As a veteran of virtual reality, I find myself tremendously enjoying the resurgence of VR through the frenzy of new companies and new technologies that keep emerging left and right, the excitement of the press covering every effort, and the increasing number of students who are requesting to join my research program.

It is very clear that this time around, virtual reality is here to stay and, hopefully, to stay for good. As a difference from what I call the “first wave” of VR in the late ’80s and early ’90s, when virtual reality was a luxury of a few well-funded research labs and highly knowledgeable computer scientists and artists, today’s virtual reality has emerged driven by the consumer market, in particular the gaming and entertainment industries. As such, it is becoming available to pretty much anyone, and with a rapidly growing choice of applications for anything we can imagine.
As much as I am enjoying VR’s resurgence, I find myself at times frustrated. This is mostly due to the belief of the current generation of VR inventors, developers, and users who are “discovering and inventing” VR right now. They have little knowledge that VR has been around for over 30 years with many successful developments. For example, people look at me in disbelief when I mention the fact that pretty much any brand of car we drive today uses VR at different stages of the product development cycle. Whether it is for engineering design reviews, manufacturing planning, or driver analysis, most car manufacturers have been using VR for years and years.

The same holds true in the oil and gas industry and several other markets. Many incredibly talented researchers and practitioners have been working since the mid-1960s on defining what we know today about VR.

STEPPING BACK

Let me share a little bit of what VR was like at the beginning. Those of us who rode that first wave know how challenging (and expensive) it was to create VR applications. We had to have expertise in both hardware and software development, as we were creating the first VR technologies at the same time we were creating the first VR applications. We had to be ingenious, creative, and resourceful, and we were driven by a strong passion, commitment, and perseverance, all because we believed that VR would be the way of the future.

We were living the pioneering days of VR in which almost every day was one of wonder and discovery. I will never forget the many, long, sleepless nights, weekends, and holidays I spent in the lab while designing and building the first CAVE. I was doing clustered VR before PCs even existed. I was developing new hardware that enabled me to display synchronized stereoscopic images (the foundation of what now is found by default in most graphics cards). I was building fiber-optic network drivers so I could optimize the communication among the nodes in the cluster driving the CAVE (which now are standard drivers in almost every OS). I was developing low-level C++ libraries to help others use the CAVE (which now are bundled as much simpler SDKs).

At the same time, I and many others were also learning the impact that this technology had on end users through a wide range of experiments to quantify the performance parameters of the integrated VR systems required to provide a compelling, as well as safe, VR experience for the user. It is hard to describe the sense of fulfillment I had when the CAVE was shown for the first time in 1992. Thousands of people came to the exhibit, waiting over four hours in line for less than five minutes of experience.

The look of wonder, the imagination spark, the happy faces, the “wows” I saw in all the visitors completely validated my efforts to create the CAVE and “erased” the many challenging months that led to that moment. I think most of us who were part of that first wave had many similar experiences that made it all worth the effort.

VR captured the public’s imagination very rapidly, and suddenly, as more and more ideas and visions were being discussed toward shaping this new and unexplored medium, the media started to portray these visions as actual projects and products. We found ourselves facing unrealistic expectations of what the technology could do, and we transitioned from a period of positive creative frenzy to one of disappointment and decline of interest – all before this new medium had the time to mature for real use.
At that point, we entered what I call the dark age of VR, between the years of 2002 and 2012. During this period, although there was not much mention of VR in the press, some of us early VR pioneers managed to transition from research to production, mostly working with engineering and military groups in virtual design and training applications. For me personally, this time was perhaps my most productive as far as making VR work with a purpose.
I worked with several US Fortune 500 companies to help them introduce VR into their product development cycle. I worked with computer hardware manufacturers to refine their systems to support the performance demands of VR systems. I worked with military groups to incorporate virtual training into their programs. I developed several traveling museum installations to create immersive storytelling and immersive journalism pieces. We staged several dance and theater performances integrating virtual reality into the stage. We did amazing projects, but they were done silently: They barely received any attention from the press, as VR was no longer exciting and “cool,” or the work was confidential.

A tremendous body of work was created during these dark years by my group and others, and we all learned a great deal about what works and what does not work in VR, as well as the performance parameters and the attributes that define a good immersive experience. In a sense, VR had become an accepted and established tool within certain industries and was no longer new and “enchanting.”

Dr. Carolina Cruz-Neira is the Donaghey Distinguished Professor in Information Sciences and the director of the Emerging Analytics Center at the University of Arkansas at Little Rock, and an Arkansas Research Alliance Scholar. She has conceived and built large-scale research centers focused on VR at several US universities. Dr. Cruz is also a business entrepreneur, having launched several companies and consulting businesses.

And then, around mid-2012, VR was back in the front pages with the introduction of a new generation of platforms that were significantly improved, simplified, and, most importantly, very affordable. Suddenly, VR was no longer an exclusive technology accessible to an elite set of computer scientists and engineers. It now had the possibility of becoming mainstream and accessible to pretty much everybody.

This has also driven the evolution of the software tools to create VR applications. From this point on, VR has exploded into one of the fastest-growing businesses today, is capturing the imagination of the public (again), and we are envisioning a myriad of applications that will bring science fiction into reality. People all over the world are now building VR applications for almost every aspect of human life.

It is astonishing to see that the current wave of VR is not driven by research, but by industry – in particular, industry serving the consumer market. From my perspective, this means that the work is much more focused on end-user technologies and applications placing strong constraints on the robustness of the technology as well as on the ease-of-use of the tools to create applications. I see this, together with the significant cost reduction, as the strongest improvement over the approaches we had in the first wave, and it gives me confidence that VR can be accepted not only as an entertainment tool, but as a powerful tool to improve industry processes, health care, education, training, and many other disciplines.

The lower cost and ease-of-use also opens uncharted territories for human creativity, communications, and social interactions. I am starting to believe that this resurgence of VR is defining a critical milestone in human history and that future generations may call our present “the VR revolution.”

But within all this excitement, I also feel we need a reality check on what is happening with VR. There is great potential for it to succeed for real this time, but there is also a possibility that VR may collapse again if we don’t pay attention to what we are doing as a community. As I said earlier, there is a frenzy to create a profitable market for VR technologies, VR tools, and VR applications. The expectations are starting to be too high both in terms of what we can do with the technology as well as the financial returns. At the same time, there is a substantial collective ignorance of what VR really is, what the choices of platforms are, what the components of a compelling user experience are and how that translates into a usable application, and what are safe and healthy system and application performance parameters.

For me, VR means first user perspective, depth perception, motion parallax, interactivity, and immersion. Many technologies and applications are being marketed as VR when they are really not, causing confusion and frustration for users investing in them. For instance, some have not experienced VR systems that incorporate tracking, or stereoscopic displays, or environments that they can freely manipulate. So basically, they have never really experienced a true VR environment.

A similar situation happens with the VR platforms. Today, VR is being almost exclusively associated with helmets or goggles as the display platform. But there are other platforms, like the CAVE, an immersive 3D dome, a surround-panel display, and others, all of which provide different user experiences. Sadly, many people from leading VR companies today do not know what a CAVE is and that VR is possible in platforms beyond helmets, until they visit my center in Arkansas.

Another aspect that I find worrisome is the lack of understanding and lack of concern of many groups about how sensitive the human perceptual system is and how VR can have a strong impact on it – from discomfort, to severe motion sickness, to the inability to function after a VR experience. This is a serious issue that needs to be addressed in order for VR to be successful. Latency, poor stereoscopic calibration, frame rate, resolution, and other parameters have to be carefully balanced within tight constraints in order to have a healthy and safe experience.

Just because we can access simple development platforms does not mean we are suddenly VR developers. There is much more to VR development than knowing how to drag and drop some cool 3D models and write a small set of JavaScript or C# to throw them into the display. There are many good, solid VR companies making amazing products and understanding what VR is, but there are also many others that don’t. And it is those that can negatively impact the field while it is still in its early stages; its future, although bright, is still fragile.

Indeed, VR is walking the thin line between success and decline. However, these issues can be resolved if the current VR community can take a moment away from the frenzy and learn and explore the tremendous body of work that exists from the first wave. There are many lessons learned, many well documented case studies on what works and what does not work, many visionary statements of what makes compelling VR experiences, and what the unsolved challenges are, many of which are still unsolved today. Basically, it all boils down to “if you want to succeed in VR, do your homework and learn from those who came before you.” If we all understand what VR is, learn from our successes and mistakes, and make smart in-vestments, I truly believe that the VR revolution will be unstoppable and, like many other revolutions in history, will push human life into realms we can only imagine right now.

Dr. Carolina Cruz-Neira is the Donaghey Distinguished Professor in Information Sciences and the director of the Emerging Analytics Center at the University of Arkansas at Little Rock, and an Arkansas Research Alliance Scholar. She is the co-inventor of the CAVE and the architect of the CAVELib and VRJuggler, two of the first APIs for creating VR applications. She has conceived and built large-scale research centers focused on VR at several US universities. Dr. Cruz is also a business entrepreneur, having launched several companies and consulting businesses.