EECS4443 Notes

Jerry Wu

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More about activities

An activity is programatically a class that is created, which is a controller. In terms of UI, it is what appears on the **screen**.

Activity states

- **Resume**: Activity is visible and active, usable by the user. This is the default state when the app is running.

- **Paused**: Still partially visible, but there is something else on the screen that requires the user's attention at the present moment; not in the user's focus. Activity object is retained in memory with all states and can be killed by the system in low memory situations.

- **Stopped**: Activity is completely obscured by another activity; it is now in the background but the activity is still alive. Everything is retained butis no longer attached to the window manager. Lower priority than pause so it will be killed first before paused activities.

- To stop an activity, we can smply call `finish()` for an activity to signal its own destruction.

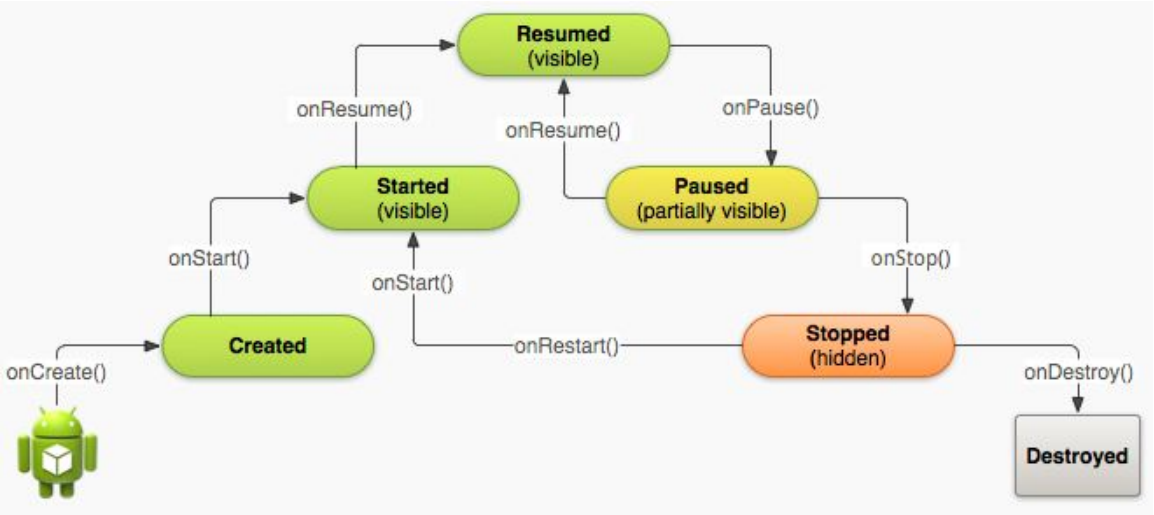
Recreating an activity

When we destroy an activity, we want some way to restore the state of that activity when we need it once more. To do this:

- Call `onSaveInstanceState()` before we call `onDestroy()`.

- To resume the activity from destroyed, invoke `onRestoreInstanceState(savedInstanceState)`.

This is the general layout of an activity's lifecycle in android.


Resumed
(visible)
onResume()
onResume()
onPause()
Started
(visible)
Paused
(partially visible)
onStart()
onStart()
onStop()
Created
onRestart()
Stopped
(hidden)
onCreate()
onDestroy()
Destroyed

Designing a user study

What is a user study?

In a nutshell, a user study is an experiment with human participants. It is usually based on human factors, experimental psychology, and statistics. They are used often in software engineering via developers and end users alike.

Goals of a user study

- It is not to evaluate a UI
- We want to compare alternatives to determine what works better
- "Better" is a subjective term based on many factors
- Quantitative factors: accuracy, fewer steps, quicker to learn, efficient, etc
- Qualitative factors: Not the primary focus, but they include appearance, enjoyment, comfort, discomfort, etc.

The method

- Method is the way a user study is designed and carried out
- *"Science is method, everything else is commentary."*
- Do not make things up just because it seems reasonable, but follow standards for experiments with human participants (**not human experiments**).

Independent variables

- A circumstance or characteristic that is manipulated in an experiment to elicit a change in a human response (while interacting with a computer system)
- Does not depend on the participant (participant cannot influence the variable)
- Example: interface, device, feedback mode, button layout, visual layout, age, gender, background noise, expertise, etc.

Test conditions

- An independent variable must have at least two levels.
- The levels (settings, values, points of comparisons) are test conditions.
- Name both the factor (independent variable) and its levels (test conditions)

Dependent variables

- Dependent variables are things that we can measure via human behavior (interaction involving an independent variable)
- Depends on what the end user does
- Examples: task completion time, speed, accuracy, error rate, retries, number of presses, etc.
- Make sure that research is reproducible and state how things are measured by units (i.e. words per minute, number of clicks, etc.)

Research questions

- i.e. Can a task be performed more quickly with my new interface than with an existing interface?
- A properly formed question identifies an IV and DV. Here we want to **establish** a new relationship between the new and existing interfaces(IV) given the dependent variables.

Statistical hypothesis testing (VERY IMPORTANT)

- Ask research question first
- The test will tell us the following:
  - If data gathered is sufficient and supports hypothesis
  - What is the statistical confidence that $\exists$ a causal relationship between IV and DV

Hypothesis statement

- Hypotheses usually come in pairs:
  - Null (initial) hypothesis H_0: the average between IV_a and IV_b
  - The alternative hypothesis H_a or H_1: the average DV is not the same between IV_a and IV_b.
- If we can't reject the null hypothesis, that means that there is relatively no difference between it and the alternate hypothesis, and vice versa.

P-value and errors

- P-value is the probability of obtaining test results at least as extreme as the results at least as extreme as the results actually observed under the assumption that the null hypothesis is correct.
- α is the level of significance (usually 0.05 or 5%.). If $p < \alpha$, reject H_0
- $1 - \beta$ is the power of test. We can use the significance level and the power of test to calculate the necessary sample size.
  Recall that 95% of the data lies within 2σ of the mean.

In summary we can look at this chart:

	H_0 is true	H_1 is true
Do not reject H_0	Right Decision (True Negative) (probability = 1-α)	Wrong Decision (Type II error) (False Negative) (probability = β)
Reject H_0	Wrong Decision (Type I error) (False Positive) (probability = α)	Right Decision (True Positive) (probability = 1-β)

Statistical tests

- Common assumptions:
  - Independence of observations; no autocorrelation
  - Homogenity of variance between groups (Levene's test)
  - Normality of data:
    - Skewedness of data within ±2, Kurtosis ±7
    - Shapiro-Wilk's test
    - Kolmogorov-Smirnov test (for large samples)
- If assumptions are met, run parametric tests. Otherwise run non-parametric tests.
- Other factors:

  - Continuous vs discrete variables
  - Groups or no groups
  - Number of independent variables

Experiment task

- Experiment task must elicut a change
- Qualities of a good experiment task include represent, discriminate, practicality, etc.
  - Should represent activities people typically do (testing a keyboard involves typing real inputs)
  - Discriminate among the test conditions (we can find differences that are real and tangible)

Examples

- Usually the task is self evident
- Idea: new widgets for creating entries in a calendar app
- Task: create an entry in the app using both the conventional method (first IV) and the new method (the widget in development)
- Idea: Auditory feedback for programming GPS destination
- Task: Use the following 3 IVs; musical sounds, natural sounds, and conventional method (talking voice)

Procedure

- Arriving (welcoming)
- Sign consent form (if publishing data)
- Instructions given to participants about the experiment task
- Demonstration of tasks, practice trials, etc.
- Rest breaks
- Administer a questionnaire or an interview at the end (if necessary)

Questionnaires

- Questionnaires complement a user study since we can use them to gather more data such as demographics, handedness, first language, etc.
- Can also solicit feedback, comments, and impressions on your application
- Example questions include:
  - Do you use a GPS device while driving?
  - Which browser do you use?
  - My level of insecurity, discouragement, irritation, stress, or annoyance was. . . {1 to 10}
- **Testing methods; Within subjects, between subjects:**
  - **Within subjects:** Each participant is tested on all conditions. Less variation but takes more time.
  - **Between subjects:** Each participant is tested on one condition only. Has more variation but takes less time.