iOS Application Development

Lecture 1: Introduction

Prof. Dr. Jan Borchers
Media Computing Group
RWTH Aachen University

Winter Semester ’22/’23

hci.rwth-aachen.de/ios
Team

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E-Mail Subject: [iOS]
Class Goals

- Understand the differences between desktop and mobile development
- Learn to write iOS Apps (UIKit & SwiftUI)
- Learn how to use advanced iOS frameworks
- During your project: extra focus on UX and usability
- Do lots of coding!
Some of our iOS Projects

- iEat
- ARPen
- CENTRE CHARLEMAGNE
  Neues Stadtmuseum Aachen
  Centre Guide
- Corona
- ForcePicker
- Aixplorer
Administrivia

• 6 Credit points

• Class times
  • Mondays (12:30–14:00), i10 seminar room 2222
  • Tuesday (10:30–12:00), i10 seminar room 2222
  • Already over 160 registrations, but 42 seats

• hci.rwth-aachen.de/ios
Course Requirements

• Required
  • OOP experience
  • Apple Developer ID
  • You must be registered for this course in RWTHonline
  • Mac capable of running Xcode 14*

• Optional (but helpful)
  • iOS device running iOS 16*
    (simulator sufficient for many tasks)
  • Previous experience with Swift or Objective-C

• This course is only for students of:
  • B.Sc. and M.Sc. Computer Science
  • SSE / MI / DS / TK

* We have a FEW time-share devices
Class Syllabus

• Part 1
  Lectures: Introduction into Swift and iOS

• Part 2
  Seminars: iOS Frameworks

• Part 3
  Project: App Development
Your Final Grade (6 ETCS)

30 % Final Exam

20 % Seminar

50 % Project
Lectures

- Introduction to Swift
- Xcode
- Introduction to UIKit
- Navigation, Animation, Customization
- Collections, AutoLayout
- Persistence and Networking
- Bindings, UIKit+SwiftUI, …
Sample Topics:

- CoreAnimation
- Haptics and Sounds
- SpriteKit
- Working with Files
- Combine
- Debugging in Xcode
- WidgetKit and Siri
- WKWebView
- MapKit
- UIPresentationController
- CoreML & CreateML
- CoreData
- watchOS Apps
- SceneKit
- Advanced SwiftUI Layout
- Metal
- 15-minute presentations
- Overview of the framework
- Example applications
- Attendance is mandatory
- 20% of your final grade
Project

• Kickoff: 19.12.2022 (after the seminar talks)
• Topics announced at kickoff date

• Submittable app
• Final presentation with live demo
• Code documentation!
• 50% of your final grade
Written Exam

• Questions about:
  • Lecture content
  • All seminars

• Tentative exam dates:
  • 1st exam: Sat. 19.02.2022
  • 2nd exam: Wed. 16.03.2022
  • 60 minutes
  • 30% of your final grade
Limited Seating

• We only have **42 seats** available

• Attending the seminar and project meetings is **mandatory**

• Only take this class if you are sure you can attend all classes
How to Get a Seat

- **Register** in RWTHonline & send the **Declaration of Compliance** before tomorrow (Wed, 12.10.) **13:00**

- We will invite everyone who did this to **Moodle** to **form groups**

- Form groups of **3 students**
  - There should be at least **2 students with a Mac** per group

- On **Friday 14.10. 13:00**, we will randomly select 14 **full** groups
  - Everyone else will be removed from RWTHmoodle
Lecture Slides and Videos

• All slides and lecture videos will be available online:
  • [http://hci.rwth-aachen.de/ios](http://hci.rwth-aachen.de/ios)
Developing for Mobile Platforms
Mobile Device Characteristics

- Context is key: task, attention split, peripheral use, movement, interaction time
- Screen size is compact
- Users interact with one screen at a time
- Mostly users interact with one application at a time (iPadOS allows split screen)
- Onscreen help is minimal
- Direct touch or pen input
10 Golden Rules of Interface Design (see DIS 1)

1. Keep the interface simple
2. Speak the user’s language
3. Be consistent and predictable
4. Provide feedback
5. Minimize memory load
6. Avoid errors, help to recover, offer undo
7. Design clear exits and closed dialogs
8. Include help and documentation
9. Offer shortcuts for experts
10. Hire a graphics designer
The iOS Family
Life as an App

- iOS is an app-centric environment
- One app per task!
  - Define the task that users want to accomplish with your app
  - Do one thing, but do it well
- Data is stored per app
- Data exchange between some apps is difficult
Designing the UI

- Make it obvious how to use your application
- Sort information from top to bottom
- Use visual weight for relative importance
- Use alignment for groupings or hierarchy
- Use multiple views for different parts of the app
Designing the UI

- Text should always be legible
- Avoid inconsistent appearances
- Provide fingertip-size targets (8 x 8 mm)
- Minimize text input
Interaction Design

- Smartphones are mostly used with only one hand

- Not everyone is used to multitouch interaction
  - Only use multitouch if you need it

- Follow Apple’s examples if possible

- If you use complex gestures, help the user
# Standard Gestures

<table>
<thead>
<tr>
<th>Gesture</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tap</td>
<td>To press or select a control or item (analogous to a single mouse click).</td>
</tr>
<tr>
<td>Drag</td>
<td>To scroll or pan.</td>
</tr>
<tr>
<td>Flick</td>
<td>To scroll or pan quickly.</td>
</tr>
<tr>
<td>Swipe</td>
<td>In a table-view row, to reveal the Delete button.</td>
</tr>
<tr>
<td>Double tap</td>
<td>To zoom in and center a block of content or an image. To zoom out (if already zoomed in).</td>
</tr>
<tr>
<td>Pinch open</td>
<td>To zoom in.</td>
</tr>
<tr>
<td>Pinch close</td>
<td>To zoom out.</td>
</tr>
<tr>
<td>Touch and hold</td>
<td>In editable text, to display a magnified view for cursor positioning.</td>
</tr>
</tbody>
</table>
Designing the UI

• Several resolutions, about four aspect ratios:

• Device orientation: portrait or landscape

• Designing for the iPad requires more than increasing the resolution
Für die folgende Veranstaltung bin ich dabei. Die Einladung mit allen Details habe ich im App-Store heruntergeladen.
GI-Radar 199: Spielsend einfach

October 6, 2017 at 08:57

Sehr geehrte Leserinnen und Leser,

<table>
<thead>
<tr>
<th><strong>SNOWSport Team Aachen</strong></th>
<th>09/05/2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>[SNOWSport Team Aachen] Dein Account wurde aktiviert</td>
<td>9 May 2013 00:24</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Hallo aaronTest,</td>
<td></td>
</tr>
<tr>
<td>deine Registrierung mit</td>
<td></td>
</tr>
<tr>
<td>Benutzername: aaronTest</td>
<td></td>
</tr>
<tr>
<td>Passwort: Das Passwort, das du während der Installation gewählt hast.</td>
<td></td>
</tr>
<tr>
<td>auf <a href="http://www.sportarten.rwth-aachen.de/SkiAG">http://www.sportarten.rwth-aachen.de/SkiAG</a> wurde soeben freigeschaltet.</td>
<td></td>
</tr>
<tr>
<td>Aktualisiere doch direkt mal dein Profil: <a href="http://wp.me/P3mDBn-nx">http://wp.me/P3mDBn-nx</a></td>
<td></td>
</tr>
<tr>
<td>Viel Spaß auf unserer Seite!</td>
<td></td>
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<tr>
<td>SNOWSport Team Aachen</td>
<td></td>
</tr>
<tr>
<td><a href="http://www.sportarten.rwth-aachen.de/SkiAG">http://www.sportarten.rwth-aachen.de/SkiAG</a></td>
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<table>
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<tr>
<th><strong>The VMware Team</strong></th>
<th>08/05/2013</th>
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<tr>
<td>My VMware: Password reset confirmation Online Version My VMware: Password reset confirmation Do not respond to t...</td>
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<th><strong>Verena Damm</strong></th>
<th>04/05/2013</th>
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<td>focus oberflächenstudie</td>
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<tr>
<td>Sehr geehrte Damen und Herren, durch einen Freund habe ich von Ihrer Studie e...</td>
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<tr>
<th><strong>micropayment™ GmbH...</strong></th>
<th>09/04/2013</th>
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</thead>
<tbody>
<tr>
<td>Zahlungsbestätigung - Ihr Kauf vom 07.00 am 09. April 2013 Sehr geehrte Kunde, wir bestätigen Ihnen hiermit die Zahlung von...</td>
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<th>07/04/2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kaufbestätigung - Ihr Kauf vom 07.04.20... 7. April 2013 Sehr geehrter Kunde, vielen Dank für Ihre Bestellung vom 07.04.2013...</td>
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<tr>
<th><strong>Atlassian</strong></th>
<th>19/03/2013</th>
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<tr>
<td>SourceTree for Windows is Now Available Read this in your browser A free, powerful Git desktop client for Windows Windows...</td>
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<tr>
<th><strong>VF</strong></th>
<th>15/01/2013</th>
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<tbody>
<tr>
<td>Bewerbung Buenos Aires Ist in der richtigen Reihenfolge:</td>
<td></td>
</tr>
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**Updated Just Now**

*2 Unreads*
Starting

• Apps should start quickly to provide a fluid user experience

• Show a launch image that closely resembles the first screen of your app (launch file)

• Restore the state of last run (minimize user input)

• Delay a login requirement for as long as possible

• By default, launch in device’s current orientation

• Think carefully before providing an onboarding experience
Stop

• No Quit button or menu item
• Be prepared to quit at any time
• Program flow interrupted by external events
  • Incoming phone call
• Store state when stopping
• Application moved to background
• Notify users what feature are unavailable and limiting your app
Application Styles

Productivity

Photos

Utility

Weather

Immersive

Seadragon
Productivity Applications

• Organizing and managing detailed information

• Often organize data hierarchically

• Organizing the list, add or remove items

• Examples: Contacts, Photos
Productivity Applications

Photos

Contacts

Reminders

- iCloud reminders
  - No items
- tasks
  - No items
- Reminders
  - 1 item
  - Buy milk
Utility Applications

- Simple task, minimum user input
- Customized, visually attractive UI that enhances the displayed information
- Data is organized in flattened list of items
- Examples: Weather, Stocks
Utility Applications

Weather

Stocks

Elements
Immersive Applications

- Full-screen, visually rich UI
- Focused on content and user experience
- Tends to hide much of the device’s user interface
- Custom navigational methods
- Examples: Living Earth, Carpenter
Immersive Applications

Living Earth

Carpenter
Games

Tiny Wings

Super Mario Run

The Machines
Summary

• Mobile vs. desktop apps: user, task, context

• Keep hardware restrictions in mind

• Application styles: productivity, utility, immersive

• Further reading material:
  

  https://www.apple.com/everyone-can-code/
What’s Next?

• Register, and sign the Declaration of Compliance and send it to both—René and Oliver (<rschaefer, nowak>@cs.rwth-aachen.de)

• Next lecture: Monday, 17.10. 12:30-14:00
  • Presentation of seminar topics
  • Introduction into Swift

• Landing page: https://hci.rwth-aachen.de/ios