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SPEAKERS

Paul Cutler



Paul Cutler 00:02

Welcome to a very special Halloween episode of the circuit Python Show. I'm your host Paul Cutler. I took the show on the road this episode is I traveled two hours east from my home just outside of Minneapolis, Minnesota, and met up with Jason P core of the Loreal technology who introduced me to the trolls. Jason and I are outdoors at a park so you'll hear some background noise, and I'm a little too far away from the microphone. Sorry about that. Also, you may want to check out the show notes and YouTube link at [Circuit Python show.com](http://CircuitPythonshow.com). For some photos and video that I took as well. You'll meet Jason and the trolls right after this word from our sponsor. This episode is brought to you by PCB way with over a decade of experience. PCBWay is one of the most experienced manufacturers and printed circuit board prototyping and design. Whether you're an engineer, student or hobbyist PCB way offers a simple and fast prototyping service. And it's cost effective at only \$5 for 10 boards, and check out pcbway.com/project Where PCB way helps makers and hobbyists collaborate on their designs and projects. Make your design a reality and check out pcbway.com for all your PCB needs. And they also now offer CNC machining and 3d printing services. Visit pcbway.com for more information, thanks to PCBWay for their sponsorship. Jason, welcome to the show.



01:22

Thanks, Paul. Appreciate it. I'm really looking forward to something like this since you started your show. So I'm really excited. Thanks for having me. I'm



Paul Cutler 01:27

glad I could come on site and I wasn't too far away. Yeah,



01:29

it's great when you know, knowing how close you were in Minneapolis, I was like pika, come on,

say this would be really, really fun. It's a pleasure to meet you.

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Paul Cutler 01:36

Tell me how you got started with computers and electronics.



01:39

Let's see. Well, when I graduated from college, I went down to Cedar Rapids, Iowa, and worked for Collins down there and worked in a GPS group doing GPS actually simulators, and then moved into FPGA and ASIC design group down there, which is how I got my feet wet doing that. And that was in Cedar Rapids. And then after a few years, I came back here to Eau Claire, Wisconsin, which is the area that I'm from originally to go to work with an ASIC design services company. And we did primarily I was a verification engineer on the design services side, and did that for a number of years. And we did a lot of stuff in the networking space, high end networking, supercomputing, things like that. And our company went through a handful of acquisitions over the years, like most companies in the high tech space do. And the last one kind of ended in 2013, we were part of a company out of the Silicon Valley called Open silicon. And they went through some bumpy times ended up shutting our design center down. So we started another company called superior on technology in 2013. And at that time, I had kind of moved mostly into doing business development type of stuff. I still like during the technical side of things when I could, but mostly responsible for business development and marketing, that kind of thing. So we continue doing the ASIC design services work. But around 2015, we had this idea to do a product and we saw the whole Arduino thing coming alive and the whole maker movement and we thought man, it'd be really fun to do something in that space that tide in the FPGA side of things, because that eight bit micro on the Arduino is just underpowered for a lot of stuff. And we saw people trying to use it for things like motion control, and servos, and motors and thought this would be a great place for an FPGA. And we came out with a board called Accelerate, which was our first product, which is based on a max 10 FPGA from Intel. It's got an embedded eight bit micro in it. AVR compatible, fully programmable with the Arduino IDE. And we launched this company called the Iariam technology at the time just to change the branding, to not confuse our ASIC design services customers. And that was really the beginning of this. And I came out of the world of doing electronics hands on and doing the chip design stuff to business. But then when we started Laurium, I couldn't resist getting my hands back into the hardware specifically for our demonstration videos and things like that on YouTube. So I would write code and hook things up. And that's kind of how I got back into getting my hands on the hardware and writing code. In the in with the learning technology, hardware.

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Paul Cutler 04:05

How did you discover circuit Python? Oh, man



04:07

circuit Python. So I think I got into circuit Python around 2019 or so I think that's right. Maybe late 2018 or maybe early 2019. What I know is this is at the time I got involved. I adv Ada was

late 2019, or maybe early 2020. What I know is this is at the time I got involved, Lady Ada was still lurking around the discord server and actually answering questions, and you don't hardly see that anymore. So it was a while back. And because I had a few questions where she just directly answered and I used a lot of Adafruit stuff already. We use a lot of it and even with the stuff that I would use with our hardware, I was buying Adafruit accessories like the lug NeoPixels some of the other hardware they have. We were using those already and so I just was naturally tracking with what Adafruit is doing. I think I I'm a big fan of of Adafruit. And I think Lamar is a genius technically, and I think that Phil's a genius in the marketing world and they're just super fun to watch. Not only as a consumer of their products, but as someone running an electronics business, there's a lot to learn from what they do. So when circuitpython came along, I'm like, This is great. I like Python. Anyway, I had designed some stuff in Python just on the side for my own stuff. And not in the micro world, but just for some ion and Raspberry Pi's. And so I naturally found it through that progression. And I think the first thing I ordered was like a metro and for Express, I believe, so again, our Arduino Uno footprint, but with the M 40. And it was right around the time PI portal was being designed is when I kind of got involved with it. So that that was one of the first pure, like, really exciting purchases I bought was the PI portal.

 Paul Cutler 05:42

So I'm standing here in a park. We have a bubbling Brook behind us, right? And I'm looking at three trolls. Yes. Tell me about these trolls. Sure.

 05:51

Well, these trolls are interactive art exhibit that the city of Altoona commissioned in originally in late 2019, I think early 2020 was when we first got involved with it in the idea was to create something that kids could interact with, that would be touchable art that they can play with. And there's a designer in Sweden, that specializes in interactive children's art displays, and artwork and sculpture that they found, I don't know the story on that. But then they started working with a local fabricator to do the metal work and the actual design of the structures. And that's how I got connected and how we got connected on the electronics. So what these are, and I'm gonna walk here in front of your camera, if that's all right, and you're gonna see my microphone, because this is what we got to record with today. But what you see here is there's there's three trolls, and you can kind of stand in the middle of them. And every one of these trolls has four panels on it, that will activate audio and turn the lights on. And so what we've got is, so I'm going to touch this one, because I know that this is one of the things. So so the hammering in the background is construction, that's not coming through the trolls. But what will happen is there's four panels on each one of these, that when you touch them, it enables a signal, or it enables an audio track, the eyes, the eyes light up. And all together, there's a total of 12 tracks with this consistent audio and all the audio was recorded by the designer, one of his partners in Sweden, they're very culturally correct for for kind of the lore around the trolls. And so if you have all 12 Be in touch, you get this 12 track audio piece that plays it's about 30 seconds long or something like that. And it just continues to loop. And the idea is that kids can come down, they can search for the touchpanel that plays the audio, and that lights up the lights. And it's a huge, huge hit with the kids. Kids love coming down here and playing with it.

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Paul Cutler 07:49

We've already seen one group of kids come in play, right? We're here today about a month into the school year. So not a lot of children are out right? What's it like in the summer,



07:57

man in the summertime, it's really fun. I, every Wednesday night, there's a there's a concert series here in the park in the evenings. And my wife and I like to come down and we listen to the music. I like to walk around and see it happening because there are kids just lined up everywhere. Everyone's touching it, they want to play with it. They're playing games and things like that, of course, the panels are the same. They've been the same the last two years. And so the kids that know it know it, right? They know how to get to it. And they know which ones but there's always new kids, and they're teaching them how to play with it. We see adults coming down and checking it out. And it's it's a really fun thing to watch them play with. Yeah, it's very popular. Some of them like to kick it. If you look closely, you know, you can see shoe marks on there. But I think it's really a testament actually to artists and Forge is the name of the company that designed the structures. And this is all anodized aluminum on the faces and steel all around it. They're extremely robust physically for sure

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Paul Cutler 08:53

how they're going to have to be. Johnson winners. Right, right. Tell me about the circuit Python here that's inside here.



08:59

Okay. So circuit Python was absolutely instrumental in the genesis of this idea, because when I got contacted by the owner of artisan Forge, he told me about the concept told me how what it needed to do. And the original designer from Sweden had kind of an idea of how it would work, but didn't have the electronics background to really know how to do it. And the first thing I thought was Touch play audio light lights. I mean, it's the it's it's the Adafruit world, right? It's the it's the circuit Python world, it's blinky lights, it's things that move, it's things that make sound, it's interactive. And I just happen to have a circuit playground express on my desk. And so I grabbed that. And I hooked it up to a little tiny speaker that had just this little really small battery powered thing. And I put a few sound effects on there. And I walked into his office to talk to him about and I said, Is this what you want something like this only on a bigger scale. And with just a little few lines of circuit Python code, I was able to demonstrate touch the touch thing It plays some audio, he gets all excited, right lights up the little light on the on the board. Everyone's excited and happy. And then it just scaled from there.

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Paul Cutler 10:08

Now did they have different ideas that they wanted to do before circuitpython.





10:13

So I brought in this little circuit playground Express demo. And it was really based on a description that the original designer had done, but his idea involve more like really expensive synth modules and other control things and MIDI stuff running around. And that's still left open, like how are you going to detect it's being touched, there were some other ideas that they had based on talking with people kind of in the industrial controls world. So using PLCs, and very expensive solution. And, again, when I saw it, I thought this is, this is a perfect fit for this kind of these kinds of electronics. And when I was able to just so quickly show up with this thing working. And again, it's I mean, it's no genius on my part, because the libraries are there, the hardware is there, everything's there, it was just sort of being able to think through, well, I could just stitch this stuff together, and just respond to a touch and play an audio. So I mean, all the pieces already existed, it was just putting them together to create the right picture with it that did what they were looking for.



Paul Cutler 11:07

So what are those pieces that you're using to actually do it? Sure there



11:11

are. So each troll has a box in it that handles the input from the touch sensor and lighting up the lights. And that's a such a feather in for Express. And then a touch sensor breakout board is got is in each one of these. And those are all running circuit Python. So those detect the touch. So I think if I'm remembering correctly, I think it's a spy connection, or is it I squared C I remember which one to the touch breakout. And then I think it spies and spy back and forth to the touch sensor breakout that detects the touch communicates to the feather which lights up the LEDs, and then those each send signal back to a main troll. So one of the trolls has kind of got the main This one's the main troll. This has got not only this assembler, M for Express running circuit Python to detect the touch in light, the lights, those all talk to a fourth feather and for express that is running. That one's not running circuit Python, that one's actually running Arduino code. And that one is communicating with the board that's doing all of the audio, which is another board. It's a tsunami super wave trigger.



Paul Cutler 12:15

And what does that do?



12:17

The tsunami superwave trigger is it's a SparkFun board that is specific for playing audio, and doing MIDI stuff. But what's awesome about it is it can handle like I've got 12 tracks of independent wav file audio running on that, that as soon as this powers up, it plays all of those at the same time in sync. And it just turns the volume down on all of them. So as you touch each panel, I can independently turn the volume up on every one of the tracks. So as you add panels, you can hear, you know, here's the different audio playing for all 12 tracks,

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Paul Cutler 12:49

let's take a moment and play some of that audio. Alright, so people can get an idea, I'll do this one.



13:05

It's tough to get all four. You know, that's hard that makes it really fun with kids because one child can't touch all four panels at the same time. So they kind of have to work together. So that's why you get a group of kids around here to get if you want to get all 12 tracks playing at the same time. You need a lot of kids, at least six right to get them going. And so it makes it a lot of fun. So there's a lot of circuit Python running in here. Each each one of these has a feather running circuit Python. And then there's another feather running Arduino code to handle the communication with the audio

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Paul Cutler 13:35

board. So for folks who haven't been to Wisconsin, it can get hot in the summer, and it gets cold in the winter. That's right, all of these survive



13:43

the climate that that has been kind of an interesting part of the journey. And we've experienced troubles with both, I think. And the first one was really this this spring, I showed up this spring. So they these get powered down in the wintertime. And it's just running on a battery. There's a solar charging station here that's powering a 12 volt battery. And that's what powers the whole system. So there's a there's a marine amplifier in there and speakers, which is how the audio is running. So all of that's being controlled by that and all the electronics are being controlled by that battery. And the battery gets charged in the summer with the panel. So they shut it down in the wintertime. And then this spring when we came to when they powered it back up. I got a call that hey, they they're not working, something's weird. And I generally can tell because I know the architecture, the thing, it's like, well, if I do this and it lights up, it doesn't play audio. I mean, you kind of get a vibe for what's probably wrong. These didn't make any sense what was going on. What we ended up doing was was took the faces off, gotten into electronics and just the board wasn't behaving. It was weird wasn't right and had been out here in this all winter long as it gets really cold right below zero you get january february of strings of days that are 1520 degrees below zero and these parts aren't industrial design parts, right? They're just commercial raid stuff. So we are asking a lot of this hardware and it has performed magnificently. Honestly, all I did in the spring was I had to reinstall circuit Python. So I actually got up to the I moved to version seven, or I can't remember what version I went to upgraded some libraries, put the same code back on. And then also just reprogram the Arduino one just for good measure. And then everything just worked. Just work. And it works all summer with no issues. It's really funny because Paul, you and I had scheduled this time, and I'm not I'm telling you, like two days after we scheduled learning to get together, I got a call that one of the trolls is experiencing some issues. What I think happened in the winter, it was just, it's really cold. And I'm not a devices guy. I don't know enough about ICS and stuff to know how all that works

or flash memory, but my guess would be it got cold enough that some bits flipped somewhere in the memory in the flash that's onboard that thing and it just didn't work. As soon as we reprogrammed it everything worked. Now, people out there that know how this stuff works probably laugh at that hypothesis, but I don't know. It's something weird happened and it happened after winter. So who knows what it was the summer one. There's this one troll here that that this we call him the blue troll. He's kind of bluish gray. You can see the sun shining on it right now this gets full sun pretty much all day and in the afternoon really, really bakes. And this is the one that stopped working about two weeks ago, came down did some testing tried the whole reprogram approach again. And that didn't work. The I don't know what's going on. When I when you power up the the M four Express. The lights just come on all the time, which doesn't make any sense because that's not what it should be doing. There might actually be something going on in the NeoPixel ring. So that's more Adafruit stuff, right? Each one of these eyes has a small I think they're the seven, or I can't remember how many are in the little tiny ring. Each one of these has a little NeoPixel Ring behind it that turns on, it might be the ICS, and those for all we know. But there were some other things not quite working, right. So we pulled the control box out of that, and figure that out over the winter. It wouldn't surprise me if just the heat from this did some damage. I mean, this thing is out here all summer long. But it went from May until middle of September with not a single glitch. And these things get used hard all the time all summer long. So I would say we're expecting a lot from these electronics for what was completely an experimental concept and design and implementation. They are working fantastically. And we may need to do some things to figure out how to mitigate the the environmental ills. But otherwise, we've been super pleased the city of Altoona loves it. The they love it, because it's a great attraction, and circuit pythons running right at the heart of every single one of these. So really cool.

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Paul Cutler 17:44

That's awesome. Yeah. Before we go, I have one question that I ask you to my guests, right? You're gonna build a project or a prototype, which board do you reach for



17:54

my go to board on the circuitpython side is a pipe portal. It's sort of my original love, you know, like it was the first thing I bought that was just purely circuit Python. And I love the UI piece of it. So there's something it's it's a little bit IO bound. So if you're going to do a lot of things that have a lot of IO, it's not the best solution. But most of the time I'm not, you know, I'm doing something with I squared C, or one or two outputs. And it's internet connected. If you can do you can touch the screen you can do a year I think it's a fantastic device. I love love, love the PI portal. And I keep waiting for an excuse to buy the the the giant what's the big one, the Titanic Titanic Titanic tunnel. I haven't found a good enough excuse yet. The last thing I bought along those lines, I actually bought the macro pad kit. I love that thing too. So

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Paul Cutler 18:41

I was just about to say that my macro pad gets the most use for my PI portal is also my favorite IT devices



18:47

and it's just so much fun to to work with that stuff. And just that immediate gratification of being able to change those. Is is awesome. That's my favorite. Honestly.



Paul Cutler 18:59

Jason, thanks so much for being on the show. Absolutely.



19:01

Thanks for coming over. It's great to meet you.



Paul Cutler 19:04

Thank you for listening. transcripts and show notes including links to photos and video of the trolls are available at [Circuit Python show.com](http://CircuitPython.com) Thanks to PCBWay for their sponsorship. Until next episode, stay positive