IN4MATX 133: User Interface Software

Lecture 22: Device Resources & Sensors

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Quiz 3 grades have been posted

- Average ~78%, closer to Quiz 1 than Quiz 2
- Will still be curved a few points to match Quiz 1’s average
- But curve will be much smaller than on Quiz 2

No lecture Wednesday

- Have a great Thanksgiving!
What phone, if any, do you own?

- A I own a recent-ish phone (2015 or newer) running iOS
- B I own a recent-ish phone (2015 or newer) running Android
- C I own an older phone running iOS
- D I own an older phone running Android
- E I don’t own a smartphone or I own a different device
Which of these topics would be the most interesting to you?

A. Designing and developing for wearable technology (smartwatches, etc.)
B. Automated and manual testing of mobile interfaces
C. Designing and developing voice-based interfaces
D. Gathering analytic data from users
E. Designing and developing for augmented and virtual reality
Question

Which of these topics would be the next-most interesting to you?

A. Designing and developing for wearable technology (smartwatches, etc.)
B. Automated and manual testing of mobile interfaces
C. Designing and developing voice-based interfaces
D. Gathering analytic data from users
E. Designing and developing for augmented and virtual reality
Today’s goals

By the end of today, you should be able to...

● Use Ionic’s devApp to test an app on a mobile device
● Access device resources using an Ionic Native Plugin
● Use a Cordova Plugin which does not have Native support
● Describe some of the sensors on modern smartphones
Ionic Native

- Apache Cordova also provides libraries for connecting to device resources

- Ionic Native brings these libraries to Ionic as plugins
  - Ionic Native plugins are imported as services
  - Hundreds of plugins

https://ionicframework.com/docs/native/
Ionic DevApp

- An app on Android and iOS made by Ionic
- Provides a WebView to open up Ionic apps
  - Lets you test your Ionic app on an actual device
  - Has some Ionic Native plugins, but not all

https://ionicframework.com/docs/pro/devapp/
Ionic DevApp

Or run `ionic lab`

https://ionicframework.com/docs/pro/devapp/
Ionic DevApp

Native Cordova Plugin Support

Ionic DevApp currently supports the following plugins:

cordova-plugin-screen-orientation 2.0.1 "Screen Orientation"
cordova-plugin-secure-storage 2.6.8 "SecureStorage"
cordova-plugin-shake 0.6.0 "Shake Gesture Detection"
cordova-plugin-sim 1.3.3 "SIM"
cordova-plugin-splashscreen 4.0.3 "Splashscreen"
cordova-plugin-statusbar 2.2.4-dev "StatusBar"
cordova-plugin-stripe 1.5.3 "cordova-plugin-stripe"
cordova-plugin-taptic-engine 2.1.0 "Taptic Engine"
cordova-plugin-themeablebrowser 0.2.17 "ThemeableBrowser"
cordova-plugin-touch-id 3.2.0 "Touch ID"
cordova-plugin-tts 0.2.3 "TTS"
cordova-plugin-vibration 2.1.5 "Vibration"
cordova-plugin-whitelist 1.3.2 "Whitelist"
cordova-plugin-x-socialsharing 5.1.8 "SocialSharing"
cordova-plugin-x-toast 2.6.0 "Toast"
cordova-plugin-zip 3.1.0 "cordova-plugin-zip"
cordova-promise-polyfill 0.0.2 "cordova-promise-polyfill"
cordova-sms-plugin 0.1.11 "Cordova SMS Plugin"
cordova-sqlite-storage 2.0.4 "Cordova sqlite storage plugin"
cordova-universal-clipboard 0.1.0 "Clipboard"
de.appplant.cordova.plugin.local-notification 0.8.5 "LocalNotification"
de.appplant.cordova.plugin.printer 0.7.1 "Printer"
ionic-plugin-keyboard 2.2.1 "Keyboard"
phonegap-plugin-barcodescanner 6.0.7 "BarcodeScanner"
phonegap-plugin-mobile-accessibility 1.0.5-dev "Mobile Accessibility"
uk.co.workingedge.phonegap.plugin.launchnavigator 4.0.4 "Launch Navigator"

https://ionicframework.com/docs/pro/devapp/
Cordova Plugins

- Some (few) are maintained by Apache
- Others (many) are maintained by the community
- As a result, quality varies immensely
- Features may not work as expected
Two Cordova Plugins

- Device Motion (Apache-maintained)
- Local Notification (Community-maintained)
Device Motion

- Goal: get data from the phone’s accelerometer every second
- Could be used to estimate how restful someone’s sleep was, for example
Device Motion

- ionic cordova plugin add cordova-plugin-device-motion

- npm install @ionic-native/device-motion@beta

- Add as a provider to the app’s module (app.module.ts)

```typescript
import { DeviceMotion } from '@ionic-native/device-motion/ngx';

@NgModule({
  providers: [
    ...
    DeviceMotion,
    ...
  ],
})
```

https://beta.ionicframework.com/docs/native/device-motion
Device Motion

Instance Members

getCurrentAcceleration
Get the current acceleration along the x, y, and z axes.

watchAcceleration
Watch the device acceleration. Clear the watch by unsubscribing from the observable.

Parameters

options
See DeviceMotionAccelerometerOptions table below
Type: DeviceMotionAccelerometerOptions

DeviceMotionAccelerometerData

timestamp
Creation timestamp in milliseconds.
Type: intrinsic

x
Amount of acceleration on the x-axis. (in m/s^2)
Type: intrinsic

y
Amount of acceleration on the y-axis. (in m/s^2)
Type: intrinsic

z
Amount of acceleration on the z-axis. (in m/s^2)
Type: intrinsic

DeviceMotionAccelerometerOptions

frequency
Requested period of calls to accelerometerSuccess with acceleration data in
Type: intrinsic
Milliseconds. Default: 10000 optional

https://beta.ionicframework.com/docs/native/device-motion
Device Motion

- **DeviceMotion** is a Service and can be injected like any other service

```typescript
import { Platform } from '@ionic/angular';
import { DeviceMotion, DeviceMotionAccelerationData } from '@ionic-native/device-motion/ngx';

@Component({
  selector: 'app-home',
  templateUrl: 'home.page.html',
  styleUrls: ['home.page.scss'],
})
export class HomePage {
  acceleration: string = 'No acceleration data';

  constructor(private platform: Platform, private deviceMotion: DeviceMotion) {
    this.platform.ready().then(() => {
      this.deviceMotion.watchAcceleration({frequency: 1000}).subscribe((acc) => {
        this.acceleration = acc.x + ' ' + acc.y + ' ' + acc.z;
      });
    });
  }
}
```

https://beta.ionicframework.com/docs/native/device-motion
Device Motion

No data on a computer!

https://beta.ionicframework.com/docs/native/device-motion
Device Motion
Local Notification

• Goal: send a notification to the phone

• Could be used to remind someone to journal their sleepiness, for example
Local Notification

LocalNotifications

This plugin allows you to display local notifications on the device

Repo: https://github.com/katzer/cordova-plugin-local-notifications

Installation

1. Install the Cordova and Ionic Native plugins:

   $ cordova plugin add cordova-plugin-local-notification
   $ npm install --save @ionic-native/local-notifications@beta

2. Add this plugin to your app's module

https://beta.ionicframework.com/docs/native/local-notifications
Local Notification

Important Notice

Please make sure that you always read the tagged README for the version you're using.

See the 0.8 branch if you cannot upgrade. Further development for v0.9-beta will happen here. The 0.9-dev and ios10 branches are obsolete and will be removed soon.

Known issues

- Support for Android Oreo is limited yet.
- v0.9 and v0.8 aren't compatible with each other (Won't fix)
- **Not compatible yet with Ionic Native.** Their wrapper is not a part of this plugin. In future I will contribute to them to fix such issues in time. But for the moment I am busy enough with the plugin itself.

Please report bugs or missing features!

Sigh...

https://github.com/katzer/cordova-plugin-local-notifications
Local Notification

- Since the Ionic Native notifications plugin does not currently work, we’ll use an older version
- The older version (0.8.5) is supported by the Ionic DevApp
  - The DevApp can receive notifications generated by our app
- We’ll have to inject the plugin a different way
Local Notification

- ionic cordova plugin add de.appplant.cordova.plugin.local-notification@0.8.5
- npm install de.appplant.cordova.plugin.local-notification@0.8.5
- Do not need to add a provider

https://github.com/katzer/cordova-plugin-local-notifications/wiki
Local Notification

```javascript
var now             = new Date().getTime(),
    _5_sec_from_now = new Date(now + 5*1000);

cordova.plugins.notification.local.schedule({
    text: "Delayed Notification",
    at: _5_sec_from_now,
    led: "FF0000",
    sound: null
});
```

https://github.com/katzer/cordova-plugin-local-notifications/wiki/04.-Scheduling
import { Platform } from '@ionic/angular';

declare var cordova;

@Component({
  selector: 'app-home',
  templateUrl: 'home.page.html',
  styleUrls: ['home.page.scss'],
})
export class HomePage {
  constructor(private platform: Platform) {
    this.platform.ready().then(() => {
      if(this.platform.is('cordova')) {
        // Schedule a single notification
        cordova.plugins.notification.local.schedule({
          text: 'Time to log your sleepiness!',
          at: new Date(new Date().getTime() + 5*1000)
        });
      }
    });
  }
}

https://github.com/katzer/cordova-plugin-local-notifications/wiki
Local Notification
Local Notification

• There are 137 open issues, many of which are critical to the functionality of the plugin

• For example, I couldn’t figure out how to identify when a notification led someone to open the app (e.g., they clicked on the notification)

• Other plugins may be just as unreliable as this one
  • It’s the reality of relying on open-source tools

https://github.com/katzer/cordova-plugin-local-notifications/issues
Comparing to React Native’s Plugins
React Native Libraries

- React Native includes a few libraries for accessing device resources

- Examples:
  - CameraRoll
  - AsyncStorage (device storage)
  - Geolocation (GPS)

- The rest are installed through plugins which look similar to Ionic’s

https://facebook.github.io/react-native/docs/
React Native Plugins

- Used and installed in roughly the same way: install and link
  - `npm install react-native-sensors`
  - `react-native link react-native-sensors`
  - `npm install react-native-notification`
  - (notifications require manual linking in Xcode or Android build)
- Notifications plugin has 136 open issues

https://github.com/react-native-sensors/react-native-sensors
https://github.com/wix/react-native-notifications
Thoughts on native resources

• The state of native support is pretty poor

• You could fork (copy) a broken or incomplete plugin and patch it yourself

• Is this better or worse than having to write the plugin yourself?

• This is the clear downside to building hybrid apps rather than native
  • Device libraries can’t be used directly
  • Either need to rely on community libraries or fill in the missing pieces
Strengths of hybrid apps

• Can share a codebase between web and mobile
• Can save time and effort (sometimes)
• Easily design for various form factors
• Access to some device capabilities
Weaknesses of hybrid apps

- Performance issues
- Inconsistency with platform
- Limited access to device capabilities
Modern phones include a lot of sensors
Sensors

• Accelerometers
  • Axis-based motion sensing
  • Measures acceleration in a particular direction

Sensors

- Gyroscope
  - Measures device orientation
  - Can measure device rotation, where accelerometer cannot

Sensors

- Magnometer
  - Identifies cardinal direction
  - Can be used together with Gyroscope to create a compass
Sensors

- Global Positioning System (GPS)
  - Identify where on the planet you are
  - Navigation in Apple Maps, Google Maps, etc. combines all four sensors
Sensors

• Proximity sensor: how close/far an object is
  • Switches off your screen when it’s in your pocket/backpack/purse

• Ambient light: measures how bright a room is
  • Changes screen brightness to accommodate

• Near field communication (NFC): allows nearby objects to communicate
  • Powers Apple Pay, etc.
Sensors

- Sensors can also be re-appropriated
  - Microphone: measure noise, such as for sleep quality
  - Camera: barcode or QR scanner
  - Accelerometer: pedometer
  - Touchscreen: pressure
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