ISOJ 2021: Day 3, Panel

How photogrammetry, VR and AR are adding new dimensions to storytelling

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Chair: Robert Hernandez, *professor of professional practice*, University of Southern California
- Mint Boonyapanachoti, *creative technologist*, The New York Times
- Thomas Flynn, *cultural heritage lead,* Sketchfab (U.K.)
- Retha Hill, *professor of practice & director of the New Media Innovation and Entrepreneurship Lab,* Arizona State University
- Ben Kreimer, *independent journalism technologist*
- Elite Truong, *director of strategic initiatives*, The Washington Post

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Rosental Alves Good morning, good evening, good afternoon, wherever you are around the world following ISOJ 2021. Welcome back. We have about 7,200 people registered for ISOJ from about 134 countries, so it's really amazing our outreach. Some people are not being able to watch alive. But, you know that all the videos are staying on YouTube, so you can follow it later or you can go back and check out some something interesting that you have seen. So I also hope you have been enjoying the Wonder room, where we are trying to to revive the experience of any conference when after the session, you can you can meet people and start a conversation, find old friends and new friends, et cetera.

But talking about cool things, this panel is really cool. I mean, I have been doing this for 22 years, and we we always have some new technologies, new ways of storytelling. So the next panel is Immersive Journalism: How Photogrammetry, VR and AR are Adding New Dimensions to Storytelling. So I would like to invite my friend Robert Hernandez, a professor of professional practice at the University of Southern California, to lead this panel in the same brilliant way as he did in previous very cool panels about AR and VR. Robert Hernandez, please.

Robert Hernandez Hola, todos. Bienvenidos a ISOJ 2021, una conferencia que es internacional y los que se recuerden quien soy, me llamo Roberto Hernandez. Soy profesor del periodismo digital aquí en Los Angeles en una universidad del sur de California y es tradición que yo comienzo mi sesión en español porque este es internacional. Los que no hablan español se están poniendo panicos. No se preocupen. I speak English. It's a tradition for me to start my ISOJ sessions whenever I've been invited by Rosental and team to kick it off in Spanish, to remind us all that this is an international conference. It is one of the best conferences that I ever attend, and it's always a pleasure to be here. I'm Robert Hernandez. I'm a digital journalism professor here in Los Angeles at USC University of Southern California. And today I'm your moderator talking about and exploring the concept of storytelling through photogrammetry, volumetric. Now, some of you may know those terms, some of you may not, but we'll talk about these different things together and at the end, go into a costume change and answer your questions live.

But for now, you guys know the format. Each speaker is going to present and I, too, am going to present, if you allow me just a few minutes. I want to share my experience that happened to me not too long ago. So here we go, sharing my screen. All right, so I want to tell you a story of what happened last month when I saw this tweet. Now, you're looking at

this, and let me tell you, yes, that is extremely violent and scary. This is an independent game developer that created a virtual reality. I'm going to call it a murder simulator. Now, it is grotesque and messed up. The creator himself when they tweeted it out, said, "This is a very, very violent stress test, and I'll admit I worried myself even a little bit on this one." Let's put that violence aside for one second and acknowledge how incredible it is in virtual reality to create these types of physics and experiences. But we can't ignore the violence that's there. That is something that is dominant in immersive virtual reality. All right, these games. And so what I did was I quote tweeted it and said, "This is the future of VR if we don't bring in more diverse creators." I put that tweet out into the world, went on with my day and actually forgot about it until 18 hours later when, oh, boy, did I anger a lot of developers. Now, I'm going to spare you all the vitriol, the trolling that I got. The one point I would agree with is I did not mean to drag this independent game developer who did incredible work, not the type of content I'm interested in, but incredible work nonetheless.

But I want to remind people in the industry and even outside looking into this space that most of this stuff, most of the VR video games that are successful and getting a lot of money are first-person shooters. Here's just a couple of them now. Video games are amazing. Half-Life is an incredible experience and game. Here's one you might have recognized. It's got Medal of Honor, which was really popular in a controller setting when you would fight in World War II. Here, it's done in virtual reality. So you're not using a controller, you're using your hands. You're catching that grenade. You're holding the gun. And at the end there, you're throwing that pan. But when I saw the original video, they weren't throwing a pan. They were throwing a knife. They were throwing a knife at a Nazi. In virtual reality, you don't play, like I said, with a controller. So how else do you use that knife? You literally are going to walk up to a Nazi and stab them, physically moving your body to do that. That is not what this industry can be, and should be, or limited to.

So I responded to my tweet and said, "Let's not kid ourselves. There are too many murder simulators that are out there." And then my main point is we need diverse creators, not just diversity in terms of gender, LGBTQ, people of color. Although there is an overlap of those types of point of views doing more than first-person shooters, but they don't have exclusivity into that. We need storytellers of all types to step in and to produce these experiences. I do this with my students. We produce under the name JOVRNALISM. We've worked with different tech companies, media companies. We do stories about homelessness, youth in foster care, deportees. We're in post-production on a story about surviving domestic abuse. And we too use these technologies like photogrammetry to create AR experiences. This is one, for example, where we captured a homeless dwelling, Jennifer's tent. And through photogrammetry, and I'll explain what that is in a little bit, created not an artist interpretation of her home, but a photogrammetry based model of her home that you can interact with, and most importantly, step inside, right. This is not about shooting. This isn't about fighting zombies or Nazis. This is about harnessing that technology to create experiences that connect us. Right. You can learn more about our work. We have apps and all that stuff.

But my point for this quick intro moderator talk is to say that we need you. You're going to hear from a variety of different creators here from big name, incredible organizations or tech companies. You're also going to hear from independent freelancers, independent journalists, as well as educators to remind you that you can be creating these stories. And quite honestly, we need you to be creating these stories, so we're not limited to murder simulator's. OK, that was my little talk, my PSA rant.

Now I want to talk about some of the terms you're going to hear. Photogrammetry. What is it? There's a big umbrella. This is my interpretation, and maybe my colleagues will correct my grammar there. This is fluid language and lingo in this industry that is growing and going. But we're going to talk about what's called volumetric capture, capturing in 3D. Photogrammetry, which is in the title of this project, is about using a series of photographs on a static object or room and then converting those photographs into a 3D model. Here was our first tent that we did. One hundred photos on my old camping tent that I brought to campus. We took 100 pictures of it, ran it through some software called Capturing Reality and poof, that is our 3D model. This technology, though, which seems out of reach, perhaps to you, is actually more accessible than ever before, and it's evolving quickly. Videogrammetry is another approach, where instead of static images capturing a static object, it's video capturing an object that is moving, and it's producing holograms, legit holograms of people moving in 3D space as a 3D experience. Holograms is a term that's used. It's not a 3D model. It's not an artist's interpretation. It is the person captured in a hologram. The other technology is called LIDAR. LIDAR is like radar, but it's using light. And usually that's really expensive. But if you've been paying attention, LIDAR is now in iPad pros and in the latest version of the iPhone. LIDAR, something that usually cost tens of thousands of dollars, is included in your phone for free now. For free. It's an expensive phone, nonetheless. These technologies are going to be going more mainstream and will making these tools accessible to everybody, including you. And so be aware of these new shifts in technologies, and start thinking about how might you use these to tell stories.

Lots of things to capture today, and the first one up is Thomas from Sketchfab. Sketchfab, I consider, the Instagram for a 3D model. That's how I describe it to people. It's an incredible platform that gets better and better. Thomas, thank you for joining us. Take it away.

Thomas Flynn Thank you, Robert. So I work primarily with cultural heritage organizations, helping them make the most of their 3D scans, and publishing them online, prepping them for online, as well as with the wider Sketchfab community, which includes a diverse bunch of creators. Critical kinds of things. So I'm going to be talking a lot about what other people are doing, what they're publishing on Sketchfab, rather than my own work.

For anyone that's not familiar, Sketchfab is the place to find published and freely distribute and sell 3D models online. This is a view of just some of the recent uploads to the platform, very diverse content. And once you upload a 3D model onto the platform, you can adjust and style it in different ways, using kind of the backend tools that Sketchfab provides. This is a 3D scan from a British Museum. And then when you're happy with it, you can publish it, and then you can embed that 3D model on a Web page, the same way you would an image or a video. And as Robert says, if it helps, you can think of Sketchfab as the YouTube or the Instagram for 3D content.

Being able to add things to your 3D models, so other kinds of contents or text and audio, in these examples, annotations and 3D sounds allow people to create what I'm calling object-based narratives. They can be very simple, but they can still tell a story. The first example there with the sound, adding audio to a reconstruction of historic locomotive. And then this is behind the scenes of a USA Today piece about a landfill in Chicago. So, as Robert says, 3-D capture technology, namely cameras, and photogrammetry software, and scanning apps, the smart devices have made quick, simple 3D capture a possibility. So on the left here, photogrammetry, discrete images that you then process into a 3D model. And on the other side, a much more fluid capture live as you're waving your phone around in front of this mural, capturing the 3-D form there.

I also want to give a kind of idea of trends that we're seeing with uploads on Sketchfab. Sketchfab has a community of about five million members from brands, cultural organizations, to individual artists, and individual 3D scanning enthusiasts. And here I just mapped weekly uploads for photogrammetry-based 3D models for the last six months. And across that, I've added iOS LIDAR uploads. So there are several different apps for the iPhone that make use of the LIDAR scanning that we're seeing an increase of trend in 3D models being uploaded every day from what you might term, "casual 3D scanning enthusiasts." The ease of capture affects the kind of things that people might tackle or want to capture because they capture data with just their smartphones. In general, the two workflows produce quite different results in terms of perceived quality. However, what smart devices' scanning apps lack in 3-D scan fidelity they make up for in the simplicity and speed of capture process. And plus there are people just walking around with the 3D scanner in their pocket now, so they can start scanning, any time, any place. As the workflows become more intuitive and less specialized, then more people are discovering the medium as a way of capturing and sharing their surroundings and what they're doing, in a process of timely, serendipitous and niche 3D publishing. So with these workflows, you can follow a recipe in 3D. You can explore a 3D scan of a volcano in Iceland, an annotated tour of that was uploaded to Sketchfab, a few days after the volcano began erupting March 20 this year. And you're able to compare from different sources the same object. Here is a 3D scan of a Robert E. Lee monument in Richmond, Virginia, captured weeks after Black Lives Matter protests across the city. You could compare it with a previously published scan from another user on Sketchfab made in August 2017. And there are even simple or incomplete scans. So this scan was captured with a tango device, which is a slightly older smartphone capturing technology. They can tell a story. And this is a crowd of empty shelves in a Whole Foods in New York captured right at the beginning of the coronavirus pandemic in early 2020, when there was a lot of panic buying.

And so beyond 3D models, acting as self-contained story or artifacts themselves, if those 3D models are made downloadable under open licensing and made accessible via application programing interfaces or APIs, then that's basically how a platform like Sketchfab can talk to other softwares through code. It's possible that published 3D models can become a library of content for immersive storytellers to draw upon. So there's over half a million downloadable 3D models on Sketchfab, and they can be imported directly into creative software, whether it's Unity, or Unreal, Spark AR to create Instagram filters really giving people a head start on telling stories with 3D content, when they don't create the 3D content themselves, perhaps.

So things are rarely perfect and all encompassing. And even though a 3D capture and online publishing is easier and more affordable than ever, it's still out of reach for many people due to the expense of the equipment. Robert mentioned how expensive the iPhone is. It is very expensive, and the necessity of a decent Internet connection when you want to publish online or view content online, especially high bandwidth content. And typically 3D scans, unless they're well optimized, will be high bandwidth content in general. So while digital creativity and publishing are perhaps more widespread than ever, these practices still exist within established industry and internet ecosystems. So work needs to be done to make space for underrepresented voices to be heard and stories to be told. This is just a quick snapshot you're looking at right now as users accessing Sketchfab from around the world, so you can see there are plenty of gaps. And that's something that I think will improve over time as things get cheaper and more accessible, even more. So that's where I'll leave it. Thank you for listening. And I hope that's giving you an idea of what's happening over at Sketchfab.

Robert Hernandez Thank you, Thomas, for that. Sketchfab.com is the website to start off. Lots of resources there. Next up, we're going to Mint from The New York Times's R&D lab. They do magical things, amazing things. And we're lucky to have Mint join us to talk about the work there.

Mint Boonyapanachoti Thanks, Robert, and hi, everyone. I am super excited to be at ISOJ year and to be part of this panel. Today I would like to share some of the research work I am doing as a creative technologist at The New York Times's research and development team. Well, what is R&D inside a media company, and specifically at The New York Times? We are a small, multidisciplinary team of journalists, technologists, designers, engineers and strategists who are working toward a common mission, and this mission is to explore how to use emerging technologies in the service of journalism. To do that, we work closely with many teams around the company, and namely our newsroom, but also product and technology. We currently have active research across various topics like computer vision, spatial computing, media transmission, like 5G, and of course, photogrammetry, the area I focus on.

So my job here is to help the team develop 3D capture tools, create prototypes, and to integrate our new found process with the newsroom's existing workflow. And one of the goals of journalism is to bear witness to history as faithfully as possible. And this is especially true for visual journalists who put themselves on the front lines in order to document events through photos and videos. And just so you have an idea of how visual journalism has evolved at the Times, we published our first issue in 1851, but a photo did not appear on the cover of the newspaper until the early 1900s. The first color photo was published in 1997. That is more than 140 years after the first issue came out. Now photos and videos can be a powerful tool when telling a story. But what if we could break out of this 2D rectangular representation and let readers experience a place the same way the journalists did? And to do that, we have been exploring many 3D capture techniques and one of the main ones being photogrammetry.

And photogrammetry is a process that involves taking hundreds or even thousands of still photographs and using software to stitch them together into a 3D model. Now the software looks for areas of similarity between the photos and then uses Parallax to create that. This is an incredible technique because it allows readers to experience an entire space as if they were there. And because the space is fully represented in 3D, we can show it from every angle, which also give us an entirely new ways to frame and guide a story.

So when we started thinking about how we would embed these 3D models into the Times's articles, we also had to come up with a plan for how the readers would interact with them. And up to that point, most interaction models for 3D content would just drop a user into a 3D space and force them where to go or where to look. But we felt that that experience could be disorienting and counterintuitive, especially for someone who might be trying this out for the first time. So our solution was to borrow an interaction we know our readers are most familiar with, scrolling. So as readers scroll down the article page, we guide them through the 3D space and stopping along the way to highlight the points of interest. The Times has now published multiple environmental photogrammetry models that integrate this and other interaction techniques. What you see here is a walkthrough of the Diversity Plaza in Jackson Heights in Queens, which follows the scroll to navigate paradigm that I just mentioned. And this is the historic part of New York City's Chinatown. In this story, we also use the same scrolling method. But beyond that, we integrated this flat 2D archival photographs in 2- to 3D scene for the first time. And this is another

example. This is the house of the E-gamer conglomerate FaZe Clan. In this story, we overlaid miniaturized representation of the space, or a mini map, that readers can use to navigate, as well as the ability to use the arrows, rather than the continuous scroll.

So with each new editorial application of the environmental photogrammetry, there is an opportunity to try out new interactions and storytelling techniques. And with the feedback from our readers, we are improving the user experience every time we publish something new. Now, photogrammetry as a technique is not a novelty. Other industries like gaming and film have been using it for quite some time to create photorealistic 3D scenes. What is new to us is the implementation of this technology within the fast-paced environment of the new cycle.

So I would like to share some exciting things we have been working on that have helped us become more efficient and effective. The first one I have here today is what we called a multi camera rig. This rig allows one photographer to take multiple photos at a time, making sure we collect enough data. And the second example I have is called real time photo alignment. This lets us align photos in real time in the photogrammetry software, while the photographer or the journalist is still at the scene of the event. And last but not least. They see as they scroll through the story, while we discard everything else that is not in the frame of the devices for performance purposes.

And that's all I have for today. Thank you for listening, and I hope this quick presentation shed some light on how photogrammetry can unlock storytelling possibilities. And I have a feeling that we have only just begun to scratch the surface of what is possible here, and I cannot wait to see where this industry will be in the near future. Thank you.

Robert Hernandez Thank you for that presentation. My face was glued to the screen. I have questions. I'm wowed by the technology. I'm going to pull up Ben to join us next. Ben Kreimer is someone I've known for many years as an independent freelancer. I want him to follow Mint to kind of show you the spectrum of The New York Times, but also this is accessible from an independent creator's point of view. Ben, take it away.

Ben Kreimer All right. So my name is Ben Kreimer, and I want to talk a little bit about some of my own sources of technology and story inspiration within the context of photogrammetry. I am an independent journalism technologist. My interest is really in inexpensive, accessible tools, accessible kind of being relative, but basically technologies that are available but that perhaps people don't really know about, or they don't know how to use, especially in their respective contexts. So with this in mind, I've done a lot of work, sort of communication, storytelling, and journalism work with different organizations around the world, including with Robert and his students. And I'm also a Journalism360 ambassador. And within that context, I produced a photogrammetry capture guide, which you can find pretty easily by doing a search for J360 photogrammetry guide. But in that guide, I talk about the capture process. And before I introduce some of the inspirations, some of the things that I found really useful in the process of learning photogrammetry and using it, I want to emphasize the fact that photogrammetry is like a three-dimensional photograph. Now, I'm not talking about like a three dimensional television. I'm talking about a 3D photograph for a three-dimensional medium, so it's a static reconstruction of something that actually exists in the real world. This is literally how you can digitize the three-dimensional world and bring it into a three-dimensional virtual reality, or augmented reality, or mixed reality medium.

And my introduction to all this actually came out of archaeologists, and it ended up leading me to BuzzFeed in the end. And what happened here is every summer for the past eight years, I've worked with a team of archeologists in Turkey. And seven years ago, I had been working with drones, with the drone journalism lab and Matt Waite, and I was interested in going beyond just photos, going beyond aerial photography. And in the process of exploration, and specifically drones, and the use of archeology, I learned about photogrammetry and how archeologists have been using kites, and balloons, and airplanes to do site surveys. So of course, archeologists had already been using drones for some time, and I learned the process. As you can see here, going from, say, a drone video captured to a photogrammetry capture, the quality that I was able to get from this drone that I had hacked together at the time was really remarkable. And instantly, because of my background in journalism, I thought, you know, if archeologists are doing this, why are journalists not doing it? And again, at the time, this was 2014, drone technology was still new. You know, it really came down to hacking together hardware and bits to make this process work, but it did work. And at the time, I was all about Sketchfab because this is before VR and the AR boom that began in 2015.

And so I wrote a paper with my collaborator and mentor, Matt Waite, about using specifically drones, but drones and photogrammetry for mapping news events. And I presented this at the Computation + Journalism Symposium at the Brown Institute at Columbia in 2014. And I keep saying 2014 because it was really before VR and AR. It was really about the kind of Sketchfab, flat, on screen experience. We didn't even, at the time, think about VR, to be perfectly honest. Now, everything has changed since then. You can just buy a DJI drone off the shelf and go out and do that kind of work. And the whole process has become much easier. Here's a VR example of the photogrammetry work from that dig site again on augmented reality projection.

But, you know, where does photogrammetry come from? Because it's been around actually since the mid-1800s as a mathematical process that obviously has greatly aided by computers, but essentially it's a process for surveying. And I bring this up because, again, where can you look for inspiration about how to use photogrammetry? And I highly recommend looking at the geospatial surveying world. That's where it came from as a technique for making maps. And so drones really from the beginning have been all about making maps and making kind of higher, than you can get with satellite, resolution, aerial imagery. So, again, surveying applications, landscapes. So there's a lot of environmental story implications right there. One project that I did early on was about the Dandora landfill in Nairobi. So, again, we have a large space. Again, this is actually a Sketchfab screen recording, but this was a project for Vice back in 2014. And we wanted to have a three-dimensional reconstruction of the landfill that people could fly around. And that's what we did using a DJI drone and Sketchfab to display the experience in the end. Now another application is Google Earth. So this actually is more in line with producing a two-dimensional video in the end. So if you use Google Earth for fly throughs, you can use photogrammetry to produce much higher resolution imagery than what satellite imagery is available on Google Earth. So it looks like this. So on the right here in this image, you can see the high resolution drone scan that's been overlaid on top of the Google Earth satellite imagery. So if you do photogrammetry with a drone, say, you can produce this kind of imagery that you can then bring into Google Earth for doing video fly throughs.

Another application of the technology is for wildlife documentation and conservation. There's a project called Digital Life that is literally making photogrammetry scans of animals. Duke University does a lot of work around marine life, and they'll use photogrammetry and drones specifically to study whales. You can do 3D printing, so sort

of digital twinning of real world assets into smaller scale and then sort of scale distribution of a single real world object. I think Found Images is a great place to get started, and a great place to think about interesting story ideas. And a great example, this happened very recently with the Mars Perseverance Rover that took images as it descended to Mars, and people afterwards, when those images were released by NASA, made photogrammetry or photogrammetry model of the Martian surface. Similar in a way, in 2014 or 2015, dronejournalism.org took a drone video that had been captured in the Ukraine of this airport that had been destroyed. And the video, the drone video was meant to be a video, but they, dronejournalism.org and Matthew Schroyer, took the video, cut it up into images, and processed it into a 3-D model of the airport. So, again, it's kind of repurposing media that already exists. One quick thing I did at BuzzFeed was taking images that a reporter had captured of Jeremy Bentham's severed head. And there's also LIDAR data, so the USG's has a lot of LIDAR data that's available. So a lot of environmental models that you can find for free on their website. So we're kind of talking elevation data, but it's available as point clouds and as LIDAR data sets. And the BBC's Hidden Cities, they've done some really interesting work with point clouds as a way to create actually video pieces, so 2D video productions. If you do work with LIDAR data, I highly recommend working with CloudCompare, and it's a piece of free software that makes it very easy to work with LIDAR data. And I'm currently working, as another example, on a National Science Foundation project that involves LIDAR scans from another archeological site in Turkey, coincidentally, and we're doing structural analysis work, as well as creating virtual tours for students that are unable to travel to Turkey right now because of the pandemic.

Robert Hernandez Thank you, Ben, for that. You always amaze me with new tech and new hacks to help make this technology evolve and move forward. So thank you for your presentation. We'll have more questions in the Q&A section. Next up is Elite from The Washington Post, who oversees innovation and has the challenge to figure out, is this technology worth our limited resources or not? Elite, take it away.

Elite Truong Hi, everyone. Thank you so much for spending some time with us, chatting about one of my favorite topics. This is my life every day. It's exactly the kind of panel that I would go to, too. So it's a privilege to be part of this esteemed group. So correct, I oversee innovation and experimental storytelling at The Washington Post. I think this progression has been great because you've gotten a little bit of what does it look like to be able to experiment with some of these tools. Accessibility is such a huge thing. What I would love to explore today in this talk is how do you choose topics for these kinds of stories? So that's something that I think about quite a lot as an editor at The Post. Our team is called the Lede Lab, so we work on lots of different things in terms of creative storytelling, using emerging technology, a lot of it is machine learning. How does that help us in reporting behind the scenes, as well as ongoing augmented reality, spatial storytelling, 3D storytelling and models and things like that? In the past, it's been a lot of how do we bring the story to you, or how do we place you within the story when we define immersive journalism? But I love the idea of expanding that definition of trying to figure out how do you reach as many people as possible, and expand that definition of immersive journalism to however it makes sense for you as creator.

So I want to start with just introducing my team and the people I work with every day, my core team here. I always love to see teams of folks who are working in the space, too, and how that is structured. So I oversee general strategy directions, opportunities up ahead for us. If there's partnerships that make sense for emerging tech, I'm the person who spends a lot of time in that. We have our principal creative technologist who oversees tech strategy. We have an editor who spends a lot of her time directing what this looks like in

terms of collaborating across our newsroom. We have a UX designer whose job is to focus on what does it look and feel like in these experiences of the things that we're doing, whether it's a machine learning driven product that surfaces to our journalists or perhaps, most of the time, stories that our audience can experience or dig into in different ways. We have a front end developer, and we also have a data reporter on our team. So you can see our portfolio there at that short link.

So that definition and the glossary that harkens back to all the definitions and glossary that you've heard from Robert, to Mint, to Ben and all these different terms that we're using. This is one example of last year trying to figure out how to expand that sense of how do we bring you inside a story. So an incredibly important story line that continues on through today. So we decided to embark on this partnership with The Pudding, who is this fantastic group of folks who are data visual technologists and really tell the story of there's a lot of information going around criticizing protests and focusing on riots and things like that from the murder of George Floyd in the Twin Cities last summer that really just kicked off a global movement and a lot of attention around that. What we wanted to clarify really was what really happened in the first seven days in the Twin Cities. Has it been covered fairly? So we took 250 social media videos on the ground across the Twin Cities, which is a huge area, and tried to paint a full picture of what this looked like in the first seven or eight days. A lot of it is really peaceful. You can see that a lot of media outlets, including our own team, has really, unfortunately just focused on, hey, here's the biggest events of that. But protests tell a much bigger story of that on the ground when you have a bird's eye view of what's going on here. So this template, as we kind of figured out, how do we tell the story over time and space in different areas of the Twin Cities in an accessible way, we wanted to use this template and lessons from this kind of format to anything that our visual forensics team might reconstruct in terms of investigations, what happened during the Capital riot, things like that can really inform how we tell complex events with lots of different media going on.

Another example of what I think is accessible, immersive journalism is bringing the story to you and personalizing it in different ways. So this as a story, this is midway through the pandemic in 2020, so I think this is late November or October, perhaps. We decided to partner with Google Earth and use Mapbox in different ways to try to tell you the story of these are unfathomable numbers of deaths from the COVID-19 pandemic. It is really impossible to try to wrap your head around. What does that mean in general? What do hundreds of thousands of deaths mean? It's really hard to grasp the rest of our coverage. So we always try to figure out in our editorial strategy, how do you reach as many people as possible? And also how do we make the story relevant to you, especially if we're telling a national story? How do we make that more local no matter where you are? So for this particular story, what we wanted to do was if all the COVID-19 deaths happened around your area or in your zip code, here's what that would look like and bring that story home to you. That is also what I consider immersive journalism in different ways.

This one is a little bit more fun, this one is from in January when we were trying to figure out how do we cover the 2021 inauguration. It is going to look so different the inauguration in the past. And also trying to figure out how do we tell a story of The Washington Post over time? We have 144 years of history here, and I think it's really fascinating to dig through our archives to see how history itself tells a story along one story line. So for this one, what we wanted to do was experiment. With flat objects. Daily Prophet from Harry Potter has always been something that we love playing with, the concept of what does a talking newspaper look like to you, and how does this look like as galeries? So it's something of digging into our own archives of front pages from all the inaugurations that

we've ever covered, how they're meaningful throughout time, our precedents within that, and also really just trying to play with how do we reach as many people as possible in this space. So here's what it looked like, here's our inauguration issue in print. So we wanted to incorporate this in print as well. Just a quick QR code. You're able to open this. It sends you right to this link. We'll go ahead and allow access to your camera. And this is also something that this is during the time where we're still in severe lockdown, COVID-19 cases, infection rates are still through the roof, and we're trying to play with the idea of field trips and galleries that are immersive, that are brought to you in different spaces. And really just trying to think through how does that look when we bring exclusive things to you and be able to go through galleries and feel like perhaps you're in a field trip or visiting a museum when we don't have access to museums at that point. And this is exclusive as well, kind of looking through archives and history and seeing how things have progressed over time.

I think the last thing that I think is important to think about is that we always have too few resources and too little time to be able to pursue projects. The stuff generally takes a good amount of time and experimentation to perfect. So here are some things that I think of as editor in this case, is how do we evaluate projects? Generally, we're a scrappy, small team. We collaborate a lot across our newsroom, which is a thousand per newsroom, also trying to figure out a workflow that fits for us. Generally, the majority of our projects is this topic high impact, meaning can we reach a lot of people with this? Is it general interest? Is it something that's very on top of mind for news right now? But if it's not, could it help us move to a new audience that we're attempting to try to reach and haven't been able to in different ways? So that's where it really, really helps to consider different perspectives. And how do we tell stories differently that are very newsworthy, and also giving it enough time to push the idea with new tech. How can we do this differently? But if not, how do we make this accessible, interesting and creative storytelling in different ways? So you could see how we could use those stories where we could tell the localized story of COVID-19, understanding those death numbers in many different ways. But we wanted to try to incorporate mapping for that. And also, the last thing that I encourage everyone as a creator, individual, or working with different teams and organizations is what is your distinct point of view? So what is your perspective on this? How does it differentiate from other places and times? So if you're going to use objects to drive a narrative, how is that different from the same person who might scan and look at that same object to tell a similar story? Really kind of figuring out what your angle is there is as important as any other project or story that's going to be reported. So I think about that a lot, as opposed to defining its voice and differentiation as well. Thanks so much. That's it for me, and this is where you can reach out and so, so excited to see everything coming from this community as well. Thanks so much.

Robert Hernandez Thank you, Elite. I want to thank Rosental for indulging me to be able to have a larger panel than normal because I wanted all these diverse perspectives. And one perspective I wanted to include is how do you create these creators? Retha from ASU has experience in that. Retha, the floor is yours.

Retha Hill All right. Great. Thank you, Robert. Yeah, this panel has been fantastic. I have so many questions as well, but that will come later. So I want to talk a little bit about augmented reality because we haven't talked about that too much, more photogrammetry and other practices. But as Robert said, I'm a professor at the Walter Cronkite School of Journalism at Arizona State University. And before that, I was a Washington Post reporter way back before Elite got there, I guess, and was a founding editor of WashingtonPost.com back when The Washington Post was first getting into digital. So

back in 1995, and we tried to experiment and do all kinds of things, but of course the technology just wasn't there. In 1999, I went over to be the founding editor and vice president of BET, where we created BET.com, and for the last 14 years, I have been out at Arizona State running an innovation lab at the Walter Cronkite School of Journalism. And we've done all kinds of things at our lab. We've done 360 video. We've done a little bit of photogrammetry. We work with the USA Today network on the Pulitzer Prize winning project around the border wall that extends across the country. We work with LIDAR and 360 videos to just make that accessible to people. Some of my students created a company, a virtual reality company, to report on the Southwest and on Mexico, and that employs several students for a few years before it kind of fell apart. We've created a ton of smart watch and smart phone applications. We've built news games just to try to get that technology out to people and have people play with the news and experiment with the news. But for the past three years, I've been kind of obsessed with augmented reality and wrestled that into something that we can create quickly and can be stable in something that our audience can get to and not have any issues with it. Interestingly, back in 2010, I created my first augmented reality app, and it cost a mint. I use the same technology that brought Robert Downey Jr. alive on the pages of Esquire magazine. I don't know if any of you saw that. And after getting it up a few weeks later, that company had a change in technology. And unfortunately, the app was not accessible to many people. But I learned a whole lot in building that app. And the lesson that kind of stayed with me was the difficulty in getting augmented reality into the mainstream. And I knew that there would be a challenge. And there was then, and I think still now, a challenge from a hardware and a production standpoint. But I've always had a soft spot for AR more so than VR because it's applicability for practical usage by people. If you have your phone, if you have a device of some sort, you can get to the content.

So every few months, really, weeks it seems, like we get these headlines about is this the year that augmented reality will be adopted by the masses? Are people ready for augmented reality glasses? And I would argue that I think the public has been really jazzed about the idea of augmented reality for a while now. Some of you might remember in 2002 when Minority Report came out and everybody was just buzzing about this whole issue of gesture based interface and contact lenses or some kind of other heads up display where you could get useful information, like when there's a sale on T-shirts at the Gap, or directions to various places around town, or just about anything. You can call your buddy from just waving your hand in the air. And so I think people got really excited about it then. And also, I think that anyone who's ever walked down the street holding their smartphone up in order to get directions know that augmented reality and any type of glasses or heads up display would be a much, much better interface for them, and it's just the way to go. But the problem, unfortunately, is that the road to augmented reality has been long, and I think that the public, the questions around, will the public take to AR? Will the public buy these glasses? Will it be this year? Will it be next year? It's really because I think we have to think about it, that the public will embrace augmented reality when there are practical reasons to do so. And I raise that because I think with journalists, we rightfully so get really excited about all the wild things that we can do. We look at what the hardware companies unveil at their various sort of developer conferences when they outsource it to some firm to create some really cool games. And it's seamless, and it's cool and things are flying around. And of course, we want to do that, too. And the problem is, I think, is that we are too far ahead of our consumers in many ways when it comes to augmented reality, because we want to create these splashy things, but the pipeline and the accessibility is just not there. And it's hard for me to admit that, but that is the case. And I think that journalists should be thinking about over the next few months how we can spur adoption of

augmented reality and then later on maybe some of these other things by providing content that will be useful to people, that will be indispensable to people.

Now, you know, we got caught up in the whole splasy AR thing, too, at my lab. I remember a few years ago, we used Vuforia and Unity to create a tribute to the late Senator John McCain. And we built sort of his life story in augmented reality. We built by hand the Naval Academy, where he went to school. We even created the pond or the lake where his plane was shot down with flames shooting from the plane. We even recreated the so-called Hanoi Hilton, where he was held for all those years and tortured and held as a prisoner. We even had the little North Vietnamese tanks going around it. But the problem with doing augmented reality in this way, using Vuforia and Unity and using some other programs, is that with all the libraries and all the extra stuff that's put into creating something like this in an accessible platform like Unity, it just makes for a really heavy project, a really large file that if you can get it past Apple, particularly, if you could get it past their requirements into the App Store, it's just such a large file that when users pull those down in order to view in their space that they maybe will look at it one time if it's stable, and then they delete it in order to preserve storage space on their application.

So what I want to argue for is, yes, we can do all these things, and we should continue to experiment, and particularly with augmented reality, because as that Wall Street Journal headline said, it could be coming to a heads up display or glasses near you soon. And I think that journalists and other lay people, as we think about how do we do some of this interactive stuff, we have to think about, yes, those splashy, big things that maybe some of the larger corporations can do, The New York Times and The Washington Postm, and so on and so forth. But we also have to think about how do we spur adoption by creating these killer applications, basically information that the public can use. And I think once we do that and it becomes so indispensable to them that they'll want more, they'll look at other things.

So if we kind of think back to what worked for other devices, it was the really simple applications, like directions, like a flashlight app, like a Yelp or an app that told you where you could go find something to eat that really became those things that people wanted all the time and told their friends about. Like, you got to start using applications on your smartphone because it'll make your life easier. So what I think we're going to be thinking about a lot this fall coming up and over the summer is how can we create a better pipeline to get augmented reality, particularly, to people and how to come up with simpler things that will be like fun and useful to folks. You know, you get glasses on and you're walking around, you can see short restaurant reviews. You can see how many stars, any health inspection reports. I think those are the type of things that we can do as journalists to try to get more people to embrace this technology. Maybe little hidden gems in our community, the things that make them unique that news companies can authoritatively talk about and provide that content. Directions again for getting around a particular part of your city, or a particular neighborhood in your city, or getting around campus. That's something at a school as big as Arizona State University, we definitely need to do that. And the other part of it is just the pipeline, how to create these things. It's good if you have a big team, but if your students, journalism students, and myself, or a small shop, or small newsroom or radio station, public radio, or a PBS station, it's challenging to create some of these big projects right now. It's getting easier, but it's still challenging. I don't want to spend two thirds of the semester teaching my students RealityKit, or Xcode, or Java in order to do an augmented reality project. And yes, there are easier tools out there like Apple's Reality Composer or Adobes Arrow, where you can pretty quickly create something in AR, and then share it to your phone. You can get content from Sketchfab. Thankfully about a year

or so ago, they made all of their assets compatible with Apple's USDC format, which it was really hard to get things created and to be able to put into an AR project that way. It was super easy to do this. I can teach you how to do it in ten minutes. The problem with it is, again, this is unstable. You can't do much. You can't have many interactions. We tried last semester to create a project around COVID, just looking at a few people in the community of Navajo County who have passed away from COVID, and to try to create avatars of those people. And Reality Composer just couldn't handle it, and neither could Arrow. So we're still kind of back there stuck with the pipeline issue, the technology that we have to create in order to make something that's a little bit more stable. And then, of course, how do we provide that to users, so that it's easy for them to get to it and really be able to enjoy it. Now, there are a lot of companies that will help you create augmented reality, where they have a library or interface in between the raw code and what you want to do. And it's pretty easy to learn some of this stuff. But what I found is that the licensing fees make it just very expensive for a university setting or for maybe a public media where you can't monetize these projects.

So not wanting to be the skunk at the party. But all of this stuff is like really a lot of fun. But I think as journalists and all of us who are in this space, we need to kind of put our heads together to figure out how we can make these things, not the splashy things, but the practical things that will encourage the community, our users, our viewers to go out and get these glasses. Now, this might be a problem that we'll be facing sooner rather than later. I mean, everybody's looking at this promo for Apple's developer conferences coming up in June and wondering, is this a hit? Are they just glasses, or are they trying to say that augmented reality or headset glasses are coming from Apple soon? We know that Facebook is working with Ray-Ban to get some other glasses out there, and there are several different types of glasses already in the marketplace. But the adoption is not there. We're waiting on 5G, but also I think that the public's waiting on content that will be indispensable and that they will want to go through whatever hassle there is to wear these glasses so that they can get it because it's going to make their lives easier. And then they'll tell their friends, and they'll tell their friends, and so on and so forth. So that's a lot of what I've been working on and thinking about lately because I want to do the big projects, but I also want the viewers to be there when I do those. Thank you.

Robert Hernandez Thank you, Retha, for that presentation. As you saw, there is a lot of diverse perspectives and approaches to this new medium, this new storytelling method. And I've got a bunch of questions, and I'm sure you do, too. So let's open it up to your questions. All right, so through the magic of time and prerecording, we did a costume change and the panel is now back together, and there's a lot of questions that have popped in. I'm hoping the panelists can join me on stage here as I review some of the questions. The first question I have, and I'm going to ask this of Mint and Ben. If you can talk about quickly, could this technology be used for breaking news? How might we use this technology for breaking news? So Mint, why don't we start with you, and then we'll follow with Ben.

Mint Boonyapanachoti Thanks, Robert. This is a question that I get asked a lot not just by friends and family, but also by my colleagues as well, and I'm sure it's on a lot of these amazing panelists' mind as well. Well, the short answer is right now, it is very, very hard to share breaking news with 3D contents, especially large environmental scenes. And you see, as a news organization, we help people understand the world through on the ground and try to be as faithful as possible. And every story, especially in breaking news, at every stage of the process, has to be meticulous. Attention has to be paid with ethical and editorial challenges arising from the breaking news. So that said, with technology evolving

so fast and cameras getting better, like you mentioned, Robert, that now we have iPhone, but now we have a 3D scanning tool in our pocket. So that is also one of the research that I am working on at the Times and also with the team. So I see right now 3D scanning is a way to offer a new perspective to a story. And to become faster and to catch up with technologies, that is emerging technologies, that is such a moving target, we are constantly researching and working on the tools and streamlined process. Like I said, the technology is a moving target. It's very difficult, but we're really knocking those challenges off our table. If you see our photogrammetry projects before 2019, those are like smaller scale or like a David Bowie stories. And now we're moving towards larger environmental scenes. So we are moving towards a breaking news to be able to share the content.

Robert Hernandez I remember the first time an iPhone was used to capture a breaking news story in our newsroom and the day it ended up on the front page. And oh, my God, it changed everything. And that reaction is going to continue to change. When you build a lot of this stuff, you got some grants to make some volumetric capture. What's your take to that question in terms of how could you use this for breaking news?

Mint Boonyapanachoti So three things come to mind, and I will say that most of the time I'm not working, actually, I've never worked on a breaking news story. So I've not actually sort of field tested these techniques. But this is what I would do or three ways that I would go about it. The first is I would just skip photogrammetry altogether and go with a LIDAR based iOS device. Because I haven't actually time this pipeline. I can't say how long it would take to go from, you know, run around with the device to then say, uploading it to Sketchfab, but I can guarantee you it would be faster than running through a photogrammetry pipeline. So one don't do photogrammetry, use LIDAR on an iOS device. The second thing is, if you wanted to do a photographic process, I would shoot video and basically run around the scene. I mean, again, I say run around because assuming you don't have a lot of time. Run around, shoot video so that you can then extract frames. So I would do as high resolution video as you can. The third thing that's less likely to work, but there's a possibility is that, like I mentioned in my talk, you can crowdsource images. So there are projects. A lot of times they have more to do with monuments or, you know, museum objects, or sort of objects subject matter in an environment that many people have photographed over time. But if there's a breaking news event, and a lot of people happen to be there, and a lot of people are shooting video on their phones, you could take that footage, their photos and feed it into a photogrammetric software and see what comes out. So you don't even have to be there.

Robert Hernandez Yeah, yeah. I keep remembering the test done at Microsoft, if you remember that TED talk and created almost like a photogrammetry before I knew what photogrammetry was. A recreation of archival things out of Flickr, taking photos from Flickr and rebuilding it and putting it together. It's an incredible technology. But also something to watch is actually Thomas's boss, the CEO of Sketchfab, who's been doing a scan a day. So, Thomas, to go to you, I want to ask you, what is the one piece of advice you would give to someone who starting out? And then I want to ask Elite, what is the one piece of advice you would give to the boss or the manager to have that team explore this stuff with the challenging resources? But, Thomas, what's a piece of advice you would give in your perspective?

Thomas Flynn I think the simplest thing to say is to have a go. There is no reason, really, that if you have a smartphone with a camera, you can grab some open source software, you can open a free Sketchfab account. So you can go through the whole process of capture to publishing, to trying out things like 3D annotations, or adding audio to your 3D

to create kind of a 3D story. So definitely don't be afraid of it. It's not a highly complex process, really, especially once you get the hang of it. But just grab what you have handy. Even your own digital camera that you might have will be good enough. You will get some results, and there are tons and tons of people out there already doing this kind of work. There are huge groups on Facebook, photogrammetry groups. You can see what people are producing, catch tips, all the tutorials that exist. The software is kind of ready to go, if you're interested in it, I think.

Robert Hernandez Yeah, the barrier to entry is lower and lower year over year. I was hoping Apple would announce something, but Retha reminds me to calm down that she's talking about the summer, that the developers conference is where they're going to announce some stuff. But as the barrier of entry lowers, Elite, as a manager, what's the advice you would give to other managers who want to start exploring the creation of the stuff.

Elite Truong I think that's a good question. I'm going to frame this answer that still speaks to who Thomas was trying to reach just now and also their managers, if they're here and they're able to see that. But I want to talk to both, but with basically the same advice here. Right. If you can attach your experiment, that is very easy to be able to do because there's a lot of support out there that you could tap into, you could use Sketchfab, you could start with LIDAR, as the advice has been given here, and attach it to the goal that you know that your company is trying to reach, that your user was trying to reach. A goal that is easy is to be relevant in the future for any newsroom, and that involves learning how to tell stories in different ways to engage different audiences. You know, once upon a time, social media was a scary, unknowable thing that most newsrooms just did not know how to reach. So they assigned maybe interns or young people to figure it out. And this is also one of those areas where we're trying to find storytellers who could do different things, knowing the potential now from what those experiments looked like. This is something that can bring your newsroom into the future and continue evolving with it. The Post started working with photogrammetry in 2014 or 2015. I think, Ben, you mentioned a lot of experimentation early on then as well. And that was vital because we couldn't start now in 2021, without years of continuing to keep up with a tech. Every year, looking at WWDC, what are those developments? Is that something that's addition to or new? All those little steps really, really count because it's very easy to fall behind and suddenly look up, and we're in Retha's future of just like people are wearing, like wearables. And it's Minority Report a little bit. There's more surfaces in which you see news and context, and you have no idea how to reach those audiences. It's very, very important to keep up in that way.

Robert Hernandez And I will be a selfish professor and say we're creating creators. Retha's creating creators, and hire the young ones who know this stuff and had some time to inject them and fuze them into your newsroom to bring up the culture of innovation there. Retha, I have a question for you that says should technology be at the service of the content, or are there cases where storytelling is the means of reaching an audience on its own? That's a common question. I think a common phrasing that we get. Technology first or story first? What's your answer to that kind of debate, if there is one?

Retha Hill And I think both Elite and Mint spoke to this, and Ben as well, that you have to decide when you're telling the story which technology to use. That's it. You have to kind of think it through. Of course, speed is one consideration. We talked about breaking news, but some of the stuff that they do at The Washington Post and New York Times, particularly when you're kind of piecing together what happened with a shooting, or protest, or some of these other things, it really helps people. Until I saw, I think it was The

Washington Post review of what happened at the Capitol where you could walk through it, I don't think I had the same amount of appreciation for what went down on January 6 until I saw all the photographs and the movement of people. That really helped me to understand how close they were to our elected officials. So I think that you just have to make that decision based on what story you're trying to tell and how you're helping people to see what went on. We couldn't do this 20 years ago or 10 years ago. We can do it now. But, you know, I always keep in mind our users and remember that so many people might have an iPhone, but they may not have the bandwidth, the Wi-Fi, the this and that to see a lot of this stuff, especially with augmented reality. Or if they're on a laptop at home, how many students, millions of students across the United States who couldn't get real simple interactivity and might not be able to see all the amazing stuff that we want to do and we are doing. So we have to kind of weigh in both.

Robert Hernandez Yeah. And one of the things to think about is that that's the project that got published. There's a lot of experimentation, and playing, and failures that don't get published or please do not publish them. But like that culture of learning is really important to get you prepared for the moment to say this is the story, this is the time. The technology has caught up to this journalistic opportunity. And you don't decide, now I'm going to learn immersive storytelling. You've got to have been playing, and experimenting, and failing, and succeeding along the way. We have about a minute left. I'm going to ask you all to quickly share one resource, and we might not have enough time. I'm going to ask you also to tweet out that one resource using the hashtag #ISOJ2021 with the hashtag #immersive that way it kind of can be found more. But Retha, we'll go with you, and we'll go around clockwise. Retha, what's one resource that you would like to share with the community?

Retha Hill Even though it pains me, I would say Reality Composer just because it's quick and easy. If you want to experiment with augmented reality, it takes just a couple of minutes to learn it.

Robert Hernandez Mint?

Mint Boonyapanachoti My source for photogrammetry tools is iPhone and Capturing Reality, just the software that you mentioned, Robert.

Robert Hernandez Awesome. Elite?

Elite Truong This is more in emerging tech in general. One of my favorite newsletters to follow along with smart product design and field is Rishad Patel's Splice newsletter. I will tweet that out as well, but it's good inspiration of what other folks are doing in that sort of competitive research.

Robert Hernandez I don't subscribe to that one. I will subscribe once the session ends. Thomas?

Thomas Flynn The open source piece of photogrammetry software that I've seen around called Meshroom. I think if you can't afford some of the pricier software, then go with Meshroom. It's a great place to start for free.

Robert Hernandez There is a lot, a lot, a lot of free tools and technologies out there. I'll give a plug to Icloud 3D. With like eight photos, browser based, poof you can make a model. Ben?

Ben Kreimer Journalism 360 is as an educational resource, and it's a timeless photogrammetry capture guide, so it won't take you into specific software workflows. But in terms of doing the capture process, it goes into the details.

Robert Hernandez And I would say the community of creators here. That tip I gave about Icloud, that came Nonny de la Peña, known as the godmother of VR. When this group comes together, we're all like, did you hear about this thing? Or check out that other thing. We're nerding out together. And this community is diverse, and it's important for you to participate and join us as we all define this platform, this new medium together. I believe I'm out of time. So thank you to this incredible panel for sharing your insights, for sharing your time. And for those at home, wherever you are around the world, thank you for joining us. Enjoy the rest of ISOJ.

Rosental Alves Thank you so much for this great panel. I mean, I was waiting here. Actually. I've been waiting for this kind of digital immersion since I heard Andy Lipman at Harvard when I was a Nieman Fellow in 1987. So here is the old man, OK. This was the future, and the future is here. So thank you very much. Brilliant.

OK, so let's let's go on. Tomorrow, we're going to have another great day. So I hope you go now to the Wonder room. We're going to put the link on the chat here, and you can follow the day tomorrow again with another great series of keynote and workshop. The workshop will be on on climate change, on how to improve the coverage of climate change. And we're going to have a wonderful program tomorrow, so I'll see you tomorrow. Thank you very much for participating today. Bye.