   - Many others.

Session #4 (In Pair):

Preparations needed before you come to class

1. Continue to complete your team assignment mini-project from Session #3.
2. **Complete the relevant sections** of the Mobile Program Evaluation Form from the IM2073 NTULearn main course-site, under the *Content* → *Module 3 (Week 9 to 12): Mobile Android Programming*, **print out**, **sign**, and **pass** to your lecturer before your on-site assessment starts.

Tasks to do during Lesson time

a. Team assignment mini-project - should be near completion.

b. Assessment:

- (**A Reminder**) **Complete the relevant sections** of the Mobile Program Evaluation Form from the IM2073 NTULearn main course-site, under the *Content* → *Module 3 (Week 9 to 12): Mobile Android Programming*, **print out**, **sign**, and **pass** to your lecturer before your on-site assessment starts.
- On-site – demonstration of your Clicker system, test-run and Q&A by lecturer.
- (**After on-site Assessment is completed**) Submission – upload the following in a zip file to your IM2073 NTULearn class-site EJ0x, where x = 1 to 4 is your class number, under *Assignments* → *Module 3 Mobile Android Application Deliverables*. ONLY 1 member needs to upload on behalf of the team:
    - Android and Web application source codes
    - Completed and signed Web Program Evaluation Form

WARNING: Do not copy your project from others. Because you will not be able to explain the codes to your lecturer, especially if the codes are complex.

3. Requirements

Basic Requirement: Complete the mobile "Clicker" system until Step 7, excluding the Bonus indicated in Step 6
More Credits: The Bonus indicated in Step 6 and add additions indicated in Step 8 of the mobile "Clicker" system

Acknowledgement

Thank you, Prof Chua Hock Chuan, for building up the elaborated and comprehensive teaching material over the years.