

WESTERN SCIENCE SPEAKS PODCAST SEASON 3, EPISODE 2

EPISODE TITLE

Behind the Screens: The Secrets to the Seemingly Living Worlds In Video Games

PODCAST SUMMARY

There's nothing better than losing yourself for a couple hours in a foreign, thought-provoking virtual land. Those experienced in video games will know this typically ends with an irrational rant at a bunch of animated characters on a TV screen, and on truly antagonizing days, a broken controller to boot. So how do video games manage to create a sense of real-world importance? On this episode of Western Science Speaks we hear from Michael Katchabaw of the [Computer Science Department](#) at Western University. He discusses how his lab develops hyper-realistic methods for creating believable online landscapes, how online multiplayer has changed the industry, and where video game technology is heading.

INTERVIEW

You're listening to the Western science speaks podcast. Presented by Henry Standage.

Henry Standage 0:14

Video games are everywhere, which might be confusing. According to data taken in 2015, only 25% of North Americans over the age of 35 even play video games. The video game industry isn't just thriving because people are playing though. In fact, it's because people are watching. Popular online video game streamers are now making close to seven figures a month, due to the traffic generated from hundreds of thousands of daily viewers. Video games are creating a more realistic immersion into the virtual world and keeping those worlds fresh and complex enough that people want to keep returning. Today, we're going to be talking with one of the people who help create the smoke and mirrors that amuse us so much. Dr. Michael Katchabaw from the Department of Computer Science at Western University joins the podcast. Here's our discussion now.

Henry Standage 1:10

Can you talk about some of the things that you and your lab do here at Western?

Michael Katchabaw 1:15

So, the main thing that we do in our lab is we focus on various different issues in game development. And when I'm talking game development, I'm talking video games, because we're in computer science here, it's fun and exciting stuff. Most of it generally revolves around us trying to either make better games or make games in better ways. And most of our recent work is in things like improving storytelling in games, making more believable characters in games, taking a look at creating more adaptive games. So, things that adjust to the players needs and the players expectations. And also, now more so in taking a look at game analytics and quantitative design in games, things like that.

Henry Standage 1:58

How do you go about programming a convincingly human character?

Michael Katchabaw 2:04

It's challenging work. Usually what it involves is going back to trying to model the social side of things, the social sciences side of things. So looking at psychology, looking at sociology, looking at anthropology, taking a look at how real people behave, how they work, how can we try and abstract some of that model, distil some of that down into some of the key or critical elements, and focus on trying to deliver those things. People are surprisingly complex and unpredictable things to try and work with. And what we have to do is try and find some way of, again,

breaking those down to some of the key components that we can then try and model and programme around to try and make more believable characters.

Henry Standage 2:54

When we talked previously you mentioned that it's not necessarily creating a human consciousness - it's creating the appearance of a human consciousness.

Michael Katachabw 3:03

Yeah, it's all smoke and mirrors. It's all about an act, trying to create something that will convince you that they're real, in whatever context it is they're working in. It could be someone who, at the moment, for whatever reason, is incredibly terrified. And so, if they can convince you, through their performance, that they are terrified then they're doing their job. They don't really have to understand what it means to be terrified or actually really feel fear. As long as they can give that performance, then that's really what we're looking at. So, it's not about trying to have something that is truly conscious or truly intelligent, like you're trying to pursue through more traditional artificial intelligence research. What we're trying to do is create things that can act and perform in ways that support the game from that perspective.

Henry Standage 3:55

What I find really interesting is, there's a huge video game market in Asia and so how do you input cultural differences? So, the human in America, their natural acting is going to be way different than a Japanese person.

Michael Katachabw 4:09

That's why I have to take a look at the cultural and anthropological perspective on things because you need to be able to capture those kinds of norms and differences, if you're wanting to try and create something, and then allow what you create the characters that you make to be varied in their way that they ascribe to those norms and those differences, so that's why you need to take a look at a wide range of social sciences to kind of drive models and what we're trying to build here.

Henry Standage 4:43

And it seems like a lot of gaming technology has been focused on building more realistic worlds. And so why do you think that seems to be a point of emphasis right now?

Michael Katachabw 4:54

Well, I think that as we keep going forward, the expectations that players have are getting bigger, bigger and bigger. And so, we see that there's been tremendous advancements in computer graphics. So, our ability to create something that looks realistic that, you know, you see a picture, you see a video of or you see a camera pan through something. And it's like, wow, that that just looks amazing. That is absolutely incredible. But because we're able to do something visually, that looks so good, we have to kind of raise the way that things act and behave to a similar level. Otherwise, there's going to be this very disjointed experience, it's going to be very apparent to the player that they're walking through a world but it's artificial, because it looks real, but nothing actually acts real or there's subtle differences between what you expect. It's really strange, like if visually, things did not look as good, we wouldn't need to worry about things acting is good because our relative levels of expectations would be different, but because we're able to kind of push things so far in one dimension, we have to make sure it's firing in all dimensions equally well, or else the experience is going to seem very disjoint and people will have a hard time being immersed or engaged with things.

Henry Standage 6:15

Yeah. To me, it feels like video games for my generation and now the younger generation are almost like what movies were to people in the 60s and 70s and 80s. It's all about that escape, kind of, from the real world and it feels like video games are getting so good at creating that realistic atmosphere.

Michael Katachabw 6:33

That's true, like people play games for many, many different reasons. But a lot of it comes down to immersing themselves in this pretend reality. And again, if we really want them to feel immersed, then it needs to be something that kind of captures them both visually and intellectually and socially. And in order to do that, we need to be trying to advance the state of the art in all these different directions.

Henry Standage 7:05

You had some pretty cool examples when we talked before. Could you just talk about one of the things you talked about before, which is creating that realism?

Michael Katachabw 7:12

Yeah, so one of the things we did, for example, was we focused on using machine learning to have an AI learn how to act according to a set of motivations you can have. And so we took a look at psychological models for motivations, picked one, and then we started scaling up an AI that would learn by exploring its environment, how to satisfy first being hungry, and then wanting to be hungry, and wanting to be healthy and then wanting to be hungry, healthy, and social, and just kept adding new layers of complexity onto it. But each time you add a new layer of complexity, it'll do interesting things but then also fail in interesting ways that make sense, once you pull it apart and say, why did it do this? See you have something, for example, where it would go to the grocery store and eat in the grocery store as it bought food right off the shelf. Because that was more convenient. And you're then left trying to say, well, how do we, how do we teach it without explicitly saying not to do that? How do we teach it that that's not the way that people act when it's a perfectly reasonable thing to do when you're hungry? And there's interesting challenges that way, which is, I think is one of the biggest barriers is seeing some of these things ultimately show up in video games, and you have to be comfortable with losing and giving up a certain amount of control over the experience. So people that are designing and writing games and writing stories have to say, you know, the more autonomy that we give to these characters, the more capability we give to them, the bigger the chances are that they're going to do something that buggers things up royally. You have to be willing to accept some of those things. As long as those things are happening and ways to ultimately make sense and are reasonable, you have to take this kind of adlibbing by AI, you just have to accept and just roll with it. You use the example of, you know, film and television, well, quite often, you'll have an actor in the moment that will decide, you know what, I'm just going to save this or something strange happens by accident. And you just roll with it. And we need to be able to do that in games. And that's something that we need to be able to kind of loosen some of these controls to allow some of these interesting things to happen and to emerge out of the experience.

Henry Standage 9:41

You've talked about anthropology and sociology already. And the idea of setting social norms and learning them, it's completely connected to that idea too, it's how we came to understand how to operate.

Michael Katachabw 9:52

Exactly and it's trying to capture those things in a way that then comes across on the screen, in a way that makes sense and, in a way, that the player kind of gets and understands, appreciates, and ultimately believes in. There's lots of challenges in trying to do that. So, we've been making some interesting headway because up until this point, it was almost like a vacuum because there wasn't a whole lot of things going on from a research perspective in this. We've been making interesting ground but there's still so much ground to cover. Lots of challenging things to do.

Henry Standage 10:28

Speaking of challenges, so gaming has been shifting to online networking for what feels like almost two decades now, maybe a decade with Xbox Live coming out and those sorts of things. As a programmer, how does this change your work, this idea that everyone wants multiplayer now?

Michael Katachabw 10:45

it introduces some new challenges because of both the scale that you're having to operate under and also just the fact that people are now in different locations. So now you have to worry about latency and communication because you want everybody to feel that they're all in the same world or all playing on the same console. But that

physical distance means that data needs to travel across the city, across the country, around the world. That takes time. And we need to find interesting ways of masking that so that the players all feel like they're all still in the same world. And when we're trying to improve both the graphical fidelity and the AI fidelity, while doing all these things at the same time. These are monumental challenges in computing that we're trying to do. But do in real time in a distributed fashion. It's definitely a challenge. We've done some work here in taking a look at trying to manage and mask latency in games.

Henry Standage 11:49

So, by latency, just give us a definition because I'm sorry some people don't know.

Michael Katachabw 11:53

I'm sorry. Yeah, it's a term we use in the field. It means the delay between things. So you don't want it to be the kind of thing, if you've ever seen lag or stuttering in a game, like you might be playing a game like, say, an Overwatch or Fortnite, and you're watching someone on the screen and you're lining up your shot, and then all of a sudden they jumped forwards or backwards and you miss, or all of a sudden, someone appears from out of nowhere, and shoots at you, and you have no time to react and they weren't there before. Those kinds of things are artefacts of lag and latency because the game is trying to make a single unified look at what the game looks like, when, you know it takes some number of microseconds or milliseconds or even seconds for messages to go from say your console to their server down to someone else's console. Like you're looking into the past or maybe into the future, when you're playing a game online. And so, it becomes this challenge to try and say, how do we try and give everybody a uniform look of what's going on in the game. But not having everybody have to wait to see what that is. If you're playing a turn-based game where you take a turn, and I take a turn. So, we're playing like chess or something like that, then this problem evaporates for the most part, but when you're doing everything in real time, that's a huge challenge.

Henry Standage 13:20

I think there are certain jobs where it's best to be invisible. So, I was a soccer referee growing up. And if people are noticing the referee, typically it's a bad thing, for me it usually means that complaining and I think programming these servers online is kind of a similar thing, where if people are noticing it, that illusion is broken. They're screaming at the TV.

Michael Katachabw 13:43

It's working the best when all of this magic is happening, and no one's aware that it's happening. That means everything's working and coming together. As soon as they're waking up and they're noticing that, you know, that guy is popping as he's moving along there or that AI is running straight into wall and isn't stopping or turning around or doing anything, it's just running into that wall. Those are things that people, you know, notice and say there's something wrong with this. And that's waking them up out of this illusion, this dream that you're trying to immerse them in, in trying to solve those, like, for us as people, those are obvious problems. It's like no dude, he should not be running into the wall like that, or somebody should not be like popping in and out as they're moving across the world. Those are obvious problems to us to see, but to solve those are tremendous challenges.

Henry Standage 14:36

Speaking of that immersion, what are some of the more subtle things that you guys do here to help create that?

Michael Katachabw 14:44

Often, it's all in the little things that you do. So, it's trying so that for example, when you do something in a game, an AI notices that you do that, and it changes how it would act towards you as a result. It's little things like that that we take for granted because as people, we would see someone doing it. So, if you walk into a restaurant and you treat the server in a rude fashion, then you might expect other customers to kind of be looking at you in a strange way. Or the other servers might come up to you and treat you in a rude fashion. Or somebody might ask you to leave the establishment if it persists or gets too bad. So, you expect all of those things to happen as a person, but those things happening behind the scenes require a lot of interactions, some fairly complex machinery in order to make that work. And those are the kinds of things we're trying to do, is to make it so that not only do

the AI's have the capabilities to do these things, but we're packaging up these tools in a way so that we can give them to developers and they don't have to do all of this grunt work and all this heavy lifting themselves. We're creating reusable solutions to these problems so that a developer can be using a package like unity, for example, they can take some of our packages, pop them in, and all of a sudden, things are just working for them. And those are other challenges.

Henry Standage 16:16

I remember sneaking Grand Theft Auto on once my parents would go to bed as a teenager. And just thinking it was something that was so interesting.

Michael Katachabw 16:27

I often use Grand Theft Auto as an example, from like a moral, social ethical standpoint, there's lots of issues with it. Just in terms of what they've been able to pull together from a technological standpoint, is impressive. You might disagree with kind of the content and the direction they take with things. But what they've been able to accomplish is really, really quite impressive in terms of just the sheer variety of things you can do inside those worlds and the amount of interaction, and the variety of interaction you can have within that world. It is just impressive, again, the level of violence and the other problems that it has, that's a discussion for a different time. But just in terms of the technology, it's, it's really interesting what they've been able to do.

Henry Standage 17:16

Yeah. The last point I wanted to cover with you was if you guys have done any virtual reality work?

Michael Katachabw 17:25

Yeah, so we've done some work in VR, some of in terms of building out tools and technologies for developers. So we've done some work with industry. So different companies that are working on different technologies for allowing you to interact with VR, so wearable technology, so that you can reach out and grab things, for example. And we've done some work in building some game tools for developers to go along with some of those things. We've also done some work, more on the application side of things, and in for example, the medical space where we've done work in creating virtual environments for Parkinson's rehabilitation. We've done some work with VR for measuring the impact of heavy machinery on the human body we've been involved in in a few different things from that perspective, and all really, you know, interesting challenges that come through the injection of VR into things.

Henry Standage 18:25

Do you believe in it as a therapeutic method?

Michael Katachabw 18:28

Oh, absolutely. There's obviously going to be differences between doing things in the real world and in the virtual world. But the virtual world has the potential to allow us to do things in clinic that are much closer to how things work in the real world, in a much safer and more controlled environment. So, one of the things we were doing on the Parkinson side was taking a look at traffic simulations, where you're wanting to take a look at how people navigate through a street with cars going past it and having to cross at the crosswalk. And you have to worry about things like gate freezing. That's a tremendous problem that you would not want to explore in the real world because there's obvious danger and implications from doing that. But you can remove a certain amount of the danger from things by looking at things in the virtual world. Now, of course, you can argue the removal of real danger might skew and disrupt things. But actually, what we found is in the virtual world, there's still an awful lot of carryover between the virtual and the real world. So yeah, I think there is a fair bit of potential there.

Henry Standage 19:37

Do you believe it's the final frontier for gaming because I think there will always be a market for people who want to play console, and I think they'll always be a market for people who want to play old consoles like GameCube. But I think for the masses it does kind of seem like that final frontier.

Michael Katchabaw 19:53

I would hesitate in labelling anything as a final frontier, the more we do things, the more we go, I've seen like over the years, you'd say, wow, this is the best I've ever seen. We're never going to get better than this. And then, you know, 2, 3, 5 years later, it's like, okay, that bar keeps getting moved further and further and further down. So I see, you know, the, the introduction and the modernization and the widespread use of VR as kind of like a next step in the evolution of gaming, but I don't see it as a final step, I see several final frontiers from here. And that's what makes, you know, work in gaming and R&D in this space really exciting, is that no matter how far you push that boundary, there's always further that you can keep pushing.