

Preddy to make fashion fireworks right go at Old Navy get up to sixty percent off the entire store during the eighty's red white and new sales save big with items for two dollars four dollars six dollars and eight dollars including women steaks for just two dollars plus today's only tomorrow and Sunday get flagged tees for the whole family for just two fifty also more essential is up to sixty percent off like flip flops Take tops swimwear in shorts and Old Navy and old Baby dot com six ounce only guitars are offered out six hundred to seven five excludes clearance departs registering items jewelry today only deals today only deals. Get in touch with technology took stuff from house to. Pay their welcome to Tech stuff I am your host Jonathan Strickland and today I'm going to augment you know yeah. Or at least tell you what augmented reality and they are is all about and if this seems like it's deja vu that means you are a long time listener of tech stuff because we did our episode about a our way back in two thousand and nine that's when Chris Paul that was my co-host and together we recorded an episode that we called What in the world is augmented reality and that was a pretty short overview of the concept like twenty minutes long and that included two different listener mails so I thought I would do a deeper dive bigger explanation about what Augmented Reality is what it's all about how it works and sort of the applications we might. Put A R toward things that you know was it good for tons of stuff as it turns out so the first thing we should do is probably define some terms because if you haven't really looked into augmented reality in you aren't familiar with a are you might just be lost I'm going to define it all for you right now. Because that's the case stand up guy am technically speaking augmented reality is using digital information to enhance or augment an experience in our physical real world so the way we usually see this implemented involves some sort of display that has an image of the real world on it and it overlays digital information on top of that image so think of like a camera's view finder like an L.C.D. screen on a camera and it actually labels the buildings that are in view when you're out on the street and you hold the camera up or a smartphone or even aware of will device like a head mounted display that you can look through so you can see the real world you're not just staring at a screen or if you are staring at a screen you're staring at a video feed that is provided by an external camera mounted just on the other side of the screen so it's like you're looking through a display in the first place but then on top of that view you have this digital information that's the most common implementation we talk about but it's not the only one augmented reality does not have to only be or even involve visual information at all and you could have audio only augmented reality for example but the whole idea is that it's something that is created digitally to enhance your experience in the real world now we can contrast this with the concept of virtual reality virtual reality of course is a term where you create an experience completely through computer generated means a computer is making all the things you see and hear and maybe even beyond that if you have really sophisticated setups so you might have some haptic feedback haptic refers to your sense of touch so if you have haptic feedback that means you're getting information feedback through your sense of touch common example this is. Rumble pack inside a game controller where you know you fire a gun in a first person shooter and your controller rumbles as a result letting you know that you are in fact unleashing virtual destruction upon all you survey. Well the same thing could be true with virtual reality set up so virtual reality is all about constructing an artificial reality a simulated reality augmented reality is all about enhancing the one that we are actually in and then there's also mixed reality mixed reality is kind of sort of in between the two you might have some physical objects within a room that are also mapped to a virtual environment and then you use something like a head mounted display to enter the virtual environment That's what looks like you're inside but you have physical objects in the room around you that are also mapped to the virtual world meaning you could pick up this physical object and you would see that reflected within the virtual world where you might you know pick up a sword and shield or move a chair or something along those lines so I made a reality virtual reality and mixed reality are all kind of inner related so much so that their histories also are very much in a related and there are some people who try to collect these different technologies these different approaches and put them under a common umbrella and they tend to use the phrase alternate reality which is unfortunate because that's also a are but alternate realities kind of the umbrella for virtual

augmented and mixed reality. That kind of gives you the definition of those basic terms and it is important to understand them because they're becoming more and more important today you are already probably aware of a lot of V.R. headsets that are out there on the market as well as V.. They are. Well they're kind of like cases that you slide your smartphone into so your smartphone becomes the actual display on of your headset the headset itself is more or less just a. Head mounted case for your phone. We've seen a lot of those come out over the last few years and we've also seen a lot of our applications come out typically for things like i Pads and smartphones but we've also seen some hardware come out that for wearable devices that falls into the augmented reality category stuff like Google Glass which I'll talk about more a little bit later in this episode. For augmented reality to work to get this enhanced experience of reality around you there are a lot of technological components that have to come together so that you actually do get an experience that is meaningful you know you have to have technology that quote of quote knows where you are and what you are looking at or what you are close to in order to get that augmented experience it wouldn't do me any good if I put on an augmented reality headset for example and stared at let's say a famous painting and instead of getting information about the famous painting I see an exploded view of an car engine that made no sense so you have to build and technologies in order for the A are to understand what it is you're trying to do and to augment that experience which meant that we had to wait a pretty good long time for the various technologies that we used to to create this relationship to mature to a point where it was possible sometimes we had technologies that would allow us to do it but it required tethering headsets to very large computers which meant that you didn't have really any mobility and. And it really limited the usefulness of the actual application in other cases you could say things like your head tracking technology was absolutely necessary for a R. to develop the way it did G.P.S. technology as well remember it wasn't that long ago that we ordinary mere mortals didn't have access to really accurate G.P.S. information for a very long time that was purposefully made less accurate it was a matter of national defense it wasn't until the ninety's that you started to see G.P.S. become more accurate for the basic consumer way back in the day you might get accuracy of up to around one hundred meters which is not great if you're looking for the next place to make your turn if it's one hundred meters away that's that's pretty far but now it's within a few feet so it's much better that sort of stuff all had to come together in order for augmented reality to become. Viable I almost said a reality but that just starts to sound redundant at any rate let's talk about some of these technologies we we are we really need things like gyroscopes accelerometers these help devices understand their orientation where they are in respect to something else like are they for a smart phone it might be is it in landscape mode or portrait mode but for a head mounted display it would help give the the unit the information it needs to know which way you're looking like are you looking to the Easter to the west that kind of thing. Also campuses obviously very important G.P.S. sensors image recognition software but has become really important so that when you are looking at something the system can actually identify what that is in some cases you can get around this. You can design an A R system where let's say you make a movie poster and the A Our application has the movie poster animate in some way if you hold up a smartphone that's running the appropriate app so I'm just going to take a movie from my past that does not have an eight hour movie poster associated with it but one that I can talk about as if it were a good example and that has to be Big Trouble in Little China universally declared the best movie that has ever been made so you've got your Big Trouble in Little China poster up on the wall and you hold up your smartphone and you activate your Big Trouble in Little China movie marketing app and the camera on your phone detects the poster it you know the posters there well the app and the poster together are able to construct the augmented experience because there have been elements put into the poster that the app is looking for and once the app identifies that like it sees maybe eight different points on the poster and because of the orientation of those points it knows what angle it's at what height it sat in relation to the phone and can give you on your display the augmented reality experience in this case it's obviously Jack Burton in the pork chop express eating a sandwich because as we know the most riveting scene in the movie. Unfolds in this way so that would be kind of an augmented reality

experience where you didn't have to worry about every possible application on the real world you made it for something very specific which means in your software you can have the camera look quote unquote for these particular points of reference and thus create the augmented experience in that way if you want to take that and move it to the real world where you can see augmented information about just the world around you it becomes way. A more complicated you have to have a very sophisticated image recognition software so that the camera picks up the images the software processes the information identifies what those images are and gives you the relevant information so working with all the sensors augmented reality can make this a possibility so another example let's say you're out on the street in Atlanta you're here in my hometown Atlanta Georgia and you're looking at a building and you wonder what it is and you hold up your phone and you've got your little map app that allows you to look at a real world setting and tells you information about it and it tells you it's the Georgia Aquarium Well first of all you would probably know that already because the signage there is actually pretty good but the point being that this would be something that would tap into the G.P.S. coordinates on your phone so it would know where your location was help narrow that down the compass would tell it what direction you are facing the. Camera Angle also where you have some image recognition going on there the accelerometer tells the orientation of the phone itself all of this data together would give the software the information needed for it to display the label Georgia Aquarium on your phone and it all happens in an instant That's pretty amazing a typical you also have to have some other method to communicate with a larger infrastructure because we don't have the capability of building an enormously powerful computer that has all this real world information programmed into it and make it a handheld or wearable device so usually you have to pair these devices with some other larger infrastructures sometimes it's a double handshake for example with Google Glass you would use Bluetooth to connect Google Glass to a smartphone then the smart phone would have the connection to the larger Internet through your smartphones cell service provider. So while you're. Experiencing the augmented reality through the Google Glass it's actually communicating through your phone to the infrastructure to get the data it needs to show you the information it's showing you very important elements and all of these components like I said came together more or less around the same time most of them were being developed independently of each other and just the now we're seeing them all converge That's an old favorite word here at Tech stuff converged together to create the augmented reality experience to make it possible so how did we get here how did these different elements develop Well there are a whole bunch of technology pioneers who really created the foundation for augmented reality as well as virtual reality and mixed reality but one that I think we really need to concentrate on it first is Ivan Sutherland now Sutherland was born in Hastings Nebraska in one thousand thirty eight and as a kid he was fascinated with mathematics particularly geometry and also with engineering he began to study and experiment with computers while he was in school and this was a time where personal computers were a thing there were no personal computers at this point computers were actually pretty rare and they were huge and in fact they often would rely upon physical media formats like Punch punch cards or paper tape to read a program so you didn't even have a disk or certainly nothing like a U.S.B. thumb drive or anything like that you actually had to put physical media into the machine for it to read and then execute whatever program you had designed for that device he went to college at what is now Carnegie Mellon University on a full scholarship he graduated with a Bachelor of Science degree he would then go on to earn a master's degree at Cal Tech and a Ph D. in electrical engineering from MIT and actually his doctoral thesis supervisor. Claude Shannon and we talked about Claude Shannon back in the two thousand and fourteen episode who is Claude Shannon and we recorded that not too long after Shannon's passing So if you want to hear a really interesting story about a pioneer in computer science you should go check out the two thousand and fourteen episode back to Sutherland for his thesis he created something called sketch pad and that was really by most accounts the first computer graphical user interface or gooey a graphical user interface means that you interact with the computer through graphics representing various commands on the computer windows and the mac operating system are both examples of graphical user interfaces as

is the interface on your smartphone if you have a smartphone where you choose applications on a screen that's a graphical user interface well subtle and created what is largely considered to be the first one of those After college he entered military service and he was assigned to the National Security Agency we have great friends there I assume I'm sure they're listening because they're listening to everything and any rate he entered the N.S.A. as an electrical engineer and in one thousand nine hundred sixty four he replaced J C R Licklider as the head of DARPA's information processing techniques office or IP to go and also buy back then DARPA wasn't DARPA it was just arpa. So this is the same group by the way that would end up doing a lot of work that would form the ARPANET a few years later on the ARPANET was the predecessor to the Internet in some ways at least the ARPANET was what ended up being the building blocks for the infrastructure that would become the Internet now all of that work happened after Sutherland had already departed the organization. His work became a fundamental. Of both virtual and augmented reality as I mentioned earlier in one nine hundred sixty five he wrote a piece an essay that's very short very easy read and you can find it online the title of the essay is the ultimate display and if you ever do any research in virtual reality or augmented reality this essay is going to pop up in your research so go ahead read it it's like two pages long so it goes very quickly in that essay he talked about several ideas including the idealised display the ultimate display something that would be the the furthest you could go. With display technology in a Keep in mind in his time why his time he still lives by the way this time in the one nine hundred sixty S. he you know things were rather just restricted to monitors you might have a light pen but usually you just use a keyboard like it was pretty bare bones they said let's push this as far as we can imagine it and in his example he thought of a room that would be completely controlled by computers everything you would experience within that room would be generated by a computer everything you see hear smell taste and touch all of it generated by computers the computer would even be able to form physical objects out of pure matter itself now he wasn't suggesting that this would ever be a device that we would actually be able to build He was just saying what is the ultimate incarnation of display technology and if you read it you realize oh this is where the Star Trek Next Generation writers got their idea for the holodeck but unlike Star Trek The Next Generation the ultimate display would not go on the fritz every other episode and try to kill the crew it was better than that. They'll do a display was sort of a a foul. And ational like philosophically it was foundational for virtual reality an augmented reality this idea of a very immersive experience where you as a user are surrounded somehow by this computer generated experience and that's true both with argument of reality and virtual reality in augmented reality. The real world is still there but you get this enhanced experience that is completely computer generated. So in one nine hundred sixty eight Sutherland and a student named Danny Cohen would create A.V.R. a our head mounted display or H.N.D. and they nicknamed it the sword of Damocles. Why because you had to suspend it from the ceiling it was too heavy to wear on your head you needed it to be nice and sturdy. It included transparent lenses which meant you could overlay computer information on the lenses themselves and thus you could look through the lenses at the real world and have these wire frame graphics on top of what you were looking at and it also had a magnetic tracking system meaning that it had sensors that could detect magnetic fields and as you turned your head or you change the inclination of your head it would change the magnetic field and this would be relayed as a command to the visual center the the actual lenses themselves so that it would the change would be reflected in what you saw So you have a virtual environment and you turn your head to the left you want the view within the virtual environment to go to the left too but without head tracking technology that's impossible so this was a very early example of head tracking technology and again it used magnets magnetic fields in order to do that. Obviously it's also really important for augmented reality again if the A Our system doesn't detect that you are low. Going around then you're not getting relevant information not for the specific thing you are looking at anyway. As I said the graphics were pretty primitive there wireframe drawings but they still showed that this was a viable approach to technology using a gym D. for augmented or virtual reality Use Oh and one other note I should make so a lot of people say the sort of Damocles was the first head

mounted display and they say you know this the first H M D was made in one thousand nine hundred sixty eight I take issue with that I don't think of the sort of Damocles as the first head mounted display that to me should go to a different invention called the **head site** H E A D S I E G H T Now that was developed by Philco and unlike the sort of Damocles it didn't create a virtual world instead the head site was sort of a remote view finder for a video camera so imagine that you've got a camera mounted on a mechanical swiveling mount so you can move it left right you can change the orientation the inclination as well and then you have that mapped to a head mounted display so that if I put the display on and I look to the left the camera pans to the left if I look to the right it pans to the right that sort of thing. It was meant to be a way for for people to operate a camera in a remote location that might not be very friendly to a human being standing there for example the exterior of an aircraft you could have a camera mounted on the outside of your aircraft that would allow an engineer on the inside to look around and maybe help a pilot land or navigate in a dangerous situation or just get an idea of the status of the aircraft itself. This was very much a technology that was being pushed by the military an idea to create more military uses using this technology to make the military more competent more adept at very rapid changing situations on the technology front. So head site **preceded the sort of Damocles by about seven years** that came out around one thousand nine hundred sixty one but again it wasn't a virtual reality headset or a dog method reality headset it was kind of like you said a remote view finder but still I consider that to be the earliest head mounted display not the sort of Damocles However Sutherland would end up going on to make lots of other contributions in computer graphics as well as the overall concepts that would guide both virtual reality and augmented reality development over the next several decades. But now it will be time for me to kind of move away from Sutherland and talk about some other developments that were important in a R. and before I get to that let's take a quick break to thank our sponsor. Hello I am Tracy V. Wilson I co-host the stuff you missed in history class podcast with my friend and colleague Holly fry we tell stories that are a little less often covered in your typical history class whether they are lesser known figures in history or the lesser known parts of more historically famous people's lives recently we have talked about after a band who was a writer and a spy and she was much better at one of those things than the other we also talked about could allude to he was among goalie in princess and a wrestler you can find our show on Apple podcasts Google Play Spotify and wherever else you listen to part. All right just left off of the I. Even Sutherland Now let's talk about a different father of augmented reality Myron Krueger or **Dr Myron Krueger** in **one nine hundred seventy four** Dr Krueger created an augmented reality lab called **Video place**. He was really into this idea of seeing the interaction of technology in people in artistic ways he really wanted to explore artistic expressions using technology and people working together. So he wanted to create an artificial reality environment that didn't require the user to wear special equipment you **wouldn't** have to put on a **head mounted display** or **wear special gloves** or use any kind of device to control your actions **because that's a barrier between you and the experience** instead his version consisted of a laboratory that had several rooms all networked together and each room had a video camera in it and a projector and a screen now the video camera would pick up the motions of the person inside the room it would send information to the projector which would then project the person's silhouette on the screen and the silhouette was typically a really bright color and you good move around in your silhouette would move around so you almost became like a puppet master controlling your own silhouette but then he started doing corporate other things like other **elements that were virtually on the screen** the projector was projecting things that were on the screen but not in the actual real room itself so imagine a ball and a ball is being projected on the screen where you could move around so that **your silhouette would interact with the ball in the ball would bounce away** that sort of thing so you would be able to interact with virtual environments by moving around in a real physical space and while those objects were. Really there in front of you you could see the representation of them on the screen and this was really powerful stuff and remember I said these rooms are all networked together so you could actually have a system where a **person in one room and a person another room both have their silhouettes projected together in their respective rooms on the screen**

and your silhouette would be one color the other person silhouette would be a different color and you could interact with one another and according to reports from this art experiment they noticed that whenever people would have their silhouettes cross one another they would actually recall while in their physical rooms keep in mind they're in different rooms they're not in the same one together they would recall as if they had made physical contact or bumped into someone so it shows that there was a very powerful psychological element to this virtual presence and again that psychological element plays a huge important role in V.A.R. and our research and development not just for creating products but just to understand how we process information and incorporate it into our sense of reality. Not to get too deep for you you guys so experimentation in the field continue to over the years in the early one nine hundred eighty S. Dr Kruger would write a book and publish it about artificial realities but while the principles for augmented reality were established the technologies were still rather unwieldy they were large they weren't reliable and it would require several years of work to improve those technologies to create majorization strategies to get the elements down to a size that was more practical for that sort of use and what require you to have a head mounted display mounted to the ceiling. And all of that took time but you could tell that the ideas underlying argument and virtual reality were already in place. One thousand nine hundred ninety there was a Boeing researcher named Tom called L. who coined the term augmented reality and he was specifically using it to talk about this approach to overlaying digital information on top of our physical world to enhance it in some way. And now Dr Cabell earned a Ph D. in physics and astronomy from the University of Arizona and before contributing the term augmented reality to the public lexicon he did extensive work and artificial intelligence research and development he also became a professor in the fields of Electrical and Computer Engineering at the University of New Mexico. So when he was working with Boeing he used this phrase to talk about specific system he was working on an augmented reality system and the whole purpose of this was to help people who were helping construct airplanes lay cables properly the whole idea was to use the system so that. An electrician can see exactly where the cable needed to go inside the partly constructed cabin of an aircraft and that way you could follow the directions that you see through your display lay the actual cable down where the guide tells you to go and then you would have a properly wired airplane. And I'm sure as we're all aware properly wired airplanes are good airplanes improperly wired airplanes are not so good so it's very important system to make this much more smooth and fast and it meant that you didn't have to have as many experts to guide the process you could actually have someone come in who had never done this before and just follow the directions through this augmented reality set system and they could wire the airplane properly. So really clever means of using on materiality Also we would end up seeing that same sort of philosophy used again and again in the future in more sophisticated. Types of technology but was the exact same approach exact same idea underlying it. In one thousand nine hundred two Louis Rosenberg proposed a system that the Air Force could use to allow someone to control devices from a remote location and that consisted of a video camera which would provide the visual data to the user through a head mounted display they would wear the display on their heads or they would look at a screen but typically they'd wear display and then they would also wear an exoskeleton on their upper body that would allow them to control some sort of robotic device typically robotic arms and usually the way this would work is that the display was designed in such a way with a video camera so that the view that the person had it made it look like the robot arms were their actual arms which required a little bit of trickery on the part of Rosenberg they had to fudge the distances between the video camera and the robotic arms to give this this sort of feeling that the robot arms represented your actual arms so you move your arms inside the exoskeleton the robot arms would move as well at their remote location so you've got like a really fancy remote control. Now imagine that the robot arms are holding various tools the suit would also provide haptic feedback that touch based feedback to let a user know more about was going on when they're operating the arms so if you were to. Do something that would make a robot arm encounter resistance then you would feel have to feed back in the suit that would indicate oh you're going beyond the parameters of where this robot arm is capable of going. So you

learn very quickly where you can operate within that suit and make sure that you are not pushing it beyond its limits you could also. End up using these tools to do various things in this remote environment now Rosenberg called his system virtual fixtures which meant that the user would see these virtual overlays on top of a real environment that they were looking at so I'm going to give a very basic example that is to illustrate this because it's hard to imagine it's hard to get it across in words but let's say you're looking through a head mounted display and in front of you is a board wooden board and there's just a regular wooden board there's nothing painted on it or anything in the real world and it's in a room that's across the building from you you cannot see this with your own eyes you can only see it through the video camera. The virtual fixture overlay might be a series of circles and the circles are things that you are meant to cut out of the board using the robot arms and a tool that's right there inside the physical environment across the building from you so you follow the patterns that you see in this virtual overlay and you complete the task that's a very simple example and this system was meant to allow for that that's what he would call the virtual fixtures these overlays that you would see that would appear to be real but actually were not present in the physical environment itself. Now also in one thousand nine hundred two a group of researchers at Columbia University were proposing a system that they called the knowledge based augmented reality for maintenance assistance aka karma. Cute their approach was pretty novel they pointed out that while augmented reality had tremendous potential It also had a really big barrier and that it takes an and Norma's amount of time. I mean to design or animate an implement these graphic overlays for a our application so let's say you're in a room and you're looking at different objects and little labels are popping up for each object if you're having to do all that by hand takes a huge amount of time what they wanted to do was create artificial intelligence systems or at least techniques to generate graphics automatically on the fly so this would be similar to using image recognition software so that if you look at a specific box let's say the image recognition software might be able to map that box to a specific product and thus give you an overlay of information about the product that would be inside that box and would be able to do all this automatically it would not require a human programmer to go through and and look at every single product in every single type of box and program all that out that would be ridiculous it would take forever so it was the work of this group with karma that really started the ball rolling with this AI approach to automatically fill in that information and make a are a more practical experience. Around the same time between ninety two and ninety three the Loral Western Development Labs which was a defense contractor began to work with the U.S. military to create a our systems for military vehicles and you can understand very quickly how they are would have enormous potential for military applications and in fact they are is very commonly used in lots of different things like pilot helmets where it helps pilots keep track of targets and identify potential threats that kind of thing but and this case they were really looking at creating a augmented reality system that would create virtual opponents for people working in simulated war time could. Shin's So really a training program imagine that you're operating an actual military vehicle like a tank and you have a view outside those really an augmented reality system so you're actually looking at the real world around you you aren't just sitting in a simulator inside a building you are out there in the field controlling a real vehicle moving around in real terrain but you also see virtual representations of enemies in that real terrain and you can practice maneuvers and firing on enemies that sort of thing probably not using live ammunition at that point but having a more realistic simulation in a real environment so that you're not just trying to create a totally virtual scenario. Anyway that work was done in ninety two and ninety three the world wouldn't really learn about it at large until about ninety nine because that's the way the military works they're not so eager to talk about their stuff while are still doing it. Meanwhile had the same time artists were continuing to explore the relationships between physical performers and virtual elements you remember I talked about Dr Kruger earlier well in one thousand nine hundred four a different artist Julie Martin would create a piece called Dancing in cyberspace and in that piece dancers on a physical space or a physical stage were able to manipulate virtual objects so an audience would be able to see both the physical performance by the dancers and the virtual

reactions the things that happen within the virtual environment as a result of the dancers moving around their physical space pretty neat and one thousand nine hundred five two researchers Recchi moto and the Gallo created their their first real head held a R display but it was a tether display it wasn't free form you could just take it anywhere it was called navy cam and you had to have a tether cable essentially connect the navy cam to a workstation. But it had a forward facing camera and you could use a video feed to go through this hand-held device through the cable to the workstation and it could detect color coded markers in the camera image and display information on a video see through views so you could get that augmented reality experience obviously very limited you know you could not just carry this around with you everywhere you go but it shows the ideas behind augmented reality could in fact be realized in a handheld format now it's just a matter of getting those different components small enough to all fit in a self-contained mobile form factor. Now in the late ninety's we started seeing televised sporting events featuring augmented reality elements or at least you did I don't watch sports ball. That's not entirely true but don't watch football or hockey American football or hockey and both of those were the sports that really got them first off I'm going to back track I used to watch hockey but then when I peg stole the Atlanta Thrashers from me. Oh and I pegged. OK getting back to hockey so **Hockey had the fox track system which Fox put into hockey games so that you could easily follow the puck instead of trying to watch as little bitty black disc spinning around you got to watch this very bright highlighted Nealon colored disc** that everyone to have a good and after about two seasons Fox stopped doing it and people were happy until it thrashed moved away and then it was just miserable American football would follow suit in the late nineties and have the first down line introduced where they did on live video overlay the first down line usually it's a bright yellow line that indicates how far the offensive team needs to go and by offensive I mean they're on the offense. I don't mean they offend my sensibilities I'm not that against American football but showed how far they would need to go in order to establish a first down which I am told is something you want to do. That would start to get employed in one nine hundred ninety eight and over time we would see that increase where eventually skycam was able to even use the system at first it wasn't you could get a skycam view but it couldn't do the overlay of the first ten line. Until later. Well got a lot more to say about augmented reality but before I do let's take another quick break to thank our sponsor. I am Scott and I'm bent and we're from car stuff we're the podcast that covers everything that floats flies swims or drives adventures thrills and chills literally Planes Trains and Automobiles That's right and you can find all of our episodes on Google Play Spotify i Tunes and really anywhere else you get your parking. OK we're back let's skip ahead to the one nine hundred ninety nine I guess is not really skipping I just thought about one thousand nine hundred eight let's plot ahead to ninety ninety nine that's when NASA says X. thirty eight spacecraft was using an A R system as part of its navigational tools so people back on Earth could look at a view from the spacecraft a camera mounted on the spacecraft and on top of that view they could overlay map data to help with navigation and all that of course was controlled back here on earth but it was sort of an experiment to see how augmented reality could be incorporated into space exploration missions in the future and make them more effective also in one thousand nine hundred nine the Navy began work on the battlefield augmented reality system or bars. Which is a wearable a our system for soldiers you've probably seen various implementations of this over the years as obviously evolved since one nine hundred ninety nine it's one of those pieces of technology that **some soldiers took to but a lot just felt that it created unnecessary distractions technology and warfare is very very difficult because there's sometimes where we think oh more information is always better but in some cases that doesn't seem to hold true** and for some people with these head mounted displays or really it's you heads up displays hoods that can sometimes be the case depends on the implementation. In two thousand hitter cuts to Kut-O. created a software library called a our toolkit a very important software library was also open source so anyone could contribute to it modify it Brett put out a new version that sort of stuff and it uses video tracking to overlay computer graphics on a video camera feed and it's still a component for a lot of our experiences today later on in the two thousands this would be adapted so that it could also be used in web experiences not just

Native experiences to specific devices. And we continue to see a are built into new experiences including smartphones and tablets by two thousand and four some researchers in Germany were creating a R apps that could take advantage of a smartphones camera but two thousand and four is pretty early for smartphones it really would would be a few years before this would truly take off because that's when Apple came out with the i Phone in two thousand and seven that was the real revolution in smartphone technology there had been smartphones before the i Phone Don't get me wrong and many of them are really good but the i Phone was something that. The public's attention and made smartphone sexy and because of that there was a ton of money poured into the smartphone industry as well as not just to Apple but also to other companies like companies that are offering Android smartphones but I think we can really thank Apple for all of that happening in the first place especially things like seeing that accelerometer where you could switch from portrait to landscape mode I remember everyone freaking out about that when Steve Jobs showed it off in two thousand and seven at Macworld and everyone thought well this is the this is amazing what we take it for granted now but it was a big deal then. So once that smartphone revolution happened it was a landslide victory for both augmented reality and virtual reality research and development because it meant that so much money was being poured into creating newer thinner more capable smartphones then we saw an explosion in technological development that could also be used for virtual an augmented reality experiences so for example think of those sensors I talked about earlier accelerometers and gyroscopes that sort of thing well we saw a lot of development in those spaces in order to make smartphones better and people who are working in a R. and B. are experiences can take advantage of those same since are either creating apps specifically for smartphones Thus you don't have to build any other hardware you just use existing hardware but that limits how you can use it right because you don't typically wear your smartphone directly in front of your face. Or they did in up taking advantage of those new smaller sensors and incorporate them directly into brand new hardware like various types of wearables like Google Glass for example there be a few more years. And two thousand and eleven Nintendo launched the Nintendo three D.S. which included a camera it was you know the for. Three D. capable handheld device and included actually a pair of forward facing cameras so you could take three D. photos if you wanted to and it also had some A Our software included with it you would get these special Nintendo cards like playing cards and if you were to point the camera of the three D.S. at the card and look at the screen you would see a little virtual three dimensional character pop up on the card so Mario would be an obvious example you put the Mario card down on the table you hold up the three D.S. and you aim the camera at the card and you look at the screen and there's Mario and Mario appears to be jumping around on your physical table now obviously if you look off of the display there's no Mario jumping around but on the display there is this news pretty cute I remember being really impressed with this very simple implementation of a R When we got our three D.S. and then I took our three D.S. apart. And then I took pictures of it. And then I posted on Twitter and people got sad it's a great day in two thousand and thirteen Google introduced Google Glass that was the wearable that included a small display position just above the right eye. When you look straight forward you could tell that there was something kind of above your natural eye line but it didn't get in the way too much you look at the screen you actually had a glimpse you know the glance upward and then you could see what was on the display. Google Glass and had augmented reality features like crazy you could see video calls you could actually use the the glasses to not just take a video call but show the other person what you are looking at so they could see from your point. View you could also overlay directions if you're walking down the street you could glance up at the screen and it would tell you if you need to keep going straight or turn left or turn right that kind of thing is really useful I had a pair of these Google Glass and I really liked the direction they were going in I felt that it wasn't a fully realized product at the time and eventually Google agreed and after a couple years they took Google Glass off the market entirely and now you can't get them anymore. They were clever but they were expensive and they had some limitations and like I was saying earlier you know it's hard to build all the components you need into one headset so Google Glass would communicate via Bluetooth to your smartphone

and your smartphone would act as the actual nexus point to the Internet but it was a neat idea. And I enjoyed getting to use them while I did so I keep hoping to see a return of that kind of technology but perhaps in a more mature and less expensive format. Now we've also seen applications similar to the ones we mentioned earlier the ones that are meant to guide people into laying out or repairing a system we've seen that in the car world not too long ago there was the MARTA system introduced by Volkswagen. Marta makes me chuckle because that's also the name of Atlanta's public transportation system but in this case it stands for mobile augmented reality technical assistance and it's specifically designed for mechanics who are working on the X L one vehicle so if you hold up an i Pad that has this app on it and the cameras pointed at an X L one and you look at the display you'll see information overlaid on top of the car including labels for all the different parts so let's say you're a mechanic and you have to do a specific repair on this vehicle you hold up the i Pad. You look through the display and you see exactly what you need to do it gives you a set of disk instructions that shows you how you need to do it tells you where you need to stand based upon the angle of the view so if you hold it up and says no you need to move about a foot to the right you can do that then hold up the i Pad Again else are you in the right spot make sure you loosen this particular bolt first that kind of thing and it's meant to be an interactive maintenance guide in a way maintenance and repair guide this is one of those applications of augmented reality I think is a no brainer to me it's a killer app the idea of having an ability to. Work with something you are not one hundred percent familiar with but you're able to leverage the expertise of people who either designed it or built it or just fully understand it and get guidance based on their expertise in real time so you're not having to go and consult a. An article about it or watch a youtube video you get step by step instructions overlaid on top of your view of that thing to me that's the most compelling use of augmented reality from a practical standpoint there are a lot of other uses they'll talk about toward the end that I think are also really super cool so don't get me wrong it's not the only one. But let's move on to two thousand and fifteen that was when Microsoft would unveil the hollow lens something I still want to try out I have not had a chance to try Hollands yet that is a headset capable of advanced A Our applications everything from what I was just talking about giving you guidance step by step instructions on how to do like a repair job on say an electrical outlet you can even use a Skype system to call an expert who can then view your point of view and interact with that point of view so let's say. I'm looking at the outlet the expert electrician I'm talking to can see what I see and he or she can also make notes on the display which shows up in my field of view so he or she might circle a specific wire and say you need to you need to remove that one first and I know I need to do that one first because I can see which one they're talking about or they might circle another wired say no matter why you do or don't cut this wire or the toilet upstairs will explode. Like Lethal Weapon two. And I won't do that because you know that guy's like three days from retirement so I. Have a hard but no this is a really neat idea having this interactive ability to overlay the information from the world the digital world on to your physical world and beyond that the Hollands has lots of other functions not just something to do you know home repairs around the house you can also use it for entertainment purposes like you could create a screen that can show you video from various sources and you can assign it a place on a wall in your environment but say that you're in your living room and you just create a screen so you can watch Netflix and you slap it on a wall and it will stay in that same position relative to your point of view so if you look to the left or right the screen stays where you put it as if it were physically there on your wall but keep in mind it's just a virtual screen and when you look back to that part of your wall you'll see the virtual screen there playing whatever it was that you wanted to watch. I think that's a super cool idea and they've also shown off games like a game in mind craft that uses Hollins so you can actually view a Minecraft world sitting appearing to sit at any rate on. Up of a table to and walk around the table and view the minecraft world from various angles and play that way I think that's super neat don't know how compelling it is because again I haven't tried it myself but I really like the idea. This year two thousand and sixteen A R got another big boost from a little game called pokémon go although I have to admit this was a really primitive basic implementation of augmented reality really it was not much more than just a in fact it

was nothing more than just an animated overlay that would exist on top of the camera view of your of your device so I'd say I'm holding up my smartphone and I'm trying to catch a jiggly puff and the jiggly puff is currently bouncing up and down on the sidewalk in front of me that's about as far as the augmented reality actual experience would go so very primitive but because Polk a month ago became so popular so quickly it really pushed the concept of A R to the front of the minds of people everywhere including business owners who immediately said we need an augmented reality app whether they actually needed one or not is beside the point a lot of people got into a are because of pokémon go for both good and bad I always think that you have to come up with the experience First you have to understand why you need to use a specific strategy to create a specific experience and then build it not hey we need better reality make something that's a R. To me that's the backwards way of going about it but what do I know not a programmer so I'm sure the programmers feel in a similar way to to me but that's just a guess. Now the future of A are depends heavily upon the applications we see and which ones end up being successful and which ones aren't. Right now I would say that the best bet is to see more of a our features built into smartphones and tablets. Not maybe not necessarily built into them but have apps available that create our experiences for very specific contexts like let's say it's a museum app you might download a museum app on your phone and when you go to the museum and you use your phone you can get more information about the paintings and sculptures and other installations that you see in a museum that's an easy one to understand but that same app is it going to be useful once you leave the museum you no longer have the context that it is tied to I think that smartphones are probably going to be where the greatest development is going to be in the near term because wearables a still really hard to do we start having a consumer version of the Hollands out available for anyone to purchase and it may never come out as a consumer product Microsoft hasn't shown a whole lot of interest in making it a consumer product maybe that will change but at the moment I wouldn't hold my breath so I would argue smartphones and tablets are pretty much where it's at maybe some implementation with some existing headsets which have external cameras mounted on them as well like forward facing cameras you could build a our experience is there then it gets a little weird because you're also you know you're looking at a monitor looking at a video feed of your surroundings and on top of the video feed you get the overlay same thing is true for your smartphones and tablets by the way but different that from the Google Glass a bill mentation where you're looking at the actual physical world not a video representation of it but the real world and then because the display itself that you are looking through is transparent you're looking at a transparent overlay of digital information that gives you more info about the world you are in. I think they are super cool I think it's really got a lot of potential to change. The world around us and to change the way we interact with the world around us you could imagine a dystopian future implementation of a are where we all have to wear glasses and we're constantly getting personalized commercials beamed at us whenever we look at anything like Imagine walking past a store casually looking in the window and then getting a whole bunch of ads for all the stuff that's in the store window that would be obnoxious and it's easy to understand how people would not want that yet also easy to understand how that could possibly become a future or think of the future where your privacy is no longer even relevant and you walk down the street and you look at all the people's faces who are also walking on the street and you're getting names of everybody and what they like and what they dislike what music they tend to listen to maybe what they're listening to right now and it's all because we've got facial recognition technology almost everyone has some sort of social media presence so you could map that face to any public profiles trying to find a match if you found a match you could bring back information to the person wearing the glasses so I can look at somebody and say oh no this is this cute kid over here she's got she likes punk rock music I'm going to I'm going to impress or with my knowledge of the cramps. That probably wouldn't work but the point being that it's pretty creepy and invasive and so there are some negative implementations of a are that we have to watch out for. Unless we get to a point where we just don't care about privacy at all anymore some would argue we're already there and in that case this implementation of a OUR may not sound creepy at all it might just sound kind

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of cool kind of the equivalent of walking into a store seeing a person with a name tag and addressing them by name if they don't remember they have a name tag on they have this moment where the who they think do I know you were in a world where everyone can see everyone's name all the time then welfare. I think I won't ever have to worry about coming at a loss when I have to introduce my wife to someone so that's a that's a plus side OK I'm in favor of it now all right well that kind of wraps up this deep dive on augmented reality there's so many different other things I could have mentioned there's so much more to the history and development of it and all the pieces of technology but this is one of those strategies that arose because so many other elements had maturity over a great deal of time if you guys have any suggestions for future episodes of tech stuff whether it's a specific kind of technology or how technology has affected us or how we affect tech Maybe it's a specific company or person in technology or you just have a suggestion for somebody I should have on the show either as a guest co-host or someone I should interview let me know send me a message the email to send it to is tech stuff at How Stuff Works dot com or drop me a line on social media you can find me on Twitter or on Facebook with the handle tech stuff H S W And I'll talk to you guys again really soon. For more on this and thousands of other topics there's a how stuff works out com. Progressive brings you Floetry with flow when closed she flows in the known mind through many of the rates shown them all I heed the call scene the rest I choose. Some tunes it's sometimes it's not when the box walks is a common Fox Trot that's a real question compare progressive direction rates with competitors rates is a progressive dot com progressive casualty insurance company affiliates comparison rates not available in all states or situations prices vary based on how you buy.