

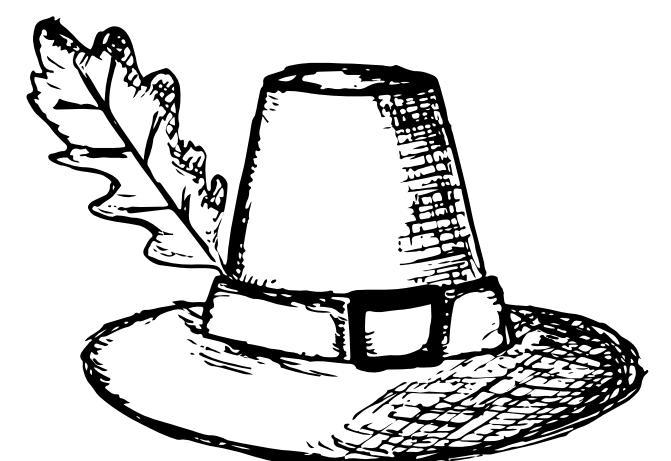
IN4MATX 133: User Interface Software

Lecture 22:
Device Resources & Sensors

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Class notes

- 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!



Question



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

Question



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

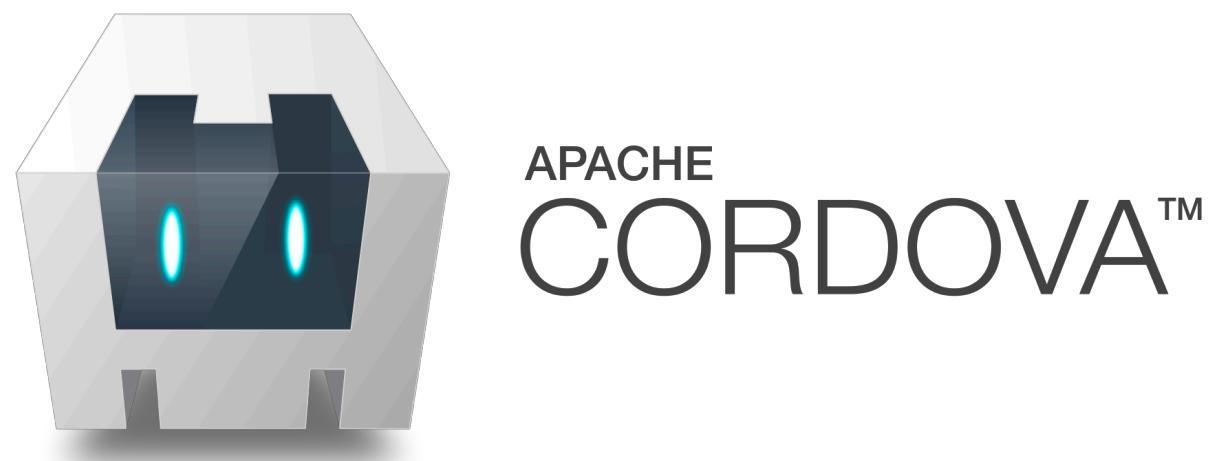
Today's goals

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

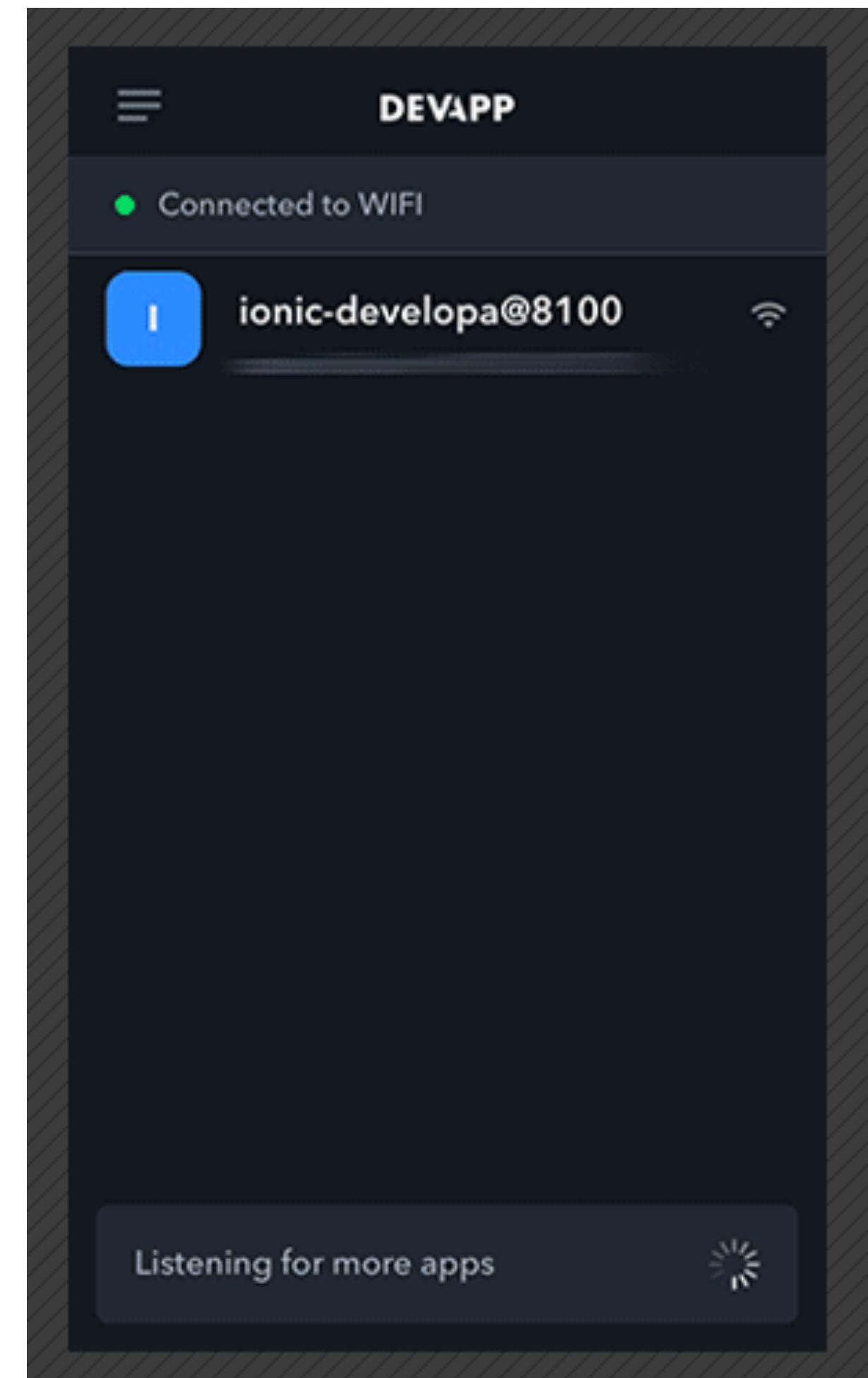
- Apache Cordova also provides libraries for connecting to device resources
- Ionic Native brings these libraries to Ionic as plugins
 - Ionic Native plugins are imported as services
 - Hundreds of plugins



<https://ionicframework.com/docs/native/>

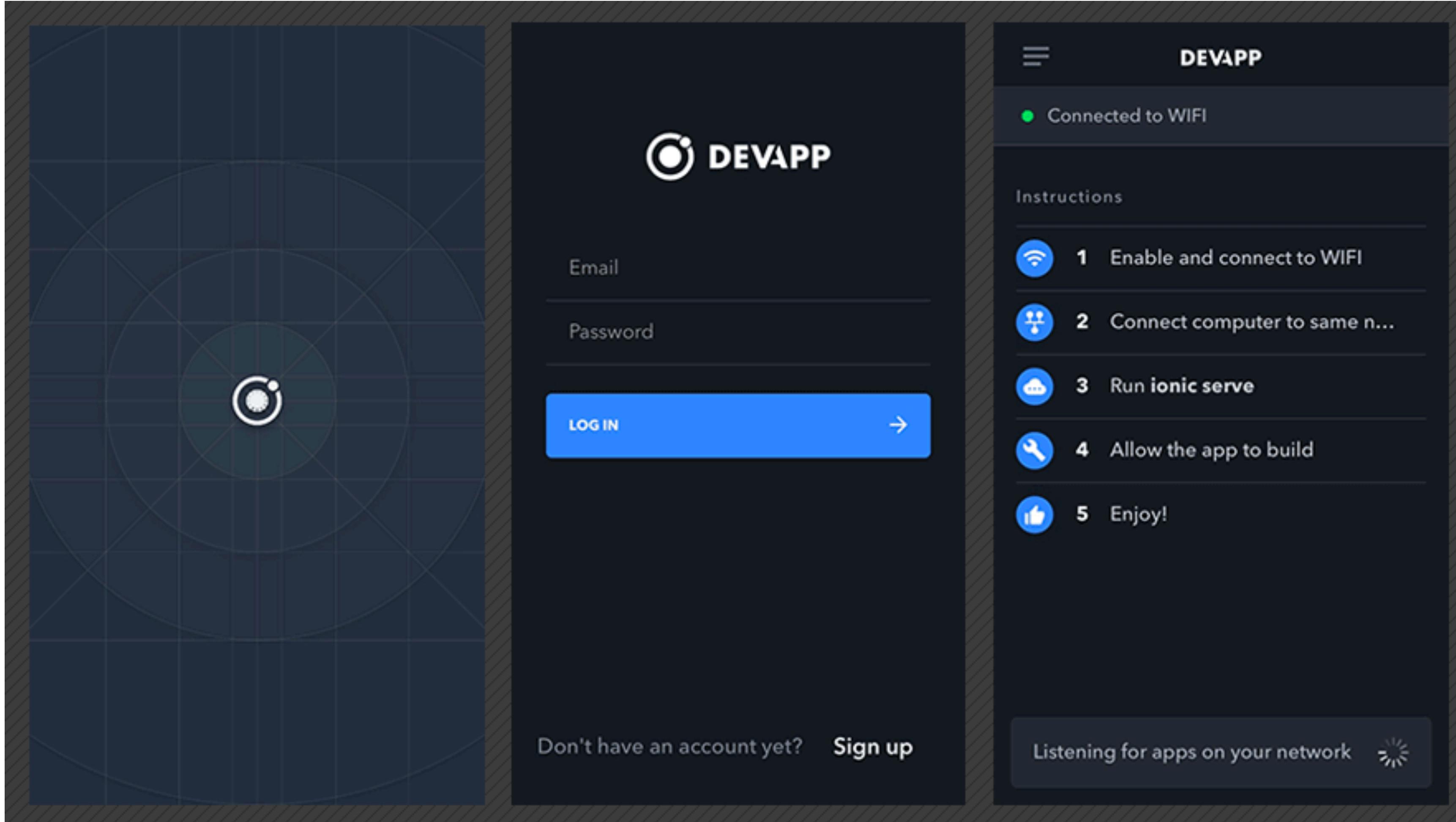
Ionic DevApp

- 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)

```
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`

optional

DeviceMotionAccelerationData

timestamp

Creation timestamp in milliseconds.

Type: `intrinsic`

x

Amount of acceleration on the x-axis. (in m/s²)

Type: `intrinsic`

y

Amount of acceleration on the y-axis. (in m/s²)

Type: `intrinsic`

z

Amount of acceleration on the z-axis. (in m/s²)

Type: `intrinsic`

DeviceMotionAccelerometerOptions

frequency

Requested period of calls to accelerometerSuccess with acceleration data in

Type: `intrinsic`

Milliseconds. Default: 10000 optional

Device Motion

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

```
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';

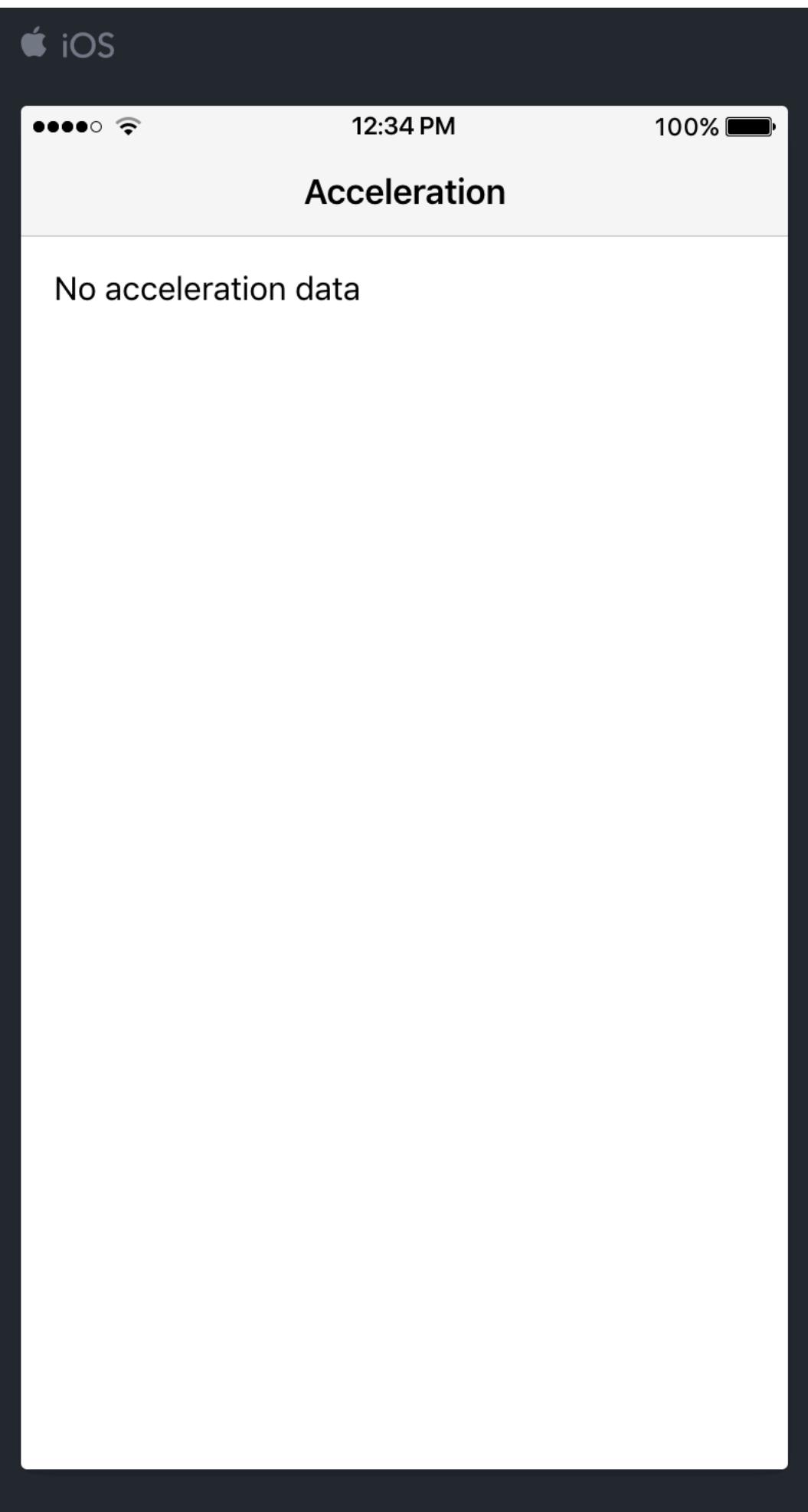
  constructor(private platform:Platform, private deviceMotion:DeviceMotion) {
    this.platform.ready().then(() => {
      this.deviceMotion.watchAcceleration({frequency: 1000}).subscribe((acc) => {
        this.acceleration = acc.x + ' ' + acc.y + ' ' + acc.z;
      });
    });
  }
}
```

<https://beta.ionicframework.com/docs/native/device-motion>

Device Motion

```
<ion-header>
  <ion-toolbar>
    <ion-title>
      Acceleration
    </ion-title>
  </ion-toolbar>
</ion-header>

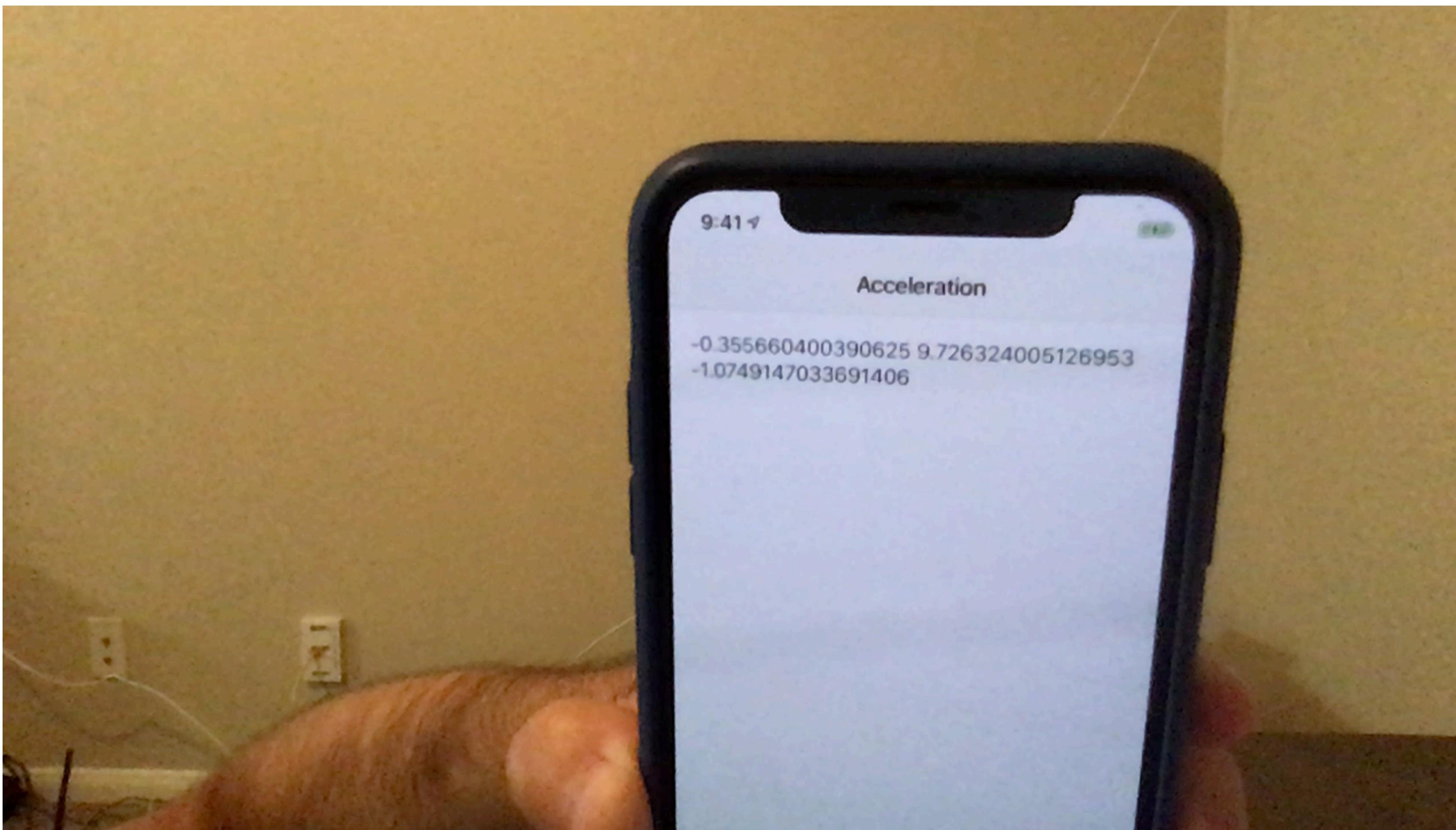
<ion-content padding>
  {{acceleration}}
</ion-content>
```



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

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[Installation](#)
[Instance Members](#)
[ILocalNotification](#)
[ILocalNotificationAction](#)
[ILocalNotificationProgressBar](#)
[ILocalNotificationTrigger](#)

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:

```
$ ionic 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 (Wont fix)
- **Not compatible yet with Ionic Native.** Their wrapper is not 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

```
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>

Local Notification

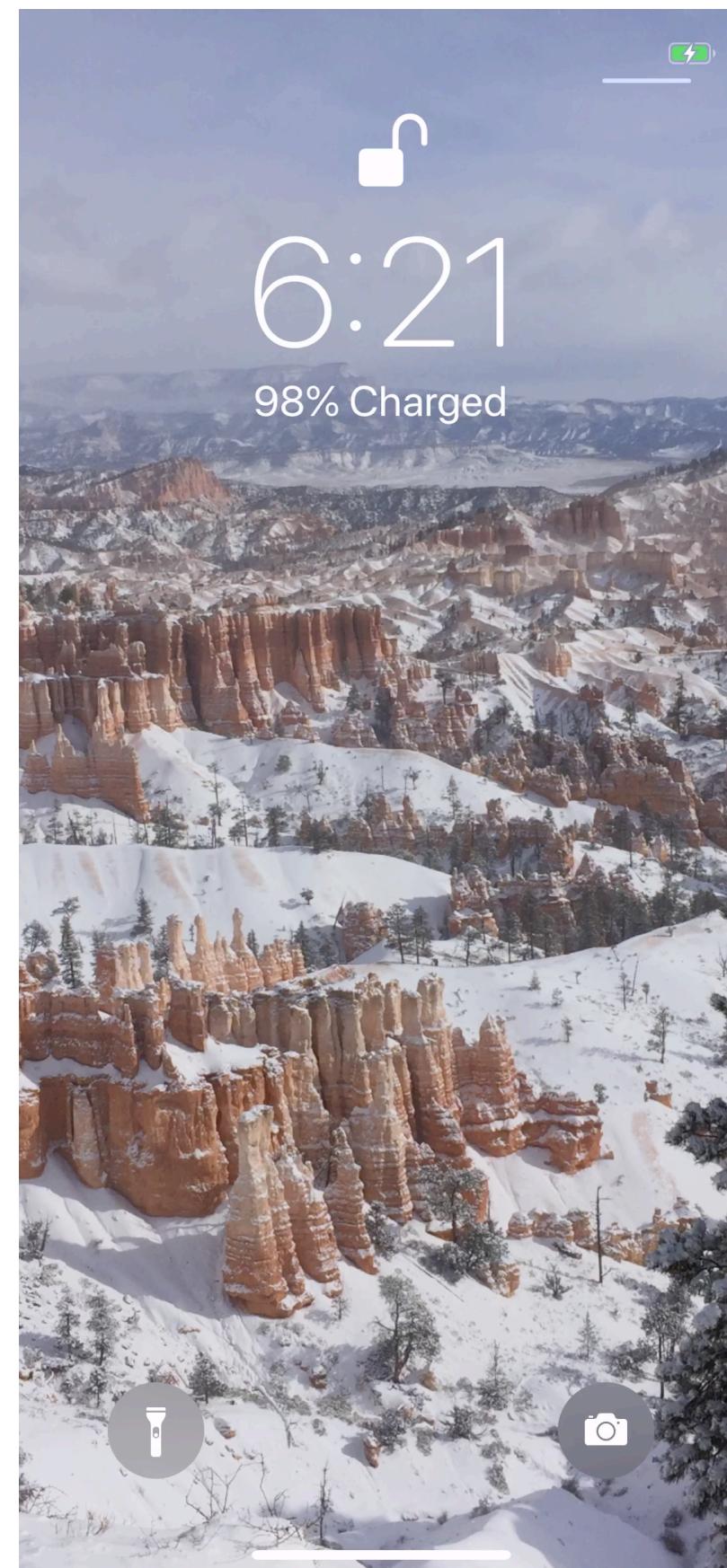
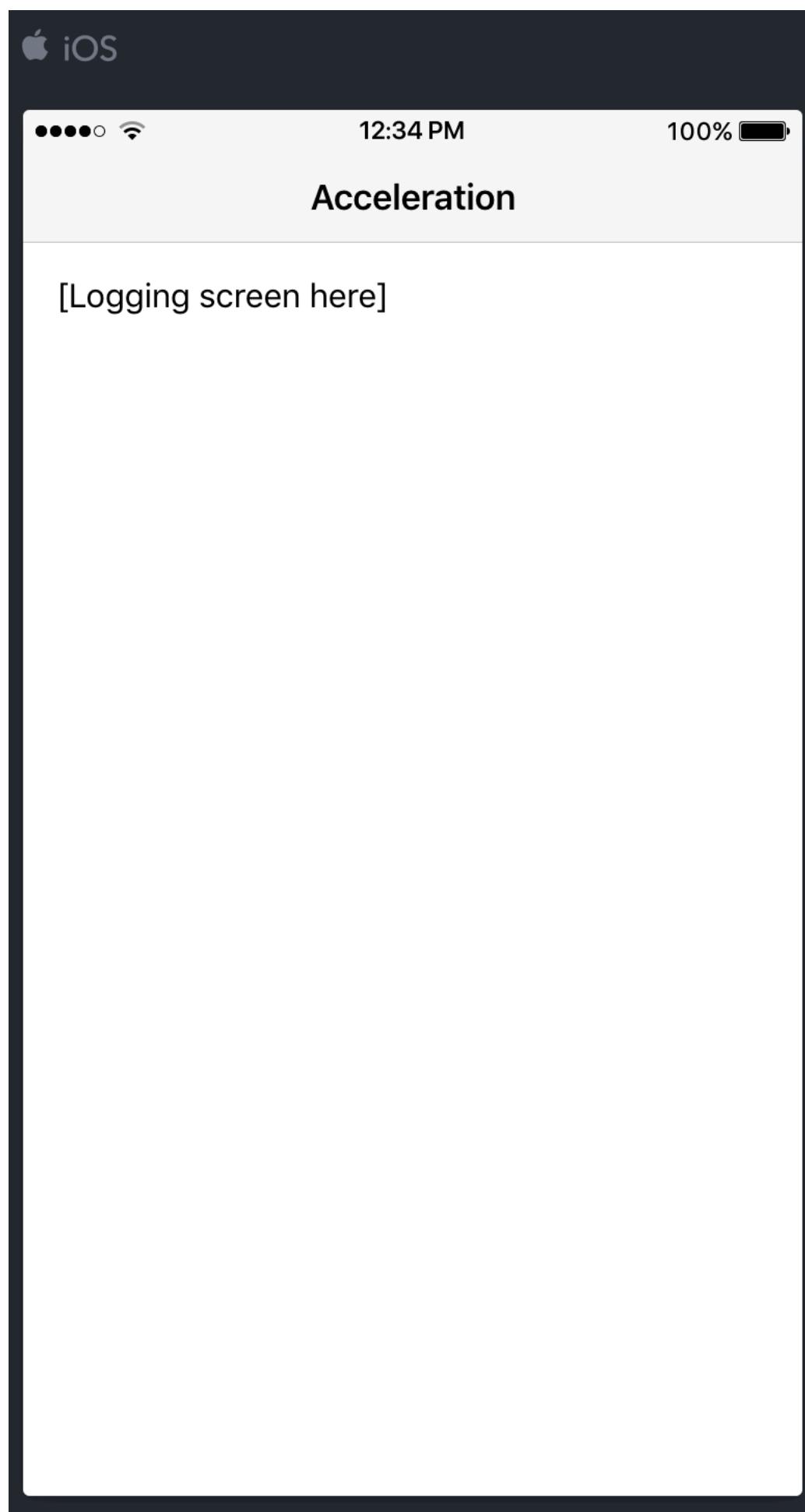
```
import { Platform } from '@ionic/angular';

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

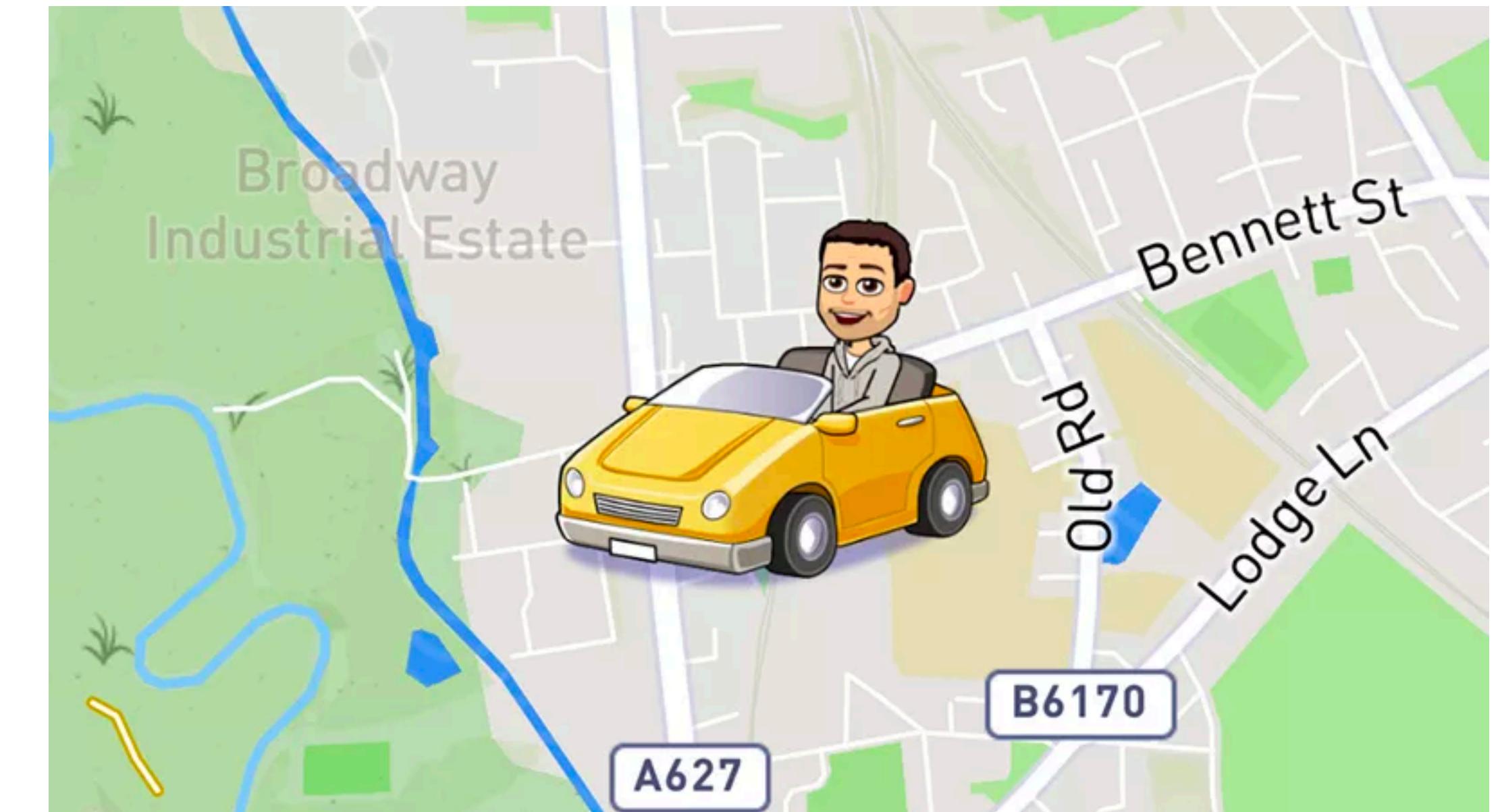
Weaknesses of hybrid apps

- Performance issues
- Inconsistency with platform
- Limited access to device capabilities

Modern phones include a lot of sensors

Sensors

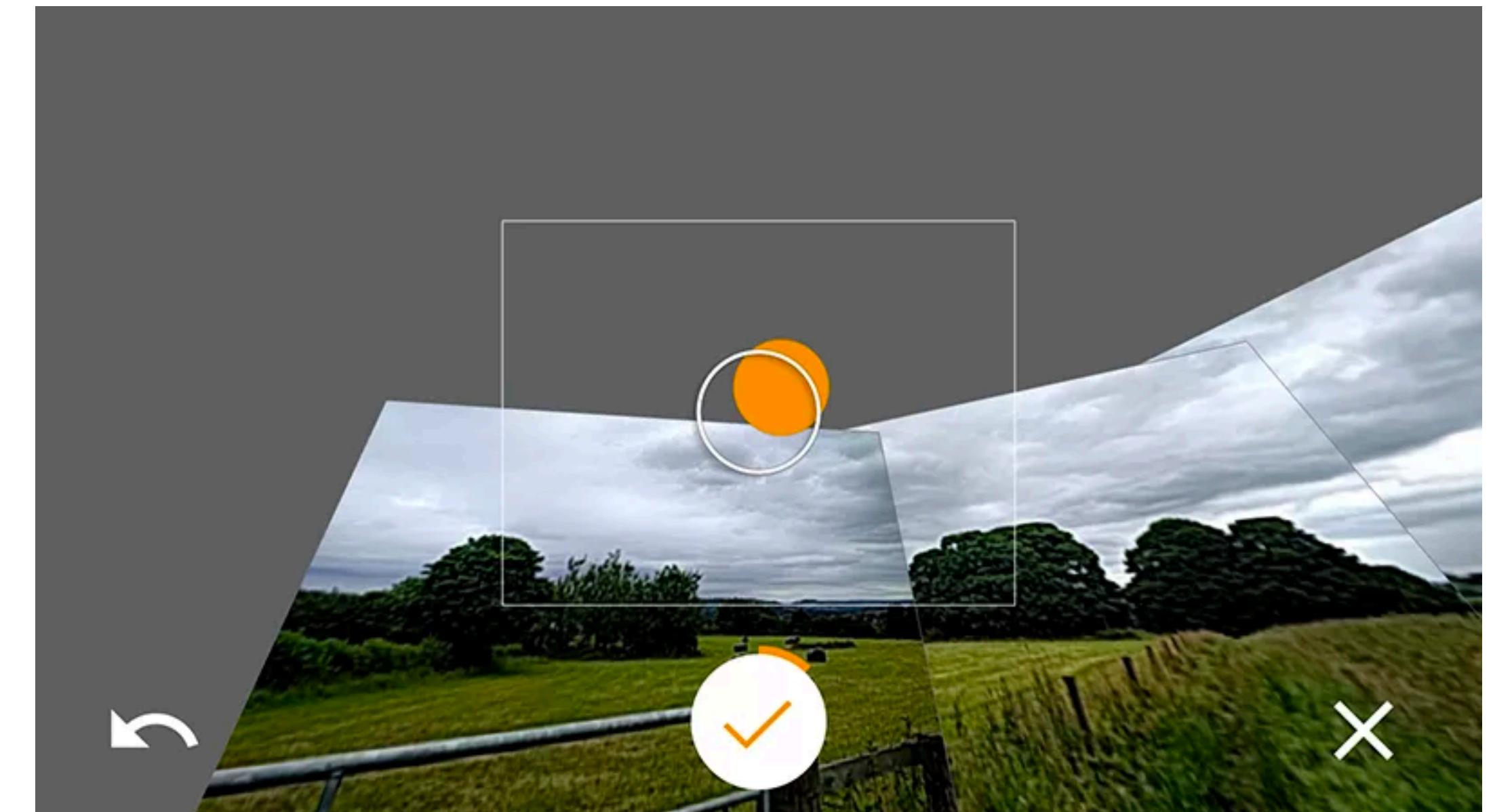
- Accelerometers
 - Axis-based motion sensing
 - Measures acceleration in a particular direction



<https://gizmodo.com/all-the-sensors-in-your-smartphone-and-how-they-work-1797121002>

Sensors

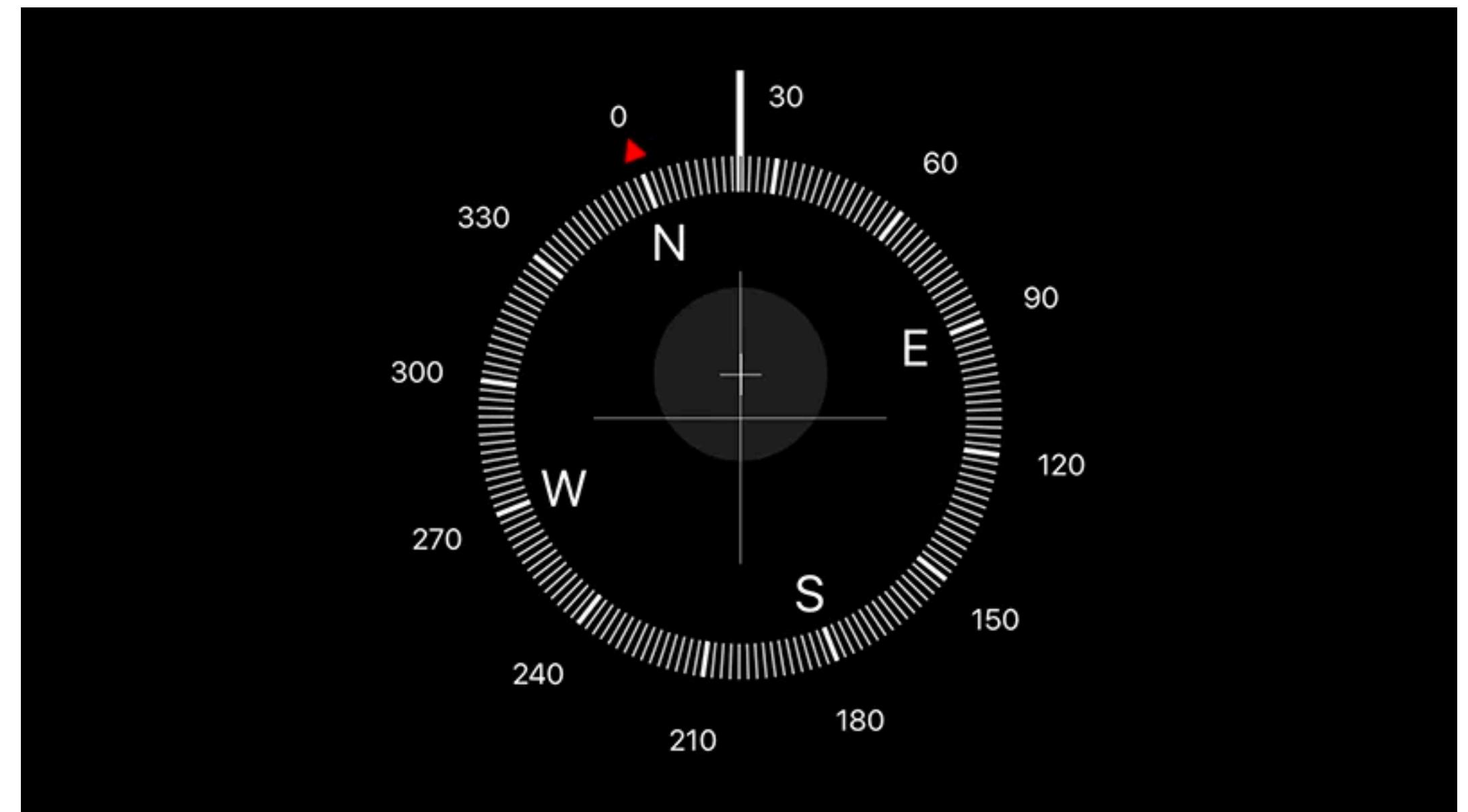
- Gyroscope
 - Measures device orientation
 - Can measure device rotation, where accelerometer cannot



<https://gizmodo.com/all-the-sensors-in-your-smartphone-and-how-they-work-1797121002>

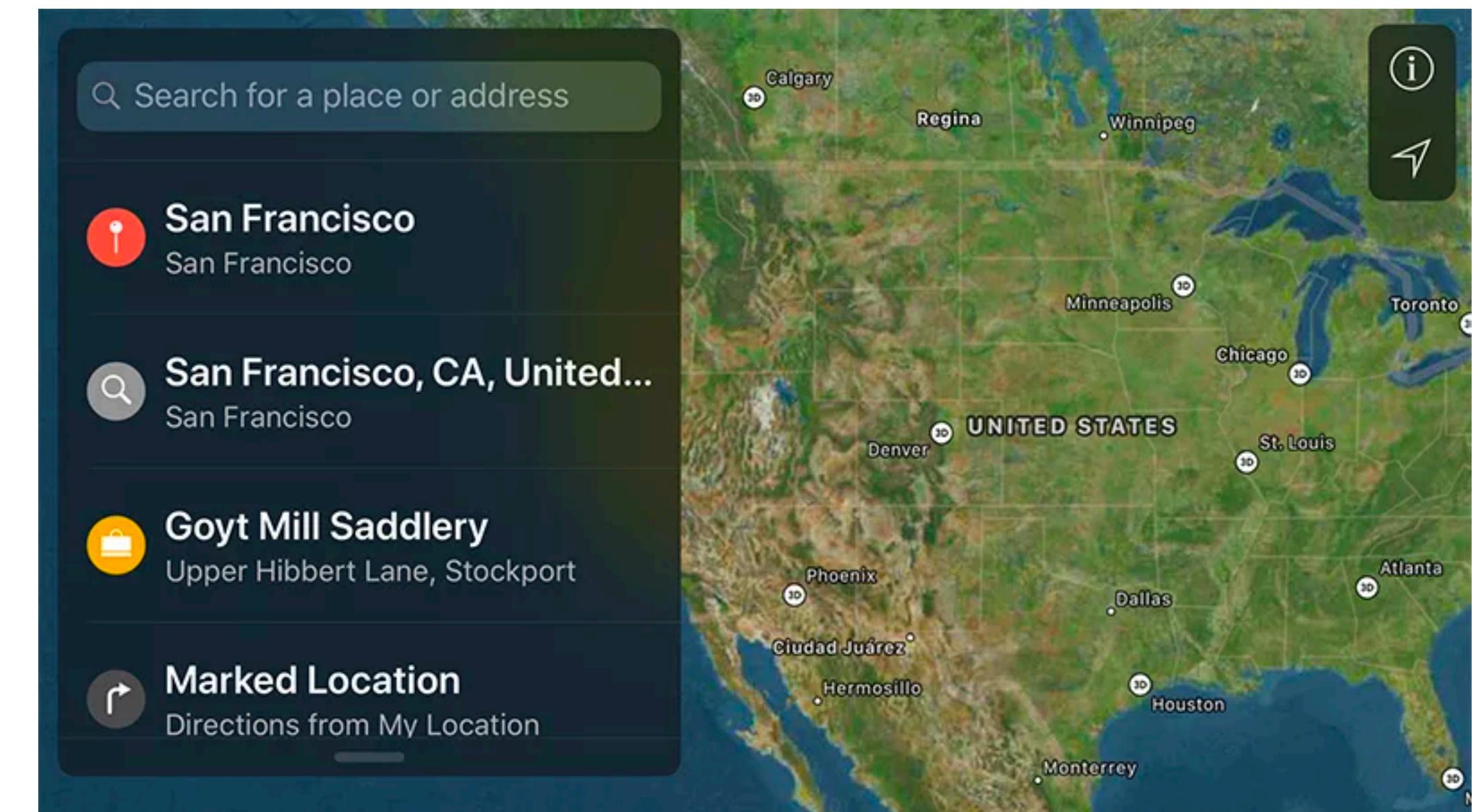
Sensors

- 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

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
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