Mastering ARKit

Apple's Augmented Reality App Development Platform

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Table of Contents

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Jayven Nhan has worked with the biggest international and national enterprises in the health care, financial banking, and entertainment streaming industries. He has published books and over 30 App Store apps. Jayven is an Apple scholar who contributes his best work to passion, fitness training, and nutrition. Passion makes problem-solving an enjoyment. Outside of coding, you may find him listening to audiobooks and podcasts, reading, or learning from YouTube videos.

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Felipe Laso is a Senior Systems Engineer working at Lextech Global Services. He's also an aspiring game designer/programmer. You can follow him on Twitter at @iFeliLM or on his blog.

CHAPTER 1

Why Augmented Reality?

Every now and then, there comes a special time in history where things really change humanity for the better. One day, when you look back, I believe augmented reality will be a special time in history.

What's so special about augmented reality, and why should you care? Here's the deal. Really, you don't have to care. In hindsight of the last centuries, a handful of people could care less about today's latest gizmos. And they may be just as happy as anyone you can imagine.

The iPhone has existed for a long time. The device itself is a force of nature. It enables people to do things that they otherwise could not without it. And I have a feeling that many of us reading this book can share a story adhere to the statement. As special as all these smart devices may seem, you can actually live without them.

Where does the technology stand with humanity? Technology has a neutral moral system on its own. Neither good nor bad. However, technology can do good and bad depending on the hands the technology lands into.

Technology has enabled humans to live longer and healthier, communicate further and simultaneously with more people, and enjoy the most lucrative career and life paths where people may not have even dared to dream of in the past.

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Intelligent medical devices can detect and prevent diseases, enhance various parts of the human body, and empower us to make better and more informed decisions. Smartphone gives us the ability to speak to people from various parts of the world in real time. YouTube combined with Internet access lets video gamers become millionaires within months, beauty experts showcase their art from their bedroom, democratize education of all subjects to be available to the world, and more.

Heck, technology has allowed this book to be distributed digitally onto a MacBook, iPhone, iPad, and more.

The existence of augmented reality will be no different. It will exist to serve the enhancement of humanity. However, it's a device that may be in front of our eyes as close to 24/7 as any device will, from when we wake up and put on our augmented reality glasses to when we place them down at night for charging. Hence, it is worthwhile to pay attention to the most up-close, personal, and interactive technology the world has yet to know.

Let's rephrase that succinctly. Augmented reality may be in front of our eyes as close to 24/7 as any device will, from the time we wake up to the time we sleep. Hence, it is worthwhile to pay attention to this technology.

Imagine yourself 10, 20, or 30 years from now. Apart from the amazing accomplishments you envision yourself to have achieved by then, some parts of your body may deteriorate. As much as you want this to be false, your vision is likely and may deteriorate as nature allows. You have glasses, contact lenses, and laser treatments to enhance our vision needs.

Augmented reality can enhance your current vision needs and adapt to your future vision needs. The latter is possible with augmented reality. When a person's vision quality deteriorates, augmented reality, combined with computer vision algorithms, can render the world in a way that optimizes a person's vision needs.

The accessibility feature dramatically reduces a person's cognitive loads from looking into the world, trying to fixate jigsaw pieces into place, and comprehending vision ambiguities.

Moreover, for people who love to multitask, such as walk and message, augmented reality's world-facing camera can act as an extra pair of eyes to assist you in your overall world awareness. Fewer people should run into health-damaging objects. And steel poles.

How about when you travel to a galaxy far far away? You seek adventure, and you have found yourself on a mystery planet. Landing on a mystery planet, you plant your feet into this mystery planet. You have stepped out of your rocketship. Black clouds surround you. The sky slowly fades darkly. Then, pitch-black.

You see a dark and habitable cave. One foot after another, you get closer to the cave. You are standing at a cave entrance. You walk-in, you see nothing. Your world-facing camera maps your world with infrared light. Safely, a step at a time, you have mapped the cave.

Now, you have yourself a man/woman cave. In addition, augmented reality can project the cave into your eyes. Even if you walk with your eyes closed, augmented reality can guide you through a world that is pitch-black to the eyes.

The Three A's: Accessibility, Assistance, Automation

Now, let's talk one of today's most prominent setbacks in academia, ADHD.

When augmented reality kicks in, the technology is an integration into the human body. Imagine this. Your future self came home and got some work to knock out the park and into the moon. You have found your desk and chair. You let gravity kicks in, and you are well situated on your chair.

You do the subtle shoulder shimmy, stretch shoulder slightly back, and then stretch your arms in front of you. You feel ready for flow. You say: "Hey Siri, start a 30 minutes timer." Siri says, "Your 30 minutes timer has started."

You see a single piece of paper document sitting on your desk. It looks you right into your eyes. You look right back at it. Siri suggests, "Hey Jayven Nhan, would you like to start focus mode?" You say, "Yes, Siri." That is all it takes to keep notifications, phone calls, text messages, room access, and any other Apple devices from distracting you.

All your Apple devices understand that you are in focus mode. Hence, they empower you by giving you the focusing power. The devices lock themselves up for 30 minutes—under the exception that you need access to your devices before the time is up.

Okay, your Apple technologies empower you to stay focus and go into flow. You start to read the document beginning with the header. It spells "P." The rest is a tad blurry and small for your eye to figure out the letters easily.

Siri suggests, "Hey Jayven Nhan, would you like me to amplify the text size?" You nod. Siri says, "Okay, I've applied the document's text size."

The document is accessible to the eyes. You read 70 papers front and back. Timer rings. Siri suggests, "would you like to start a 5 minutes breather?" You nod. Siri begins the 5 minutes voice-guided breathing exercise.

As of now, you may be wondering how Siri suggests these events? Starting with iOS 12, Siri Suggestion is a feature that works behind the scene. Siri suggests tasks by learning from donated events. Donated events are events that developers give to Siri for Siri to make helpful suggestions based on repetitive activities.

For instance, if you have watched *Game of Thrones* every Monday at 7 PM at home for 4 weeks straight, Siri may suggest that you head home from work when the time is 6 PM so that you can catch the latest episode of *Game of Thrones*.

Because you have repeatedly entered work mode, set up a 30 minutes work timer, set up a 5 minutes breather, and set up a 30 minutes work timer, Siri suggests the following since the 5 minutes breather is up: "Would you like to start a 30 minutes timer?" You nod. Siri says, "30 minutes timer begins."

After an intensive reading session, your cognitive computing power is slightly taxed. The 5 minutes breather gives your brain some breathing space. You look left. You see the 70 documents you've read. You look right—another pile of documents.

Wait.

The letters are jumping around on this one. Perhaps, this is not a dyslexic-friendly font. Your cognitive computing power is taxed. Do you need to power through this?

Fortunately, Apple has always cared for accessibility users. Thanks to the built-in natural language processing and OCR in your augmented reality glasses, you can say: "Hey Siri, read me the document in front of me." Siri begins naturally reading the document: "Empower everyone by first and foremost treating everyone with dignity and respect…."

Ah, another productive work block. You look to your right. There's only the empty table surface to be found this time. In front of you, you see a flat table surface. To your left is a productively read stack of documents—given productivity is more work done toward achieving one's objective in the least amount of time possible.

These are three examples of vision accessibility. Now, let's talk space.

Real Estate

Space, space, and space. Real estate. As more buildings are built, more people occupy space, and more city areas become dense. Particularly, earth space becomes exponentially valuable over time.

Take San Francisco, for example, the heart of Silicon Valley. San Francisco's real estate has spiked exponentially valuable over the last decade due to and not limited to innovation, culture, human talents, and prosperities.

The exponential growth in the last decade isn't limited to San Francisco. Some of the most in-demand cities in the world include New York, Hong Kong, Singapore, Zurich, Seoul, and many more.

In the particularly land-scarce places, including, but not limited to, cities, could be your backyard, front porch, or whichever room could use some extra space. These spaces remain very much a constant and less of a variable. Augmented reality can become an extremely viable option for solving space limiting problems. Augmented reality can provide state-of-the-art space reusability features.

Imagine yourself heading into a state-of-the-art fashion design museum in New York City. You walk out of your hotel in New York City with your augmented reality glasses. You see art posters on cab doors, building with art posters, and street signs that point you toward the art museum.

The art museum aggregates fashion designs designed by artists from all over the globe. There are incredible European artists from Italy, Germany, France, and many more European cities.

You line up for an hour now. Finally, it's your turn. You strut through the automatic glass doors. A lady greets you with a hello. Then, she hands you a pair of augmented reality glasses.

You take a couple more steps forward into the museum. Another automatic glass door meets you. This time, there is a biometric camera to verify that you are a guest.

The glass door fades green. Then, it turns white. The door opens. You walk through the doors.

You put on your augmented reality glasses. Virgil Abloh, Louis Vuitton's menswear artistic director, greets you. The museum tells the story behind each masterpiece—the manifestation of an idea.

Fast-forward, it's the next day. You walk into yesterday's museum. This time, you sign up for music creation.

The day after, you learn about wine brewery at the same museum.

Fast-forward to next week. It is an electronic sports week. You walk out of your hotel in New York City with your augmented reality glasses. You see sport team flags, banners with players' quotes, and street signs that point you toward the sports stadium.

Then next week, you want to catch your plane. Taxi available for hire has an Uber sign on the roof. You flag down an Uber.

You scan the QR code on the door with your glasses and hop in the car. On you go with your ride.

At destination arrival, you verify the payment with voice biometrics. You step out of the car.

Arrows greet you toward your check-in counter. You do your usual check-in. Then, arrows on the floor point you toward your Gate 1.

However, before heading to the gate, you would like to spend an hour at the First-Class lounge. You say, "Hey Siri, show me the way to the First-Class lounge."

Siri says, "I've updated your path to walk towards the closest lounge. Please follow the arrows in front of you."

Without much cognitive load, you are inside the majestic Emirates First-Class round.

An hour passes. Siri suggests, "Hi Jayven Nhan, your flight is boarding in 30 minutes. It's a good time to head over to the Gate 1 if you'd like to reach Gate 1 by boarding time. Would you like me to show you the way to Gate 1?" You respond, "Yes."

Siri, using arrows as visual aids, guides you toward Gate 1. You board the plane.

Augmented reality can personalize spaces for you. Whether you want to attend a museum presented in a language foreign, experience special events, or direction, augmented reality can seamlessly augment and personalize the world for you.

So that's space. Now, let's talk about education.

Education

Edgar Dale states that the human brain remembers 10% of what we read, 20% of what we hear, and 90% of what we do. It is time we make learning intuitive to the human brain.

Ever wonder what it's like to live as a marine or ever felt anxious prior to an event. Do you know what could help you reduce anxiety and increase your confidence? Practice. Again. And again. And again. Over and over and over again. Augmented reality can simulate reality to prepare you for an event. Say, you are about to join the marines; your role, in particular, is to strategize and deliver the strategy to your team.

You happen to be anxious to deliver your first speech to your team. Hence, you open an app that simulates your team in augmented reality. You practice giving the speech over and over again. Although a computer can give a speech precisely word by word, there has yet to be a close replacement for having a physical human-to-human interaction. In addition, to an audience simulation, your augmented reality device can show you your speech text as you speak. This reduces the need to memorize. Computers happen to keep text preciseness in memory better than humans. Hence, using computers to remember text can mitigate the time spent on text memorization.

Imagine a personal tutor for your homework. A simple "Hey Siri, tutor me" can make a homework or test preparation tutor accessible to you and anyone with an augmented reality device and access to the tutoring app.

The universe is the limit with such an app. In addition, the app can learn about you and personalize functionalities to optimize for your desired learning experience.

Accessible and personalized education for people around the world. Wow. Every kid deserves a good education. If every kid has access to augmented reality, this technology can help the human race take an excellent step forward.

People will also have education options and personalizations. You identify with particular courses, professors, tutors, mentors, etc.

Say you have a load of homework and an upcoming test. You can choose your tutor, human or artificial intelligence, to help you with your homework and test preparation.

Want to take an interactive and engaging computer course from your bedroom, perhaps due to dangerous weather conditions today? You can. The class can continue.

A professor can create an augmented reality class. A class experience where students can learn from anywhere and learn by doing. Augmented reality unlocks students' ability to interact seamlessly with the virtual world—at the comfort and safety of their homes.

More students than ever face mental issues. The world is catching up in raising mental issue awareness. No kids should go to school to put their mental health at risk, whether it's terrible weather, bullying, or haircut.

Education affects everyone. This space is ready for a revolution.

Closing

The number of augmented reality devices is at an all-time high, with over augmented reality capable devices on the iOS platform alone, and the number continues to grow. We are at a phase where we prepare for the augmented reality and human integration.

I believe that augmented reality glasses will be a very personal device. And it will be a more significant extension of the human body than smartphones.

Augmented reality is a technology that looks into the world with us 24/7. It will learn about you, me, and the world.

Augmented reality will empower people to do things that we could not do otherwise. Augmented reality will give some people independence with accessibility features.

Augmented reality will give us a personalized world.

Augmented reality will also give us an accessible and personalized education.

And this is the very beginning of augmented reality.

Let's build the world for today, tomorrow, and centuries after.

Why ARKit?

Choosing a technology is deciding to make an investment. Analogous to investing in stocks, investing in a company's technology can become a sizable investment of your effort, time, and potential outcome. This chapter covers the following considerations when choosing ARKit:

- Apple's core values
- Versus cross-platform software
- Riding the technology momentum
- Apple's documentation
- Apple's developer community documentation

By the end of this chapter, you'll have a better idea about why you'd want to choose ARKit to develop your augmented reality apps.

Apple's Core Values

Why does anything you choose matter? When we buy a branded product, we resonate with a brand to an extent. A brand stands for values, and people buy branded products that say something about them. Apple has long stood for the following core values: accessibility, education, environment, inclusion and diversity, privacy, and supplier responsibility. From Apple's core values and my observations of Apple, Apple always seems to strive to do the right things that fundamentally push humanity forward.

Big companies such as Apple bring excellent values to the world—as a byproduct, their business seems to take care of itself healthily. Companies the size of Apple have the spending power to hire top talents from all around the world. These talents can develop and push forward Apple's augmented reality platform in a particular direction.

The direction in which a platform is heading toward is dependent on the company's talents. Certain companies attract certain talents—usually, talents whose ambitions align with the company's core values.

Based on a company's core values, you can expect certain features in the company product/platform. Apple's hardware and software are accessible. Apple works toward providing education, such as teaching students to code on the Playground app.

Apple strives toward creating processes, buildings, and products using 100% renewable materials. Apple creates products and environments for its customers to experience for people of all backgrounds. Apple creates products responsibly by taking into Apple's high standard of human rights, environmental protection, and business practices. These are products/events that are to be expected from Apple.

Apple's augmented reality product and platform are expected to have included these constants. History doesn't always repeat itself, but it does tend to rhyme at the very least. If Apple's core values resonate with you, they are a fantastic reason to develop on Apple's platform and aid in fostering those core values in the products you build for the world.

Versus Cross-Platform Software

Beyond having a secure cultural connection with a brand like Apple, some people may ask: How about a cross-platform development for augmented reality? Would that be more efficient for developing a single code base for platforms inclusive of Apple's platform and others' platforms?

Everything is case by case and has its exception. Nevertheless, every cross-platform development environment requires a layer of abstraction to handle Apple's platform and others' platforms.

Adding a layer of abstraction may result in a non-native feel of the resulting app built from the cross-platform development environment. This reduces the user experience because a user may need to relearn a non-native app's navigation pattern. An abstraction layer can frustrate your users when your users can yet to operate specific functions within an app. What you want is to build an exceptional app experience for our users.

Moreover, by having an abstraction layer, you practically have to build for Apple's platform and others' platforms. This means you need to build for Apple's platform, non-Apple supported platform, and the cross-development platform.

You may not be the one to create the abstraction layer every single time. However, this requires your attention to ensure all features carry over as expected to your app.

For instance, a subsection of native app features, can your view controller (pushed onto the navigation controller) navigate back to the previous view controller with a native swipe gesture?

Another instance here. Does your app support accessibility features, such as a label or text field, to work as intuitively as the native app? Or is every single line of code in the abstraction layer necessary app's code base? Having ambiguous layers of abstractions is the beginning of days to security flaws.

Some codes may not trigger a security flaw or app crash today or tomorrow. Yet that doesn't stop it from ever happening.

The app may trigger a security flaw years from the release of your app. Or there may even be unexpected crashes due to the code architecture flaw in the abstraction layer.

In this case, it may take extensive time to debug the app's surface code. Then, under the awareness that the crash may be due to the abstraction layer, someone will need to read and understand the abstraction layer.

Afterward, debug and fix the abstraction layer flaw yourself, which you may not know if fixing this part of the code may lead to other leakages unless the abstraction layer is fully tested. Or, hopefully, given time, the team which publishes and maintains the abstraction layer releases a fix.

Also, due to having an abstraction layer, a cross-platform development environment has historically released its version of newer frameworks at a later time than the native framework publisher.

The reasons are that the native solution is first released, the cross-platform team has to coordinate and create the abstraction layer for all supported platforms, and then hopefully thoroughly test the abstract solution before public release.

Having the cross-platform development tool at your disposal at a later date could lead to a reduced time spent with the latest technology, a reduction in technological competitive edge, and deadlines, which add a framework's cross-platform support variable on itself.

How about when a framework such as ARKit releases a version update? Are you going to be able to tell that the cross-platform solution works like a native? When your app crashes, are you going to have the resources to go through the abstraction layer when the client code works? Will the cross-platform solution support all features from the latest framework or merely a subset of features at a particular date? Timelines can become an issue when working with cross-platform development tools.

Riding the Technology Momentum

Another reason to choose Apple's development platform is that Apple seems to push its proprietary augmented reality technology with more force than any other company in the respective industry. This means you'll be riding the more influential or most influential wave if Apple continues its momentum and push for augmented reality.

Apple first announced ARKit at WWDC17. Since then, Apple's augmented reality technology has only continued to progress, becoming