

Faculty Interview

Interview with Christopher Chung

Supervisor, UMRAD-Lab

Coral Gables, Florida, November 30, 2016

Interviewed by Gilda Santana

Recorded by Gilda Santana

Interview Length: 45:41 min.

Summary:

Christopher Chung manages RAD-UM (Responsive Architecture + Design) which is an experimental research lab that provides resources and expertise for project-based research on the spatial ramifications of embedded technology and ubiquitous computing.

Gilda Santana: Can you tell me about your background and how you came to be at the University of Miami?

Chris Chung: I grew up in Toronto, born and raised. I went to the University of Western Ontario, which is in London, Ontario for computer science and economics. I juggled around with that a little bit. I wasn't sure if that was what I wanted to do when I got out of high school, but business seemed like a pretty safe bet. I quickly realized that it wasn't what I wanted to do. But, luckily, I was pretty good at coding when I was in high school, so I switched majors. But after a while I realized that wasn't really my calling either. My last couple of years in undergrad I really started to think about what I wanted to do. Architecture was of interest to me so I started applying to architecture schools. I developed a portfolio during that time. I took off a year and applied to the University of Toronto, where I graduated with a Masters in Architecture in 2014. The current Dean [UM School of Architecture], Rodolphe El-Khoury, was my professor and thesis advisor during my education there. When I went into architecture school I wondered how I could bridge my skill set in computer science which I knew would be an advantage. How could I apply it to my architecture education? At first, Grasshopper and Form Finding were the immediate and obvious paths. Then I met Rodolphe, and he had RAD in Toronto, which is Responsive Architecture and Design. Since you're creating objects to be more responsive and dynamic, so the coding is the interaction with people, which interested me as opposed to

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just formal study. When I graduated he became the Dean here, so when he opened the RAD Lab I applied for the position and got the job.

GS: So how does Miami compare to Toronto?

CC: They're very different cities. Toronto is a very urban city, and I'm used to urbanity. I live on the beach now, and I can't say that I miss the cold. I really like my situation down here.

GS: What are some of the challenges you are facing as a researcher or in teaching?

CC: UM SOA is known for its classical foundations, so there's not a lot of technical support. Miami itself doesn't have a very big tech industry, or even a start-up industry as opposed to, of course, Silicon Valley, Seattle, or even Toronto. Finding supplies was difficult. I have to buy everything on Amazon, so there's always a delay with shipping. There are no local shops for basic electrical circuits, or materials of that nature in Miami. In terms of projects, working with students is great. They have passion and they bring in fresh ideas to the lab, but we have to deal with their schedules. RAD has its own projects and deadlines, which don't always conform to the academic calendar, so finding help is difficult. Again, with the classical foundation of the school, the students are eager learners but they don't have the skill sets. We always look for students who have a passion for learning.

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GS: What projects are you currently working on?

CC: We're still working with Zen City, the smart city conceptual design that the Dean is spearheading in Merida, Yucatan. We're also working with the Frost Museum of Science on an algae [bio-reactor](#) wall. The Frost Museum has a large vertical wall with a gigantic open surface which they wanted to create a program for. We proposed using algae, which has many beneficial properties such as sequestering carbon, filtering water, and, it can be used as a bio-fuel. It grows through photosynthesis, so we proposed putting algae in glass containers that would each have their own opening, so we could control the rate of growth within individual containers¹. The more light it gets, the carbon dioxide it gets, the more it grows and the greener it gets. When you put them in individual containers with individually controllable light sources, and amalgamate them across the surface, you can start to think of each container as a pixel that can display variations of green—a monochromatic living pixel. It essentially becomes a gigantic display, although a very low resolution, using a living organism. That's the visualization aspect of the project, but algae has many beneficial properties that can be used in connection to the building as a façade, in this case the Museum of Science. It can be connected to the graywater/ rainwater supply and use the algae to filter it. It can be connected to the HVAC system, which can be used to sequester carbon. Once the image is done, you can flush out the algae, create a new

¹ Using hexagonal glass jars as the "algae container", a series of acrylic shelves has been fabricated to support 128 jars creating two 8x8 matrices with 3 white LEDs (384 total) placed at the bottom of each jar. Each individual jar can be seen as a living monochromatic pixel and when amalgamated, a low resolution display is created. Each LED can be individually controlled and thus, through photosynthesis, the rate of growth of the algae in each jar and subsequently, the density and color of each jar, can be controlled. Additionally, an air pump is used for each matrix to increase the circulation of air flow within each jar stimulating algae growth.

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image, and sell the algae as a bio-fuel to be used as an energy resource. So, it's sustainable in that way. Initially it started as a conceptual project and then we made a proto-type. It's in the lab with the other projects.

GS: Who came up with the idea?

CC: The Dean came to me with the overall conceptual idea, and then he and I bounced ideas back and forth about how to implement it. It's site-specific to the museum's horizontal surface below, so the idea was that the piping that would contain all the containers to filter the water would then taper to become a roof or shelter that could irrigate and cool the plaza below. There was an issue with the plaza because there wasn't enough shade in that area, so this is how we proposed cooling it through the filtered water. So we did one proto-type with about three lights each, but it took a really long time for the algae to grow and for the image to really come to fruition.

GS: When did you start the proto-type?

CC: Oh, maybe a little over six months ago. Now we're working on a second iteration, improving the design, upping the light source so that it can grow faster. Of course it can grow with sunlight. The idea is that during the day they all get the same amount of light, but then at night is when the lights shine so you can get a display of what will grow. The following day will have an after-effect image of what was turned on and would have grown overnight.

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We had a proposal for a design competition in the Design District for Sunbrella². They were looking for a shading design. Our proposal was a little “out-there”, but, then again, we are the RAD Lab. We proposed a fleet of drones that would guide inflatable parasols that would hover around the area to create shade. So, for an individual, it would be an individual shading device, or, if there were clusters of people, the drones would swarm together to create larger areas of shade. It’s a more responsive and dynamic way of creating shade in any one particular area.

It’s sort of like the same idea as a personal shopper too, when you’re walking around the design district—maybe even carry your bags for you. These drones would, of course, be connected to the internet, connect to a server. There are ideas about connecting them to a projector and microphone so you could communicate with them.

GS: What about privacy? What about capturing other people’s conversations around you?

CC: That’s’ a good question. Of course, privacy and security are always going to be increasingly important topics as we move forward with technology with how pervasive and invasive it is. I guess, in response to this specific proposal, this is a public space so technically it’s fine. In this case, the microphone or speaker are for voice commands. They’re not intended to record your conversations. At night it would flip, and instead of giving shade, the drones would give you light. We didn’t win. I think it was probably too “out there” for them, and they probably found some rule that we broke. But the Dean got

² <https://www.sunbrella.com/en-us/about-sunbrella>

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good responses to it, so we're trying to build one. The other realm that we're getting into is augmented and virtual reality.

I just came back from teaching a course in Rome. It was intense. Unfortunately, I didn't get to see much of Rome, but I was there to work. My course looked at the Tiber river which is the main river which runs through Rome. Historically, it flooded very frequently, up until the time they built embankment walls in the early 1900s. Prior to that they would have pretty large floods about four or five times a century. I'm talking about 20 meters above sea level would cover 50% of Rome. They would be flooded for about five days. They began to put flood markers on buildings to document the year and the height of each flood. They started doing this in about the 1200s but it didn't become common until the 1500s. A lot of those were removed, but there are still many that remain. My course was essentially to teach the students to use tools and software that could use these markers as the basis for a design challenge. The first week the students were taught ArcGIS, the geographic information system, which is a cartographer's mapping system where they could get information about the current state of topography in Rome. Each student selected their own flood marker. Their first task was to use ArcGIS, bring it into CAD [AutoCAD], then bring it into Illustrator, and create a drawing of the breadth and scope of that year's flood. It was a simple exercise to get used to finding data in ArcGIS and integrating historical data into the map—they'd have to find an appropriate historical map—and then draw it. They would get the topography from this. My course was meant to be fun. It was an artistic, rather than a technical drawing of the flood. The next part focused on the design aspect of the course. It was only two weeks so I treated it like a workshop. They were tasked to create a two-part intervention. One would be in augmented reality, and the other

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in virtual reality. The virtual reality is essentially masking your current world with a digital world so you can be transported into any sort of digital model or world that been created—you could go to Hawaii while your'e in Miami. Augmented reality, in contrast, is a digital layer on top of your current reality. These ideas have been around for a very long time. So it's masking any type of digital information and projecting it through or onto any type of device such as phone or a tablet. Now there are devices like the Microsoft Hololens and Google Glass that try to tackle augmented reality. This year it's been all about virtual reality in the industry. So we used the Oculus Rift and the HTC Vive. Next year it should be the augmented reality devices that come out. It's much more difficult to do augmented reality because the device has to be aware enough of the current surroundings to map to a 3D model and then places things in them so that you can perceive them in a 3D space. Another one that's really popular augmented reality app that came out this year was Pokemon Go. But that one only places an object in front of you.

The students were tasked to use their flood markers to act as their image targets. So, they would create an app in their phone or tablet using Unity, which is really a game development engine. It's great because you can use it for architecture visualizations and push it to different platforms such as iPhone or Android. In Unity you build it once and you can use it on different platforms.

When you look at the image of the flood marker would be detected through the device and they would be able to place their intervention accordingly. They had the choice of either completely re-doing the marker, or add to the existing one. The second component—the virtual reality component—could be of any scale and they would need to work together.

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One student did a planter and a type of flower. The flower was on the marker, and the planter was the virtual reality component.

After the drawing exercise, they did 3D scanning of their site which they would eventually put into Unity the following week. They were given tutorials to learn Unity, and then tutorials for implementing AR and VR in Unity. It was a pretty intense two weeks. At the final review, we went to each site. There were fifteen students and fifteen sites, so we used one phone and one tablet.

Having said all that, we are getting into AR and VR in RAD. We have purchased an Oculus Rift.

GS: How much does the Oculus Rift cost?

CC: \$600 for the Oculus Rift and that's not including the computer. The HTC VIVE is about \$900. They have a very high minimum requirement particularly where their graphics card is concerned. We also have the Halolens, the augmented reality glasses or visor, which are essentially a \$3000 computer on your head.

RAD is here for the school. We are still working on the tweaks. The idea is that students could borrow them as visualization tools for their reviews. This course was designed to teach students to put their designs into Unity and then put them into Oculus where they would be able to explore their design within the virtual reality headset. So, right now, we're still experimenting, but we're gearing up for an exhibition in May on high rises with Eric [Firley] and Germane [Barnes]. RAD will bring the technology part of it to the table. The exhibition will look at the history and progression of the high rise in Miami in relation

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to the technologies that revolutionized the building and construction industry. The initial idea is to bring in VR headsets so you can experience the different high rise buildings. The AR could allow you to experience the exhibit itself, or, provide an additional digital layer of information, or perhaps it could be something about a specific building or project. It's still up for discussion.

GS: Are you doing anything for Basel this year?

CC: No, last year we did. We did an installation at Veruska's [Vasconez] gallery (Meeting House³). It was r&d for us, and we worked with an artist, Emmitt Moore(?) who found these videos from the forties dealing with psychosis, the background of which I'm not sure. The purpose for us was to display it in front of the new studio building. We wanted to create a visualization on the side of a building with the creation of custom rods. We're still working on how to control the lights individually—and we're close—and how to make the rods work in an exterior setting. So that's another project that going on.

GS: Well, you've answered a lot of my questions, but, such as "how the field is changing?". You're changing it as we speak!

CC: Yes! For me, architecture isn't just building in the strictest sense. You can enter into visualization. There are architecture students who set up visualization frames, which deals with animation renderings. And now we're dealing with virtual reality as a tool or

³ Meetinghouse is an interdisciplinary artistic and cultural space located in the historic Huntington building in downtown Miami. Inspired by past artists' cooperatives such as Roycroft, Bauhaus, and the Shakers, it was founded in 2014 to further the discovery, dialog and expression across disciplines.
<http://www.meetinghousemiami.org/about.html>

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representing your ideas. There's fabrication, so there's an entire field of digital fabrication, CNCing, 3D printing, laser cutting, all done with robotic arms. It's not what it was maybe ten-fifteen years ago. It's exciting.

GS: It is really exciting, and you're a part of it by bringing some of it to this campus. We've needed it for a long time.

CC: Some people look at it as though we're just making toys. When you're first starting out, it is about tinkering, creating prototypes and proof of concept, before it turns into a commercial product. What we look at is dynamic rather than static facades and rooms—responsive facades and spaces that change and adapt to users' needs—the internet of things. What if your table was online? What does that mean? How do we benefit from that? What about a room, or the entire house, and for that matter, entire cities? We're dealing with conceptual ideas for transportation in smart cities right now. How can visitors work within a city that has the latest smart technologies? How does it impact our lives?

GS: What are some of the people or projects that have inspired you, or, inspire you now?

CC: Traditional architecture inspires me for sure. My favorite architect is Peter Zumthor. He is amazing. The buildings that he does are so much more than drawings on a page. You really have to visit them to experience them. The phenomenological experience and atmospheric qualities of his buildings are amazing. More specific to the work that we do

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in the RAD lab, there's Usman Haque⁴. I guess you can say he's one of the pioneers of the internet of things. He's an architect, I believe he graduated from the AA in London. He's working on a number of responsive installations, as well as a platform that is supposed to help you put your daily objects on line and communicate with each other. Initially it was *Pachube*, and then it turned into *Cosmos*, and now it's *Xively*. It's like a Facebook kind of thing where you put sensors on objects and connect them to this platform that will allow you to connect it to other things. You can write bits of code that tell everyday objects to behave in certain ways in relation to other objects. It connects things across distances through the internet.

GS: So when you say, everyday objects, do you mean you would be able tell your bed to get warm at a certain hour before you get home?

CC: With that particular situation, you would have to have sensors in your bed in order to warm it, right? Say there are heaters underneath your bed, this platform could connect it to your car where you could command it depending on how far you are from the house. Or, you can connect it to an Instagram feed. So, it allows you to apply it to all kinds of things.

So that's one architect that I look up to. Dan Roosegaarde⁵ is another one. He's more of

⁴ **Usman Haque** is founding partner of [Umbrellium](#), formerly known as [Haque Design + Research](#), and the founder of [Pachube](#), a data infrastructure and community for the internet of things. Trained as an architect, he has created responsive environments, interactive installations, digital interface devices and dozens of mass-participation initiatives. His skills include the design and engineering of both physical spaces and the software and systems that bring them to life. <http://www.haque.co.uk/info.php> retrieved 1/11/2017

⁵ Daan Roosegaarde (born 1979) is a Dutch artist and [innovator](#). He is the founder of [Studio Roosegaarde](#), best known for creating landscapes of the future and exploring relations between people, technology and space. https://en.wikipedia.org/wiki/Daan_Roosegaarde retrieved 1/11/2017

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an interactive artist. He created an outdoor path installation somewhere in the Netherlands which was inspired by Van Gogh's Starry Night painting. He placed light absorbing rocks that glow in the dark at night. So, at night, instead of using streetlamps, the path glows. Very simple. He has another installation of bushes with lights that flicker color and light when you walk across them.

GS: You're attracted to the connection between the practical and the fantastical.

CC: Yes. Always. You have to have a little bit of both. Of course, we're in academia. Hovering around the conceptual is great, but how you make it work, how you build it and make it real is also important. That's what we do on a daily basis by creating prototypes.

GS: How can the libraries support, and have more engagement with the RAD Lab?

CC: That's a great question. In this day and age, with the internet, we can find all sorts of resources online. But of course, with every project, there are always precedent studies. I don't think that books will ever go away. I love having them and I have my own collection. I don't use the library every day, but I do use it to find books that I need. I see it as a great resource. When I first got here, there weren't a lot of books that were applicable to the type of work that we're doing, but there seems to be a growing collection. I think that the journals are great, but sometimes I don't have the time to sit there and read them.

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GS: Well, the Dean and I talked about having mobile, micro-libraries and tagging books so we could track where they are within a particular radius. That is my internet of things.

CC: That's a great idea in terms of improving flexibility. I'm thinking that you could have an app on your phone that says, "Chris has this book right now".

GS: Unfortunately, that is illegal. It's a privacy issue. It's considered an infringement on somebody's privacy. What you can do is send a message that says, "someone else is looking for this book, please be kind and return it", without having anyone know who's requesting or who has it. We do that now. You can request a book that has been checked out.

CC: The architecture library is central to what we do. You'd have to add some sort of geo-locator sensor to the book. It would be pricey.

GS: That sounds like a grant-funding opportunity for me to look into. I'm interested in designing a next-generation, architecture library—one that capitalizes on the relationships between the model-shop, the RAD Lab, the fabrication lab. I see it an information constellation, which is connected to other constellations such as CCS.

CC: Do you have books on how to use the CNC router for instance?

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GS: No, we don't have those items, but it's an excellent suggestion. I imagine that the literature would be in the model shop. Thank you for participating as one of the "new" voices of the School of Architecture.

END OF INTERVIEW
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