Augmented Reality:
The Best of Both Worlds

Augmented reality (AR) has fallen out of the public's favor somewhat in the wake of Google Glass, but don't let the fickle tastes of the tech media throw you off. It's going to be huge. Why? Because a lot of technologies promise smarter living, but AR can actually deliver a inspired way of life that is truly smarter.

By Jason Patterson

Reality? How do I tweet that?

There's a problem with the modern lifestyle. The real world is no longer holding our attention like it once did. Screens keep getting in the way, often for no particular reason, and the trend is worsening. According to Tecmark, the average smartphone is checked by its user over 200 times per day, with 40% of those surveyed admitting to checking email reflexively (without conscious awareness), and 66% admitting the same for Facebook. Two-hundred glances per day is one glance every five waking minutes, so plenty of those glances surely qualify as interruption of things that we should be doing, a condition well correlated with increased irritability, decreased productivity, poorer learning/memory, and many other forms of general unpleasantness.

Tech authority Don Tapscott, Stanford Professor Byron Reeves, and others insist that digital natives are better at switching between tasks (and thus handling interruptions) than previous generations, and maybe they're right. But
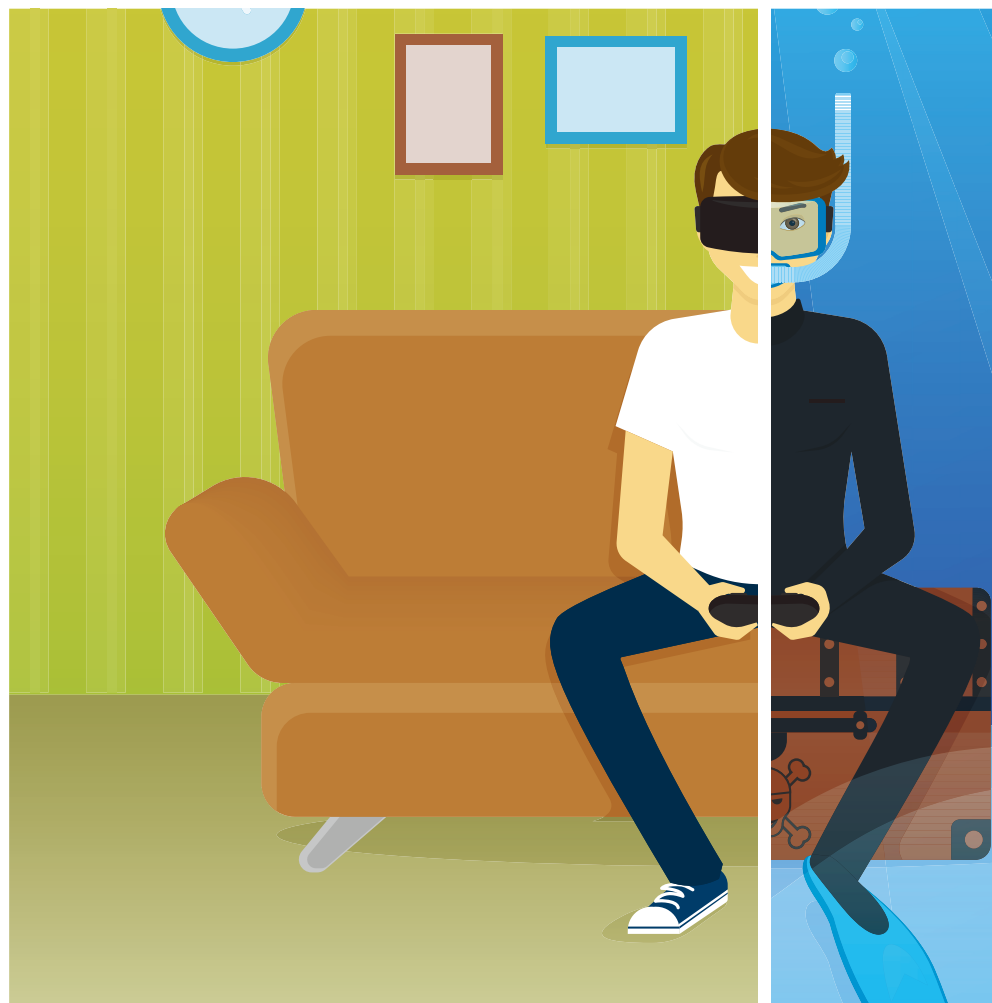
About José Alvarez

José Roberto Alvarez is Director of Strategy & Planning at Futurewei Technologies where he concentrates on media tech for global Huawei R&D. He has been involved in architecting, designing and implementing media tech products for a variety of industries including broadcast, consumer, post-production and computer graphics for companies including Philips, Broadcom, Maxim, Xilinx, and three successful start-ups in Silicon Valley, actively participating in development of H.264, MPEG-4, MPEG-2 HDTV, desktop video graphics, time-shifting DVR, and extensible processing FPGA platforms. His work has been granted 42 U.S. and 6 EU patents.
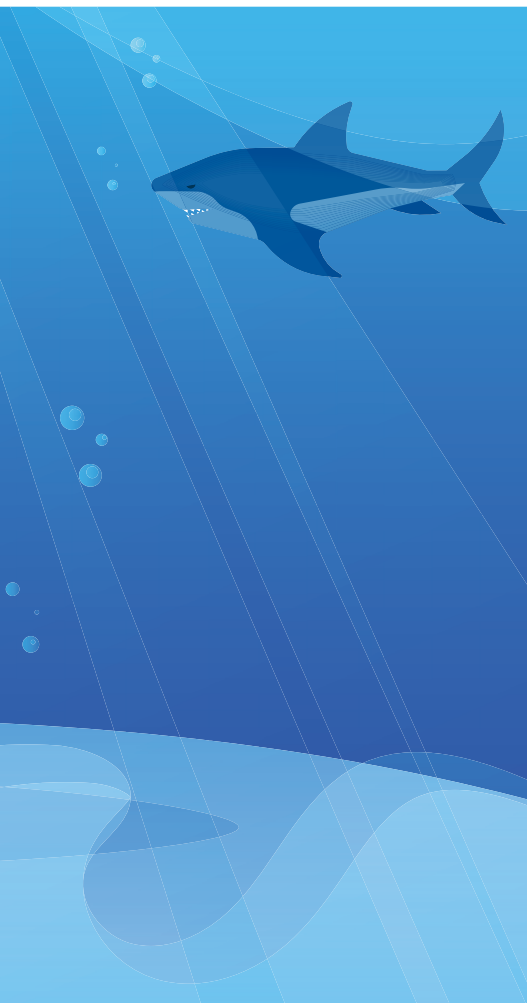
even if they are, digital natives often don't so much switch between tasks as they do "carry out real-world tasks with one hand while using their phone with the other," and no respectable psychologist on the planet would claim that the human mind has evolved to the point where we can carry out two conscious tasks at the same time without both detracting from the other, and this human limitation is not likely to change in the foreseeable future.

Can we give up our screens? Unlikely. Can tech provide an answer? Yes. Right now the problem is that the real world and the virtual world are mutually exclusive in terms of the human attention span, with each side competing with the other. The answer is to make them work together, and the best hope for that, at present, is AR.

Virtual enhancements, real ambitions

The term "augmented reality" dates back to 1990, but it entered the general lexicon in 2013 on a wave of hype for Google Glass. This is ironic because experts say that Google Glass (at least in its original iteration) doesn't even qualify as true AR. According to José Alvarez, Head of Strategy for Huawei Media Lab, Glass is more like addition to reality than augmentation, since text and very simple graphics are overlaid in the eye's peripheral vision. And indeed, text is more likely to be a distraction from what we should be looking at than other forms of overlay such as directional arrows, contextual objects or sound cues, so this point of views bears up.
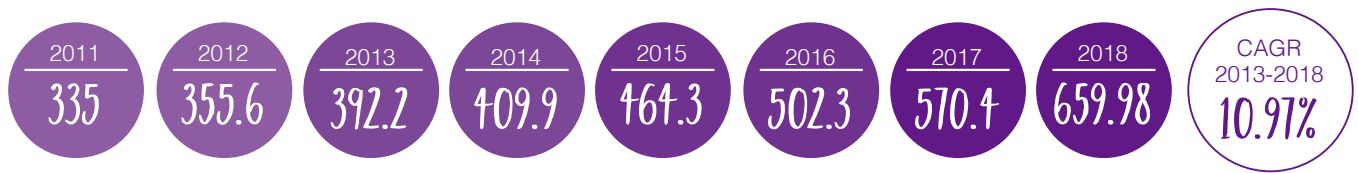
So what is augmented reality, exactly? It is a virtual overlay upon the real world, in a way that enhances the latter. This is an important definition to keep in mind, as AR is as much an effect as a cause. In fact, the form factor is entirely irrelevant, as AR can be achieved via headset (such as Microsoft's HoloLens), smartphone/tablet (the screen displays the rear camera's image with arrows or other forms of visual directions overlaying the image), or other means (a 2D map with a 3D holographic overlay would qualify).

Hurdles to AR

Before getting into AR's applications, it's probably best to consider for a moment where it applies. When Google

AR Dedicated Device Revenue (USD millions)*

2011	2012	2013	2014	2015	2016	2017	2018	CAGR 2013-2018
335	355.6	392.2	409.9	464.3	502.3	570.4	659.98	10.97%

Glass arrived, regardless of whether or not it qualifies as true AR, it was sold as a prosumer item, a lifestyle accessory, with people encouraged to take it out into public spaces as they went about their daily lives. They ran into two hurdles with this approach.

One was social, or ethical, or both (depending on your point of view). A lot of folks didn't react well to Glass's ability to take photos anonymously. But the fundamental issue actually ran deeper. According to Byron Reeves, Google Glass creates an asymmetric social relationship with those around you. You don't really know what the other person is really paying attention to, or thinking, or perhaps doing. Though in truth, we're often in that situation (no one really knows what someone else is thinking), but the truth often doesn't matter in social situations. According to Reeves, perception has a strong effect on how quickly technology is adopted.

The other reason why Glass probably wasn't quite ready for full-time work was technical. Battery life and phone dependence were among the issues specifically with Glass, but the truth is that augmented reality depends on numerous technologies that aren't quite mature. There's the matter of control, for one. In standard headset form, AR can only be controlled via voice or gesture – but neither technology is anywhere near consumer-grade reliable. There's also the matter of computer vision, as an AR headset depends on cameras being able to take-in and measure what's happening in the real world so that virtual information can be accurately laid onto

it. And this is easier said than done.

According to José Alvarez of Huawei Media Lab, "One of the challenges today with augmented reality is computational power. The computer vision algorithms that are necessary for us to understand things, to be able to track objects precisely are very computationally intensive. And today, unless we have powerful semiconductors, they are very difficult to create in mobile devices at very low power utilization levels." There are other user-end challenges as well; a whole document could be devoted just to that.

And then there's the matter of the network that has to take in real-world data, identify and precisely measure objects within it, and feedback virtual information onto those same objects. According to Alvarez, "Augmented reality poses very serious network challenges. Tremendous bandwidth is needed to be able to capture reality and then superimpose virtual objects on top of that reality. Tracking means that I need to analyze the image, perhaps, over the network, perform a computationally-intensive process, and then relay it back to this display. That is latency. That latency has to be on the order of much less than 100 milliseconds. Today, we are not approaching that. It's one of our biggest challenges in the network."

Add all these challenges together, and AR seems less and less like a daily companion, at least for the near future, and more like a specialized tool for discrete applications that are confined to largely non-public areas where network coverage & capacity can be guaranteed.

A guide that you wear

Augmented reality is probably most suitable (at present) to applications that benefit from some form of guidance. According to Alvarez, "One of the current very useful applications for augmented reality is in automotive. You may be driving your car and asking for directions, and the directions are automatically overlaid on your windshield. So no longer do you have to take your attention from the road. You can continue to drive and have directions, directions that actually make sense, that are tailored to you. Perhaps you are going to a friend, and the name of your friend's house is actually superimposed on the view that you see of the road. And that is completely possible today."

Another early application Alvarez envisions is tourism. "You go to a new city. And you point your mobile device to a building and the building happens to be a hotel. And all of a sudden, it tells you the price of the room. And you can book the room, exactly from the view of your mobile device. Very possible today."

Another area where augmented guidance could be a big help is remote tasking. According to Huawei Media Lab, a young doctor might carry out a complex surgery onsite while a cloud AI or senior doctor monitors from afar, or a junior technician might carry out remote repairwork while a senior tech monitors from the office. There are a million and one other remote training/guidance

applications that could be added here.

When asked to look ahead, Alvarez envisions, "Perhaps, contact lenses that are able to capture reality as sensors do today and are able to superimpose virtual objects completely transparently. So we wouldn't notice what is really reality, and what is really augmented reality. We will take it for granted the fact that I can look at any scene or any place and I will have information about that place or that person completely at my fingertips, automatically generated because my habits are already understood by the device. It would know that I like certain things. It would prefer to prompt me about the things that I like, perhaps a restaurant that is my favorite, or my favorite type of food, just by looking down the street. That's going be very enhancing to our lives."

Free your mind

Will augmented reality be big? You bet. In fact, the business applications of AR make many believe that its market will be greater than that for VR (which is considered more of a consumer tech) in the short-term. MarketsandMarkets splits the middle somewhat, as they anticipate dedicated AR device shipments outnumbering those for VR by nearly ten to one in 2018 (totaling roughly five million units for the former), though revenue from said devices should tilt towards VR by three to one. Time will tell, but intuitively there probably is a greater need for a tool that helps us do real-world tasks better (and help minimize some of that aforementioned smartphone glancing) than there is for tools that create artificial worlds.

But when it comes to AR, Alvarez thinks we should think bigger, literally. "AR will enhance our cognitive capabilities. It will help us be better human beings, because we will have capabilities that we didn't have before. If you look at search, 20 years ago, you wouldn't have believed that you could have the information of the world at your fingertips. Today, we take that for granted. We take search engines for granted. We always go there, in fact, as our first step online. So in the future with augmented reality, we would have exactly the same experience that we have now with search in the sense that we will feel empowered. We will feel that our cognitive capabilities have been improved. No longer will we go to a new place not knowing where to turn. No longer will we go to a party thinking, 'I've seen this person before. I wonder what his name is.' No longer will we need to worry about those things. And those things will be empowering, by freeing us into doing more things with our lives." **WIN**

AR Dedicated Device Revenue 2018 (USD millions)*

Wearable
337.4M USD

+

Spatial AR
322.6M USD

=

Total
660M USD

AR: Eyes on the prize

With augmented reality, the relevant digital information is right there in front of you, so you don't have to interrupt what you're doing by whipping out your phone. Combined with sensors that can detect your location, activity and social situation (out with friends, family, or coworkers), and contextual intelligence software that can predict your likely intention and information needs from past behaviors, you may never have to "look away" again, because anything you might need to know will be displayed before you even think of searching for it. How's that for a Better Connected World?