# EMBEDDED SYSTEMS PROGRAMMING 2016-17

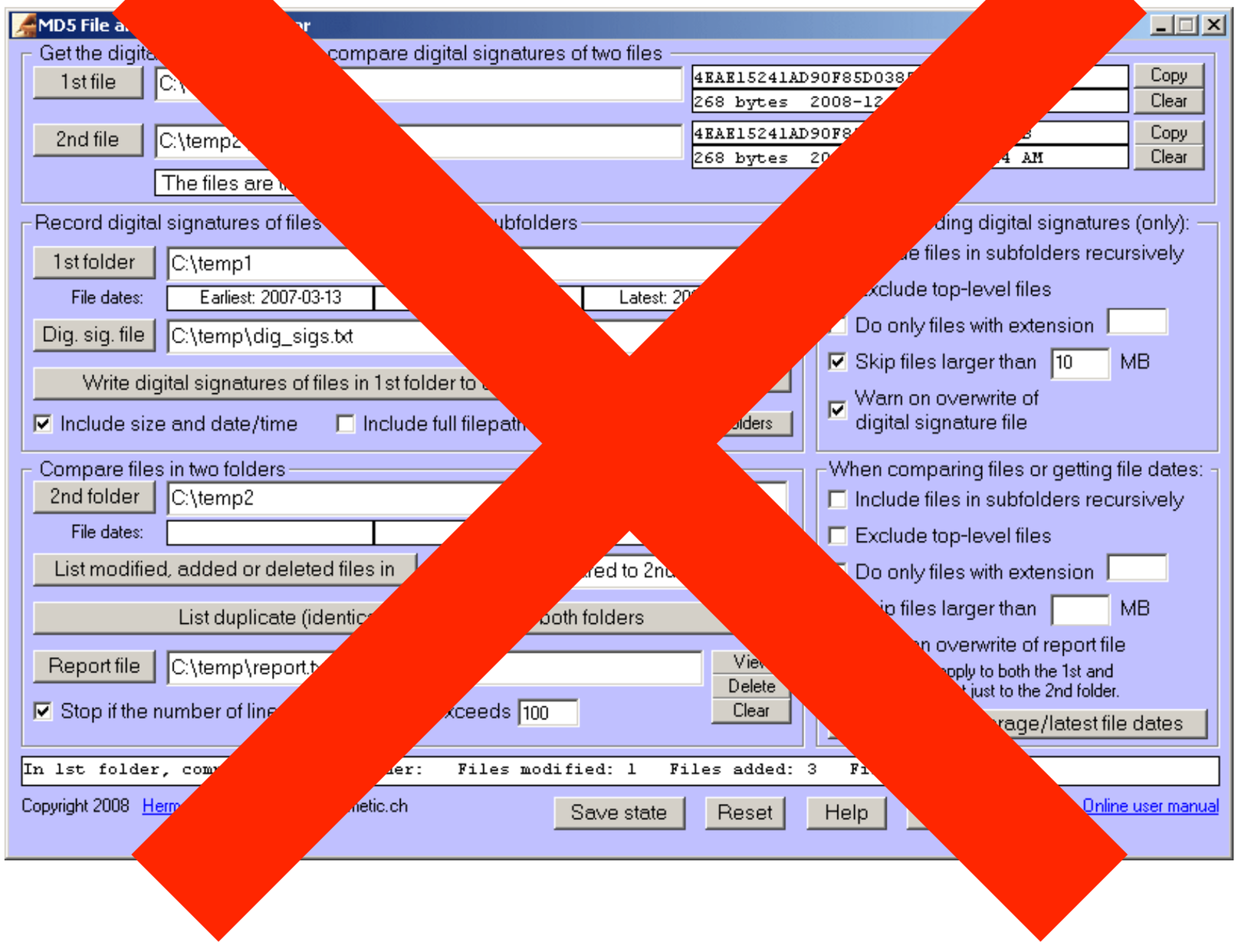
## UI Guidelines

# UIS (1/2)

Always true (almost trivial):

- a UI should be simple to use,
- a UI should be tailored to the characteristics of the device, to its screen, to its input facilities

# UIS (2/2)


Get the digita
compare digital signatures of two files
1st file
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C:\temp\dig_sigs.txt
Do only files with extension
Skip files larger than
10
MB
Write digital signatures of files in 1st folder to
Include size and date/time
Include full filepath
olders
Warn on overwrite of digital signature file
Compare files in two folders
When comparing files or getting file dates:
2nd folder
C:\temp2
Include files in subfolders recursively
File dates:
Exclude top-level files
List modified, added or deleted files in
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Copyright 2008 Herm
metic.ch
Save state
Reset
Help
Online user manual

# UIS AND EMBEDDED DEVICES

True not only for smartphones, but also for industrial controllers, automotive devices, etc.

- **Screen real estate is valuable.**
  Corollary: if some piece of information is not necessary, do not show it altogether

- The applications should **respond to user input instantaneously**, much faster than on a PC

# CONSEQUENCES (1/2)

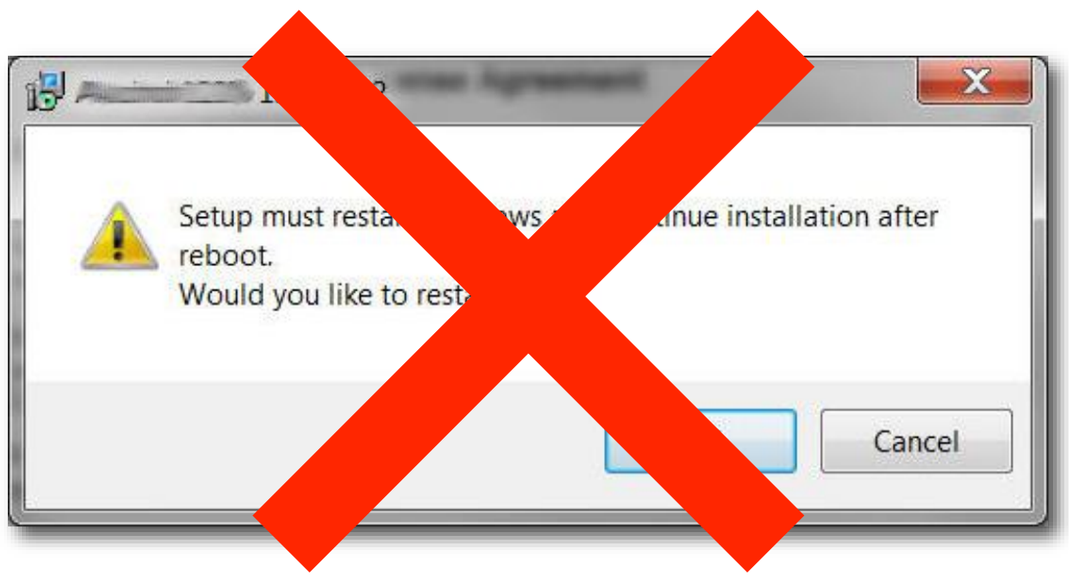
## Fast response

- The application should start as quickly as possible: no "loading components", no configuration questions, ...
- Build indexes of your data to speed up access
- Display placeholder content right away and partial results as they become available

# CONSEQUENCES (2/2)

## Fast response

- Apple says: do not tell the user to reboot/restart after installing your app. If your app has memory-usage or other issues that prevent it from running unless the system has just booted, you need to **rewrite it**



# UIS AND SMARTPHONES/TABLETS

- Each app provides a single functionality
- No concept of launching/closing an app
- Fading concept of loading/saving data
- File system: user is seldom aware of it

# CONSEQUENCES (1/4)

One app, one functionality

- **"Resist the temptation" to add features** that are not essential to the main purpose of your app and to your target audience

- Instead, focus your effort on introducing **new ways to interact with key app content**

- **Keep modal tasks short** and narrowly focused

# CONSEQUENCES (2/4)

No concept of opening/closing an application

- **Do not quit** programmatically
- **Always be prepared to stop**
- Android, iOS: **restore the state** of the app to that in use when the user last ceased using the app

# CONSEQUENCES (3/4)

Fading concept of loading/saving data

- Your application has its own “documents” inside itself
- **Auto-save** data behind the curtains every time a change is made
- Implement an “**undo**” function so that the user can revert undesired saves

# CONSEQUENCES (4/4)

No filesystem awareness

- Do not show anything that makes the user think about file metadata, file locations or even files altogether

# UI PRINCIPLES ACCORDING TO APPLE

- User control
- Aesthetic integrity
- Consistency
- Metaphors
- Direct manipulation
- Feedback

Picture from fakesteve.net

# USER CONTROL (1/2)

- "An app can suggest a course of action or warn about dangerous consequences, but it is usually a **mistake [...] to take decision-making away from the user**"

- "The best apps **find the correct balance** between giving people the capabilities they need while helping them avoid unwanted outcomes"

# USER CONTROL (2/2)

- The user's focus is on the **content**

- As you customize your UI, take care to ensure that it does not overshadow the content

- **Do not try to replicate paradigms developed for other kinds of platforms** (e.g., the web)

# AESTHETIC INTEGRITY

- The quality of app artwork is very apparent, but there is more to aesthetics than this

- "Aesthetic integrity [...] represents how well an app's **appearance** […] **integrates with** its **function**"

- An app must send "a **clear, unified message about its purpose and its identity** that helps people trust it"

# CONSISTENCY

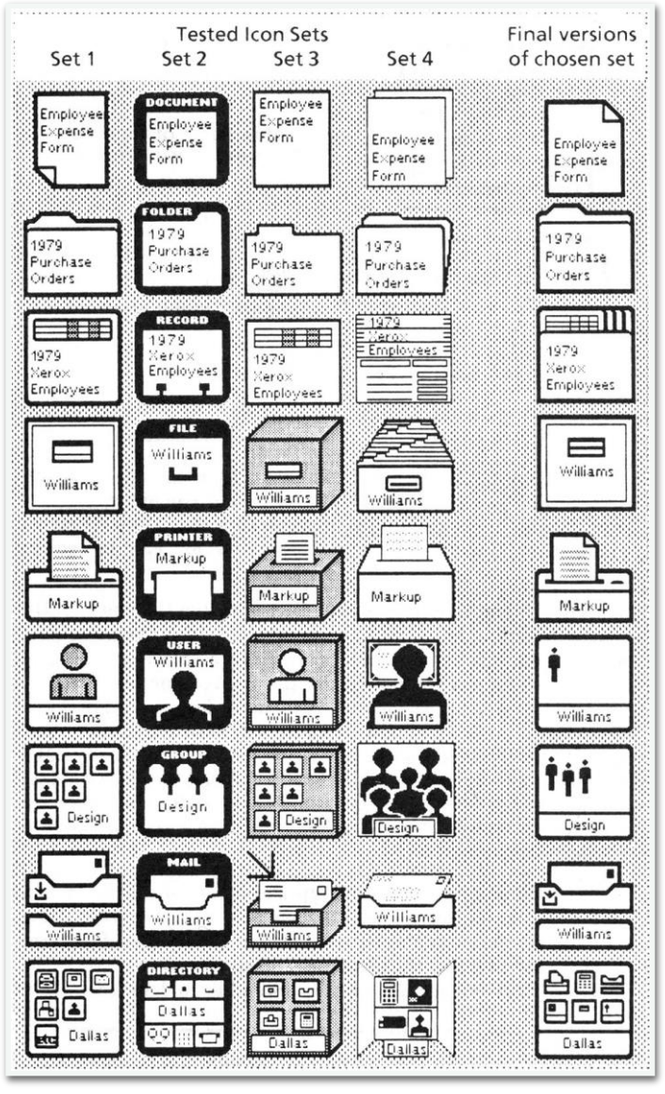
- **Consistency allows people to leverage on previous knowledge and skills**, so as to avoid increasing the user's cognitive burden
- Consistency within the application itself
- Consistency among applications
- "A consistent application is not a slavish copy of other apps and it isn't stylistically stagnant"
- Use standard widgets and resources (icons, buttons...)
- Implement a UI customization only if it "facilitates the task people want to perform and enhances their experience"

# METAPHORS (1/4)

- "When virtual objects and actions in an app are **metaphors for familiar experiences** […] users quickly grasp how to use the app"

- "It's best when an app uses a metaphor to suggest a usage or experience **without letting the metaphor enforce the limitations of the object or action on which it's based**"

- Smartphones/tablets provide powerful hardware, which makes it possible to implement **rich metaphors**

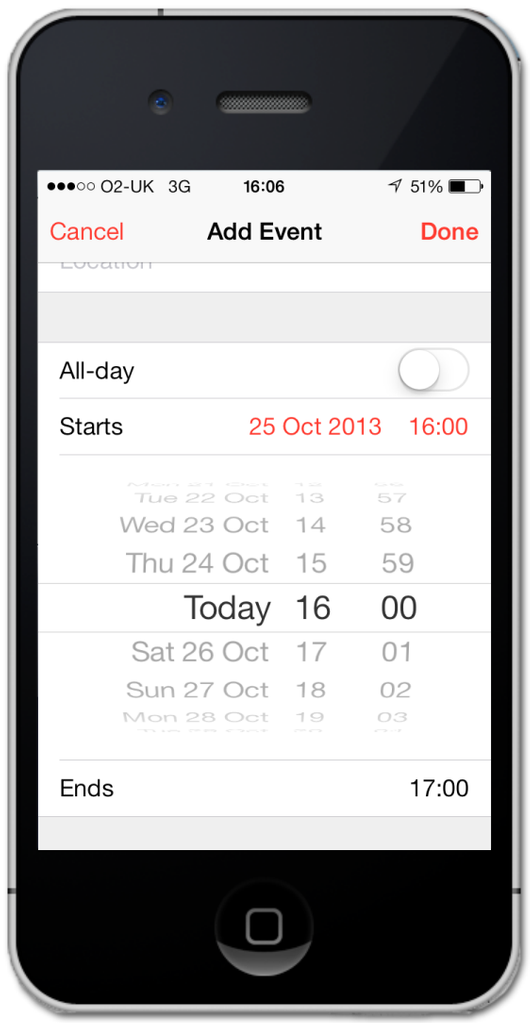



Picture: guidebookgallery.org

# METAPHORS (2/4)

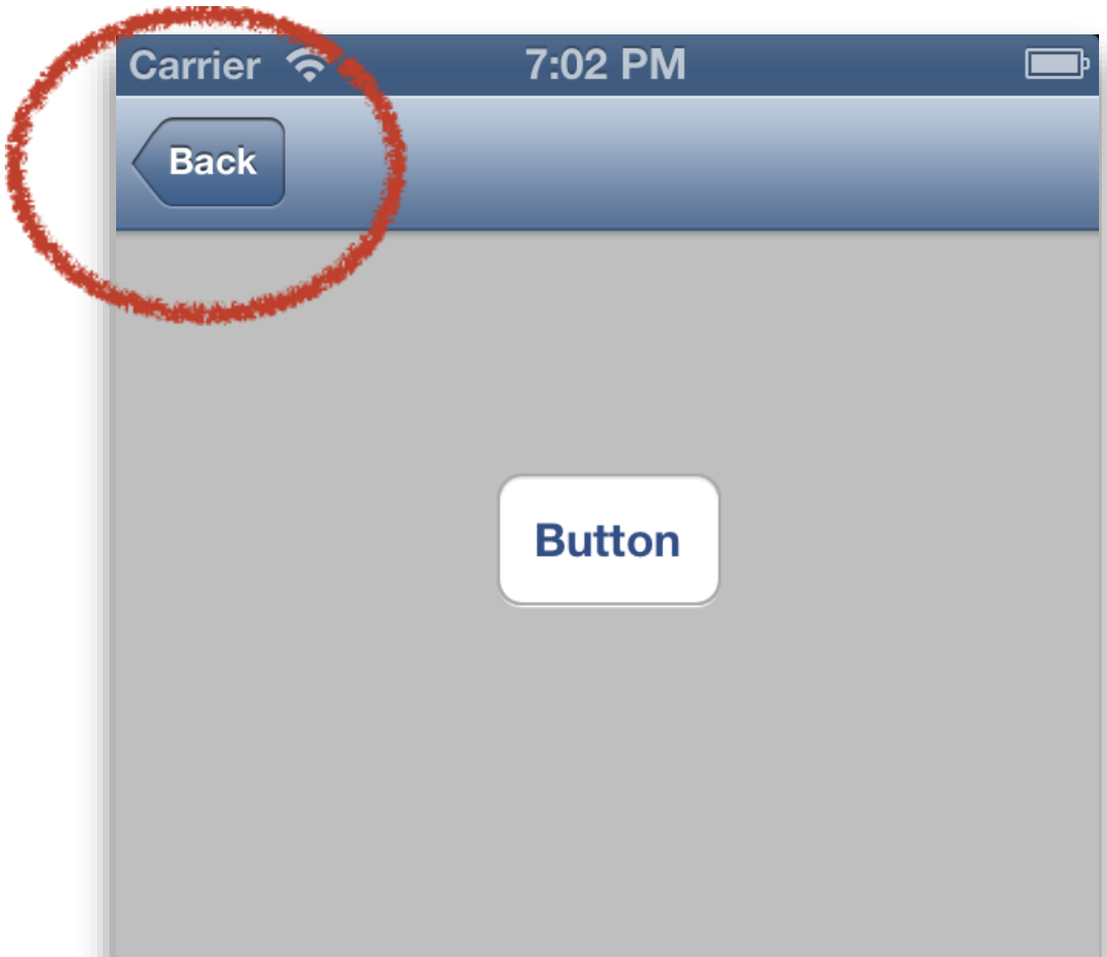
- Metaphors for familiar experiences "rooted in the **real world**"

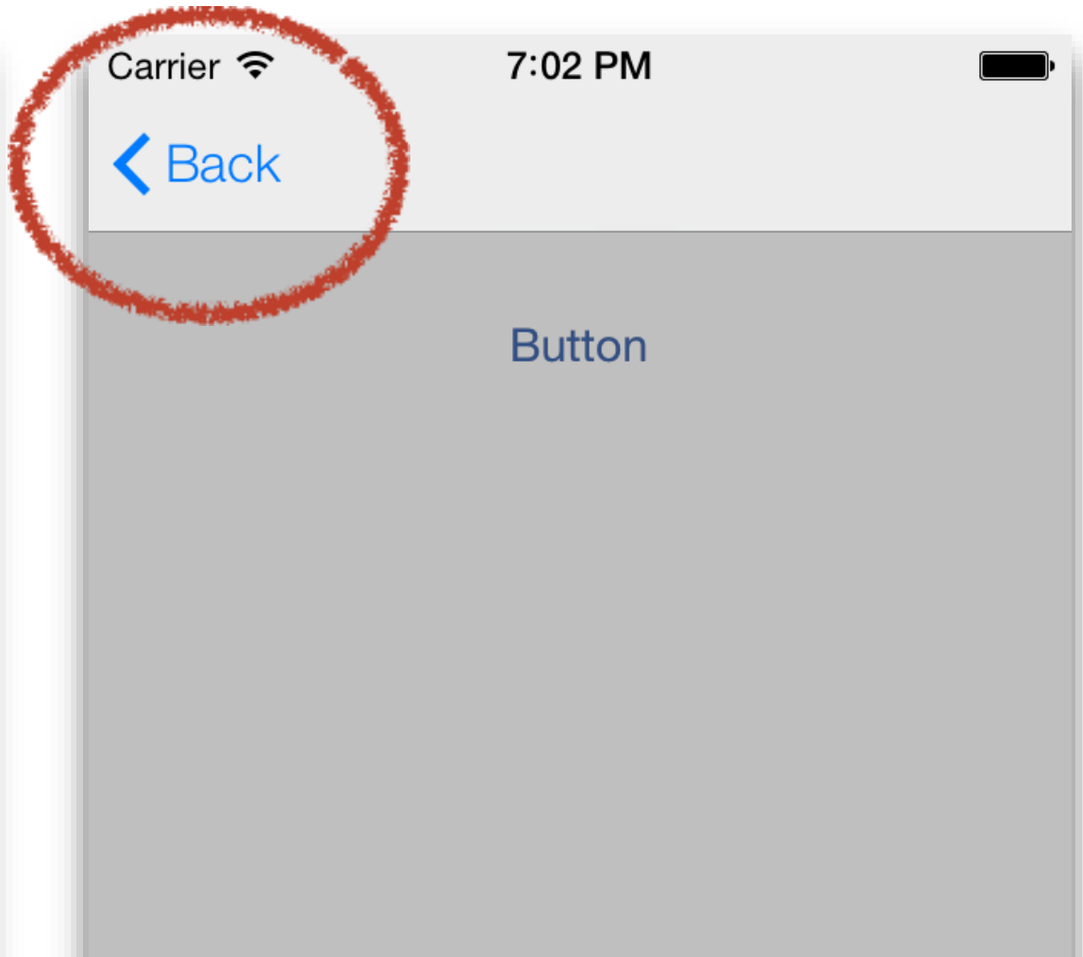




# METAPHORS (3/4)

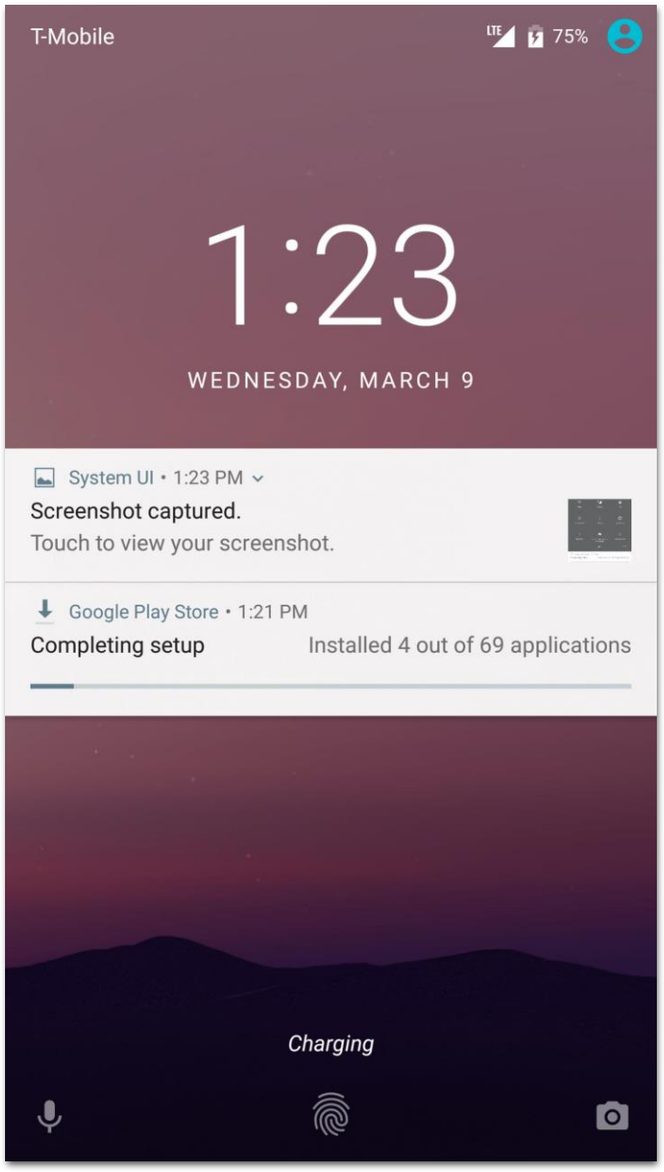
- Trend towards **less skeuomorphic UIs**:
  the connection with the real world is getting subtler

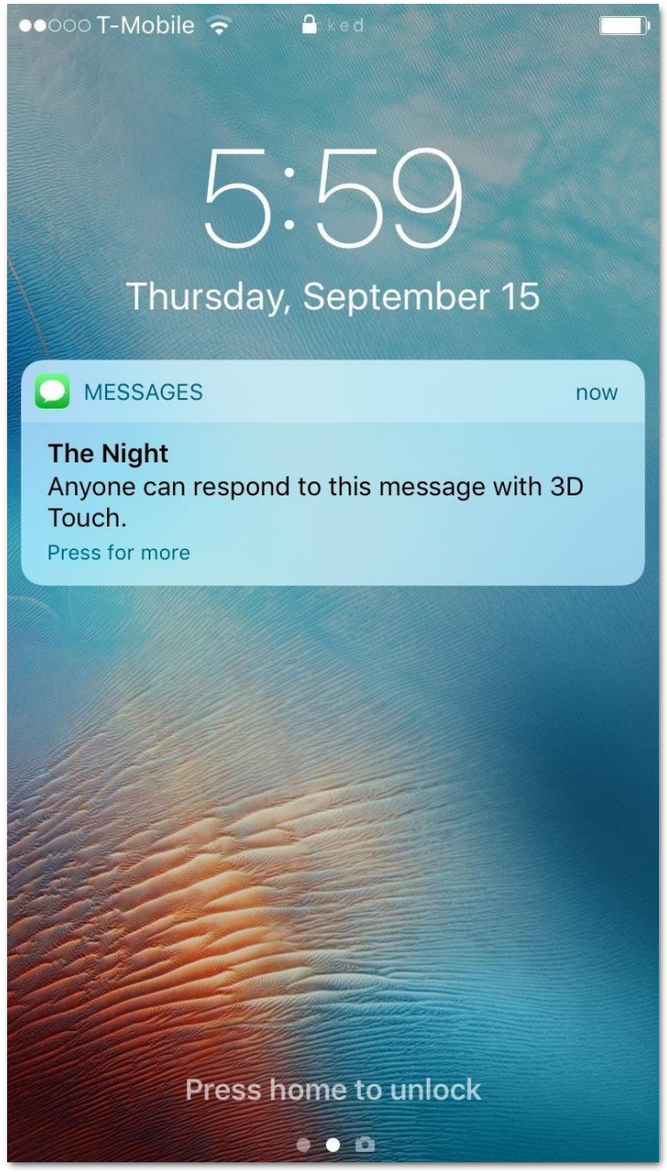


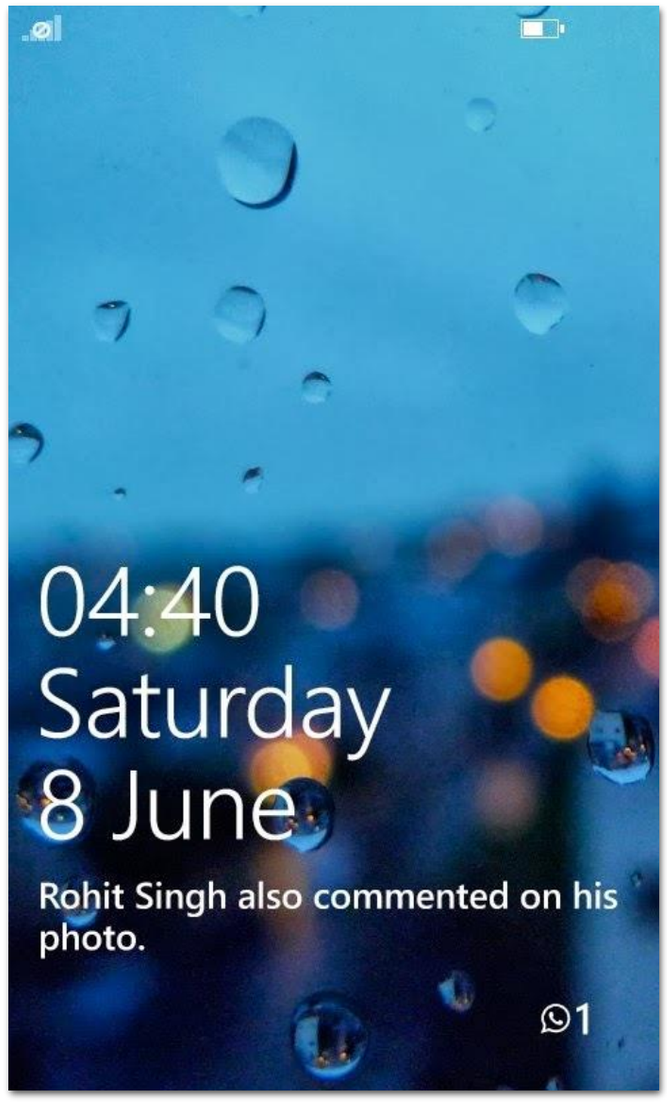




Pictures: mobinett.com

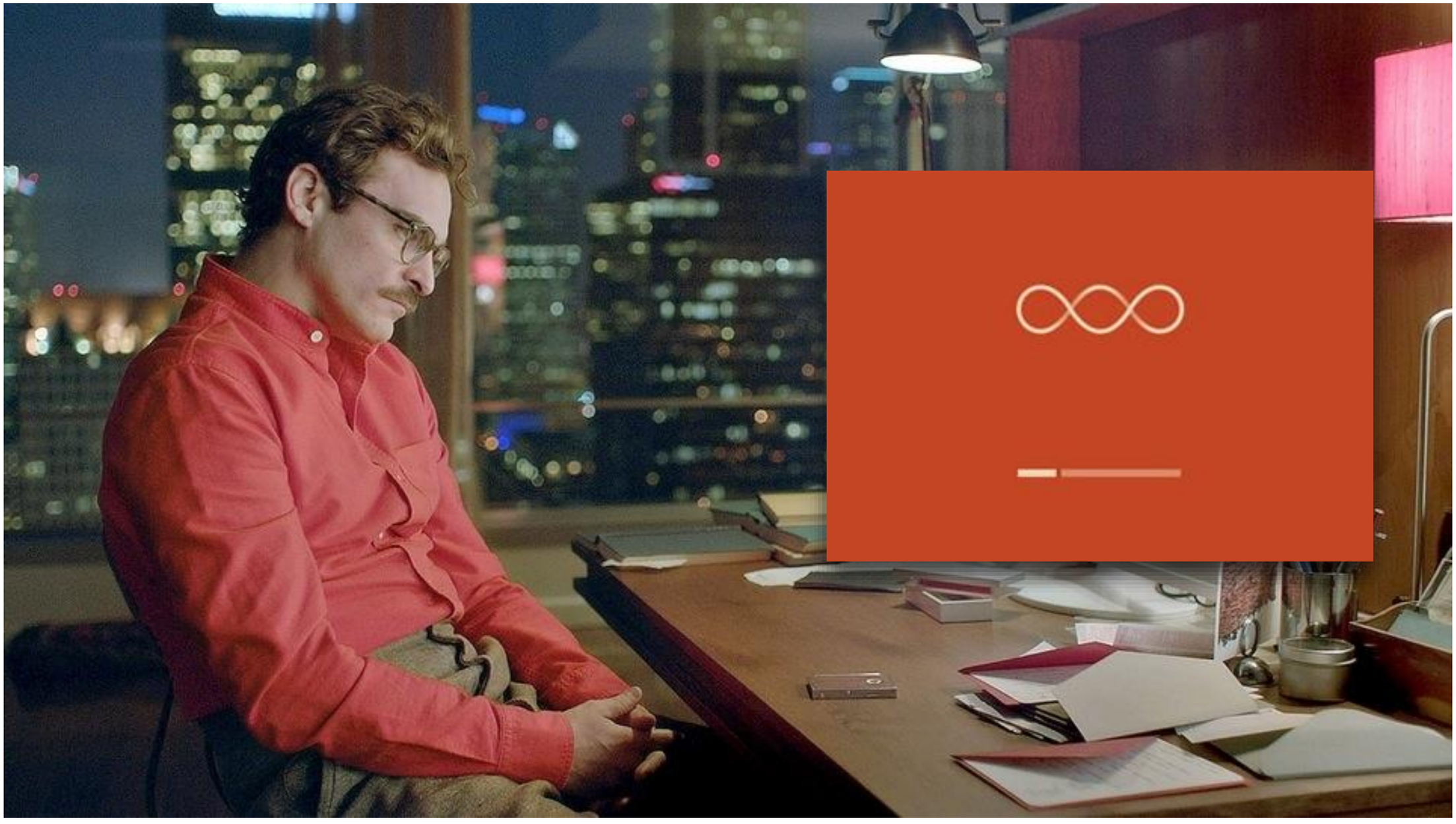
# ZEITGEIST & CONVERGENCE



# ZEITGEIST & THE FUTURE



(c) Annapurna Pictures

# METAPHORS (4/4)

- Metaphors for familiar experiences
  "rooted in the **digital world**"


# DIRECT MANIPULATION

- "When people **directly manipulate onscreen objects** […] they're more engaged with their task and it's easier for them to understand the results of their actions"

- The sense of direct manipulation is further enhanced by
  - animations (e.g., kinetic scrolling)
  - **multi-touch** support and **gestures**

- Caveat: "the screen size [...] might vary, but the average size of a fingertip does not"

# GESTURES (1/2)

**Tap**

Briefly touch surface with fingertip

**Double tap**

Rapidly touch surface twice with fingertip

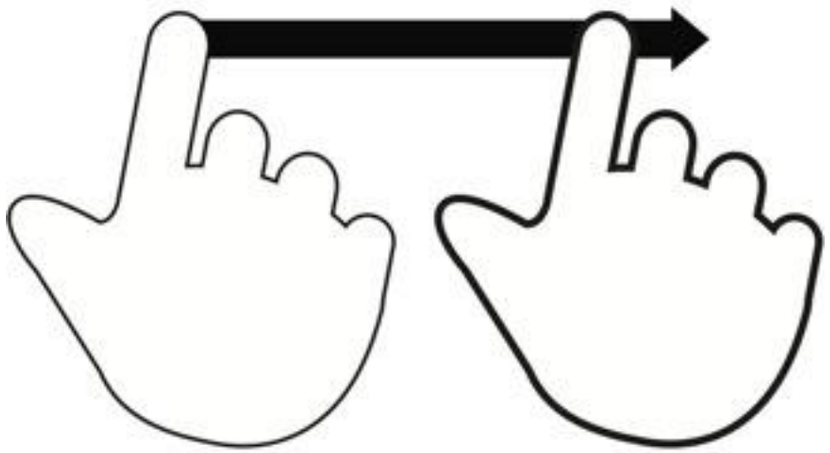
**Press**

Touch surface for extended period of time

Images from the [Touch Gesture Reference Guide]

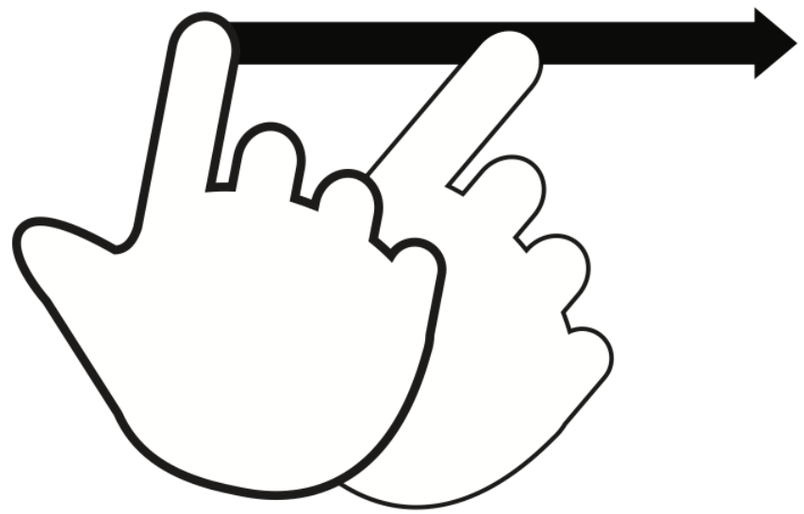
# GESTURES (2/2)

## Drag



Move fingertip over surface without losing contact

## Flick

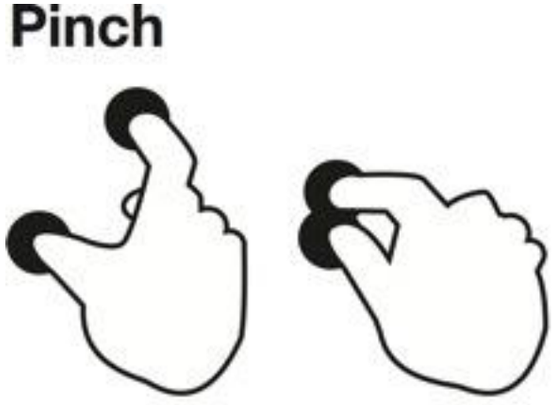


Quickly brush surface with fingertip
Called “swipe” when the brush is longer

Images from the Touch Gesture Reference Guide

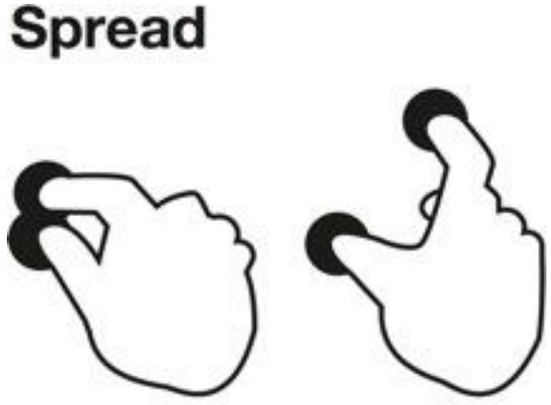
# MULTI-TOUCH GESTURES

**Pinch**



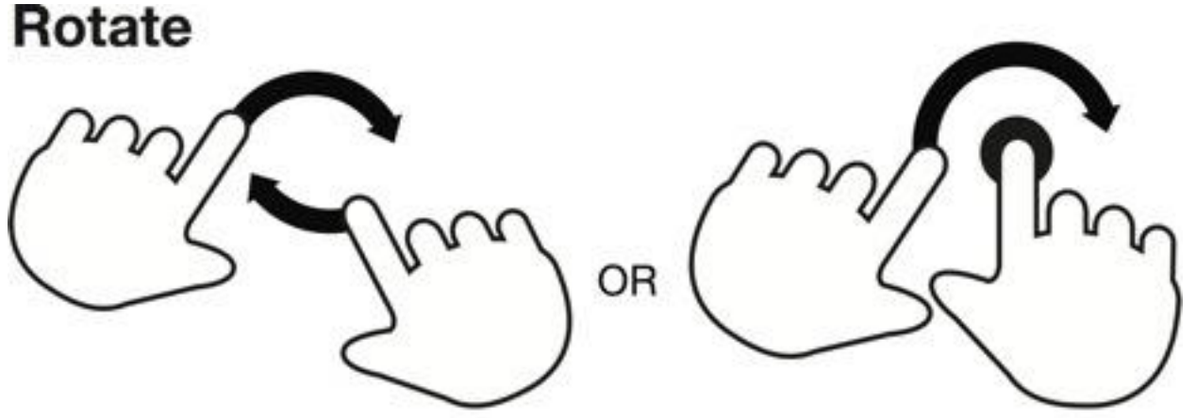
Touch surface with two fingers and bring them closer together

**Spread**



Touch surface with two fingers and move them apart

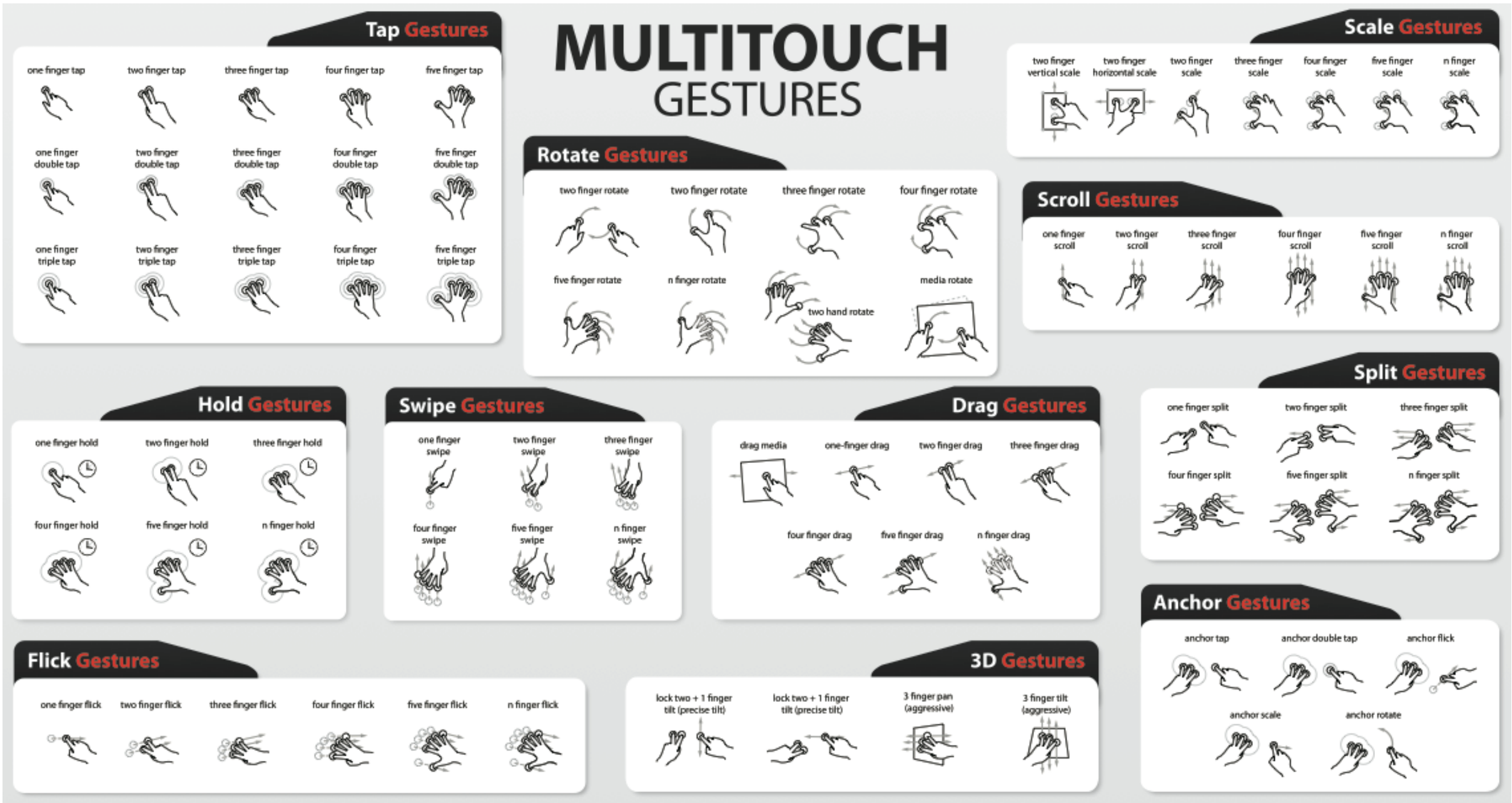
**Rotate**




Touch surface with two fingers and move them in a clockwise or counterclockwise direction

Images from the Touch Gesture Reference Guide

# MORE GESTURES




From GestureWorks' gesture library

# CAVEATS

- Use **complex gestures** as shortcuts to expedite a task, **not as the only way to perform a task**, since users may not know them

- If possible, **avoid introducing new gestures**, since users must make an effort to discover and remember them

# FEEDBACK

- People expect **immediate feedback** when they operate a control, and they appreciate status updates during lengthy operations

- "The built-in iOS apps provide **perceptible feedback in response to every user action**." Your app should do the same

- "Subtle animation can give people meaningful feedback that helps clarify the results of their actions"

# REFERENCES

- Android Design
- iOS Human Interface Guidelines
- Windows Design

LAST MODIFIED: MAY 10, 2017