

PROFESSOR: I don't have anything very structured, but I just want to get the conversation going. The first question I have for you guys is, tell me about a time you had to problem solve. So I want you to talk to the person next to you and discuss when you had a problem solve today.

[SIDE CONVERSATIONS]

Girld who--

AUDIENCE: Build.

PROFESSOR: Do I have any volunteers for some good examples? How about on the rest where-- OK, go ahead.

AUDIENCE: [INAUDIBLE]

PROFESSOR: What'd you do to--

AUDIENCE: Well you have to figure out where exactly you went wrong so you can fix it.

PROFESSOR: Nice. What about you?

AUDIENCE: It's not very like an intricate problem, but everybody in my family has an iPhone. We all take each other's chargers if we lose our own. So to solve that problem I got a Sharpie and I drew a heart on my charger.

PROFESSOR: Oh, nice.

AUDIENCE: And I knew this is mine. And I couldn't take it anymore. [INAUDIBLE]

PROFESSOR: That's a good idea. Anyone else? Anyone-- how about for the raspberry pie activity? Did everything work flawlessly?

AUDIENCE: Probably not.

PROFESSOR: Yeah?

AUDIENCE: If I brought that picture of the camera up on the camera it was upside down and backwards. We figured out how to flip it and make it right.

PROFESSOR: Oh, nice. Was it hard figuring out where to put that line of code?

AUDIENCE: Kind of. We figured out which section was brought up on the camera and which section was brought on the computer and put it in the right one.

PROFESSOR: Good. How about for processing? Any good examples? Yeah, in the back.

AUDIENCE: I had to figure out what the camera was trying to see, so--

PROFESSOR: How'd you figure that out?

AUDIENCE: Well, [INAUDIBLE]

PROFESSOR: Great.

My next question is, how would you improve the camera you built today? So this time turn to someone behind you or in front of you, and tell them what you would do differently.

[SIDE CONVERSATIONS]

PROFESSOR: Girls who--

AUDIENCE: Build.

PROFESSOR: Do I have any volunteers from the second row? Yes?

AUDIENCE: We said that we'd make the camera more durable, because ours broke and so did theirs. Like the plastic part where you hold it together.

PROFESSOR: Nice. What kind of material do you think you would use?

AUDIENCE: We like metal or a better plastic.

PROFESSOR: Did any of you guys play with Alex's lenses? Did you see how protective they were? And a lot of professional photographers, they break them all the time. So-- yeah there are ways to make it more structured and prevent it from breaking.

Any other ideas besides the case? Yeah?

AUDIENCE: The speed. It would take a photo a couple seconds after you pressed the button.

PROFESSOR: Yeah.

AUDIENCE: So it would be a lot easier to photos if the moment you see the image you want, if you took the photo it would get that exact moment instead of like two seconds after of something.

PROFESSOR: Yeah. That's a really good point. Anyone else? Yeah?

AUDIENCE: I tried to make it so that when you are zooming the camera around and looking at the image on the screen it moves more smoothly, so that it's not jerky images as you're moving.

PROFESSOR: Do you guys remember how in the code it said-- you had code for displaying that image, and then you had code for displaying the-- or capturing the picture that you took when you pressed the button? So when you have that code for capturing the image, when it's displaying on the screen it's actually taking that image and then displaying it to you. So that's a lot of work for a computer to do versus just-- I think Gavin actually had looked at that.

AUDIENCE: Yeah. I was trying to make it faster.

PROFESSOR: What were your ideas? What would you have done?

AUDIENCE: So there's a way that you can just write some memory instead of-- so there's different types of memory. There's RAM versus your permanent storage on the SD card. The SD card is a lot slower. So you can save it into your local memory and cache it, and then throw that one the screen without interacting with the file system. That should be faster. But I didn't get to it.

PROFESSOR: Sweet.

The volunteers are thinking about this stuff, too.

The last question I have for you is, tell me about an Instagram filter that you changed from the original instructions. So this time turn to someone next to you, but someone different that you haven't talked to yet.

[SIDE CONVERSATIONS]

Girls who--

AUDIENCE: Build.

PROFESSOR: OK. How about from the third row. What did you guys change with your filters? Any volunteers? Did you guys just keep it the same the whole time?

No? What'd you do?

AUDIENCE: Oh--

AUDIENCE: Wait.

PROFESSOR: Oh. You can both go.

AUDIENCE: Oh. I did one where you could click it, and then I just put on the [INAUDIBLE]

PROFESSOR: Oh, nice. Did anyone else do the image effects change? Oh, nice. One person back there.

What about from over here? What did you guys do with the Instagram filters? Yeah?

AUDIENCE: Well, [INAUDIBLE] the original instructions. We changed the colors on the first one from a red-ish, greenish color to a lavender.

PROFESSOR: Oh, neat. Cool. The RGB values?

AUDIENCE: Yeah.

PROFESSOR: Yeah? You, too?

AUDIENCE: I messed with the turn everything except the color you clicked on into grayscale one to turn it into-- turn just the color you clicked on into black.

PROFESSOR: Oh, nice. Those are all really great ideas.

So this concludes the program. I hope you guys had a wonderful time and learned about things that you wouldn't normally think about when you think of computer coding and engineering. There were a ton of people-- all the volunteers in the

morning, and then the ones in the afternoon, and our keynote speakers. So they are in the room next door, but let's give them a round of applause so they can hear you.

[APPLAUSE]

And you guys probably caught on to this, but most of us work at MIT Lincoln Laboratory. I do ocean robotics there. And I hope you got a chance to talk to your volunteers and hear about what they do at the lab. We do all sorts of things. And SolidWorks also sponsored this. And MIT OpenCourseWare-- have any of you guys heard of that? Raise your hand if you have.

Oh, not too many of you. Good.

So MIT OpenCourseWare is online curriculum. So if you guys want to get this code, we're publishing it online so you can play more with it and get the software and all the instructions. We also have a curriculum and wearable technology. So you can check that out, too. And all this information will be sent to you in an e-mail. And we also have a Facebook page, it's just Girls Who Build, and a Twitter account. And I'll be posting all the material and photos from this workshop on those websites.

So with that, I have a bunch of fun demos for you guys. We have 3D scanning, and photogrammetry, and a light field camera in the research area. So you can rotate around the stations and ask questions and talk to the volunteers. We also have the computer still set up, so you have a little bit of time to keep playing with the code and the cameras.

So in conclusion, thank you all for coming. And feel free to come up to me and ask me more about camera technology. We'd happy to tell you about other fun projects you can do.

Thank you, guys.

[APPLAUSE]