

# snn-qapb-obz (2023-10-11 16:05 GMT+2) - Transcript

## Attendees

Aarsh Thakker, Addisu Taddese, Bonolo Mathibela, gajendra nagar, h sh, Haolong Wang, jishnu, Kimberly McGuire, Kimberly McGuire's Presentation, Mayank Joneja, Ramon Roche, Reddy.chaitanya Aswini Kumar, Sampath Ganesh, Serif Burak Orpak, SGN\_ \_047, Tim Tuxworth, Vignesh Balaji

## Transcript

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**Kimberly McGuire:** All right, so thanks everybody for joining on this 11th. September meeting. Of Arobotics Community Working Group. So today it's going to be a discussion developer meeting about a topic that we've selected in the past, which in this case is going to be simulation. So, I'm going to host, I'm Kimberly McGuire from bit Grace, Ramon Roche will be on the backends, although if his voice allows him to,

**Ramon Roche:** Hey, thank you, everyone. Thanks for joining us.

**Kimberly McGuire:** Yeah, thanks a lot for joining. So like I said, introduction topic it's simulation. So we'll just have a little bit of an intro for death then very easily. We're just going to have a discussion about that but people can kind of Express their difficulties with the simulators for errorabletics or things that can be improved. So, then we can kind of discuss about things in general and then conclusion a couple of announcements and then we're just going to have the announcement for the next meeting as well. So there's all should be within an hour.

**Kimberly McGuire:** And So simulates for our politics. they're already a lot of simulators out there. Obviously, gazebo is one of them. My favorites. Also, Whipples, This is the one from the Ladybug and Moses, most of them kind of supports some kind of aerial dynamics. which means is that they're able to have something that's able to fly in the air. and people use it for different purposes for fishing. Based navigation to try it out. First on the simulator for control-based sign or swarming at each of the simulators kind of needs a different set of. I'll say qualities data to the application of topic. And that is perhaps of something that we can kind of discuss now. Among other things. I made a list of simulators you can find them in the errorabletics. landscape, perhaps Ramon, you can maybe Share the link in the chats.

**Kimberly McGuire:** Where we already have a couple of simulators they're out there. There's many more but kind of like the basic, of course, because ZIBO is a very stable one that people use Web bolts, as Quad culture dynamics in there esexim from the video, that's starting to be quite popular. These days, there's also simulated sacraments for area or both aerosene from Microsoft although they're going to deprecates that soon or they're not going to be longer maintain it and from the piloting training community. Somebody also mentions in these flights gear and explain. I've never tried those before, and from the RC the remote control community, people who tend to use real flights to simulators and reinforcement learning, you have Bible and everything and they have quote to

**Kimberly McGuire:** There as well, I guess. maybe I have a nice pool out for you guys to maybe fill in. Which simulator you're using at this moment? And if you go to the I've launched a pool right now. Which is, finish your right on real engine, is missing. However, that's actually perhaps something. Also kind of like something different, but you can make a of course.

**Kimberly McGuire:** So I'm now kind of talking about verbotix for both accumulators were where things are kind of enveloped in one physics simulator, rendering simulator, although in real engine has it as well. Is everybody able to see the poll though? So if you go to The triangle square. Circle. There should be a pool available that you can kind of like both of which simulator use ic2 votes already, but we have more people. I'll guess the food myself, too.

**Kimberly McGuire:** We have Sevenfolds. Eight votes.

**Kimberly McGuire:** yeah, of course. If there's anything missing in the list that you're using, of course, and say that in the jets, like, the motto, Beauty toolboxes, Indeed I'm aware of that. I think I've tried that one really long time ago, but I don't know what the current state of that one is

**Kimberly McGuire:** Yeah, let me just end the pool right here, then I see nine people.

**Kimberly McGuire:** Nine people for the votes. somebody said there should be multiple options for this ball. I agree. Unfortunately, that's not really an option. I think in these polls but just use the select, the one, whatever you're using right now and that is fine. So, if I if you are still holding, you using the old gazebo, and then after that's the new Casey was mostly being used weapons. Only one, that's probably me. And somebody actually is using Bible. But I'm actually surprised because I thought it would be more. wide range, but as somebody already said, it would have been easier for people to actually have multiple Options out there, So at least that we have gonna have An idea that gazebo is very brightly used in the arrow for this community at least. From you guys.

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**Kimberly McGuire:** And then there's of course raw simulation packages that's either they support roles ordered So router s is a rose one package. That's many have used that was developed by the University of Ed Zurich and I have Flightmare. Also I think that's also only rose one and yeah. Jim Bible drones based on Bible as well because simulator and there's probably many more out there but it's currently in the list and if there's anything missing or if of any other type of simulator package, kind of that combines also like the middlewares things with that and perhaps also that you're able to switch between the real thing, and the drone like you just let of course. That's still any chance.

**Kimberly McGuire:** And there's also a couple of nice comparison papers out although there's not really one specifically for aerial politics but it's just for both reports in general. Yeah. So there's a couple of these comparison papers where they actually lists several pay. simulators that are suitable for arabletics and I've also co-organized and 2023. I could workshop the role over book, simulation element aerial vehicles and hopefully that's will. Yeah. So there's going to be a paper about that as well. So hopefully we'll have a specific review paper about that.

**Kimberly McGuire:** Yeah, kind of discussion topics, very quickly. I would say, Let's start with some kind of initial faults. What are your experiences with the simulators? what do you like whether you don't like? Yeah, what is important for rendering versus dynamics model for first parallelism is also you parallelism. I mean more kind of the swarming capabilities, what is more important and whatever kind of color comes

up with it. So let's kind of have an open discussion about this. initial thoughts. What are your parents with the simulators?

**Kimberly McGuire:** so yeah, for instance, a lot of you used the old gazebo in terms of What is your experience with that? Do you like it? Do you

**Kimberly McGuire:** You can use a chats or you can. Just say, comments.

**Kimberly McGuire:** Yes. Go for it.

**gajendra nagar:** Yeah, can you hear me already? Yeah. So I mostly use the old gajendra and...

**Kimberly McGuire:** Yeah, of course.

**gajendra nagar:** one. Good thing about gazebo there is a plugin system that makes it very easy to use if you want to develop anything like custom physics module or something else, apply some effect or do something. So, That is the easiest way to connect with the cross middleware and doing things. So that's why the ganeshibo any. I also work with some of these slide here and so flight gear mostly I use they can wear jccs So with that is also the working principle is kind of similar. They have model files and they have plugins. so that is by simulation experience, Still. I also tried five bullet for the reinforcement learning, but the five lit.

**gajendra nagar:** When I try it was only used for these reinforcement learning. That is nothing else that you can do. That is slightly use a song to fly apart daughter and to control using iron.

**Kimberly McGuire:** Hey, alright.

**Kimberly McGuire:** Yeah, that's good. It could be the case. I put five bullets in there because there's this gym pie bit of drones, that's kind of built about maybe they also...

**gajendra nagar:** Yeah. Yeah, that is the time.

**Kimberly McGuire:** but maybe actually that Jim Pipel of drones makes it actually capable for drones specifically. So yeah. maybe I should Change it up.

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**Kimberly McGuire:** Is there also particular reason why you're not using the new gazebo yet?

**gajendra nagar:** So I am still in between to transitioning to Ross to completely, so that's why I am stuck on the old gazebo. So, probably in a month or two, I'm trying to move from Rose, 1 to rosters, then I will be switching to you busy.

**Kimberly McGuire:** All right. Is there anybody? That is like that the gurney working with the new gazebo that have any comments on their experience with flying in a cloth router, and there or something like that.

**Kimberly McGuire:** Not everybody at once.

**Kimberly McGuire:** Let's say I've been mostly kind of dwelling around the world's myself now these days but I noticed when I tried out the new gazebo about and half a year ago or something like There were actually a lot of messages that weren't really implemented yet. Because you had rotor S. Which was then

kind of integrated into gazebo. So at least this ignition messages were taken off and far from as well. but that wasn't transferred at that point. Because people new I'm not sure what the current state of it is. I don't know if anybody has And the experience in. This. And

**Kimberly McGuire:** Though, all anybody else wants to kind of like, b\*\*\*\* in their experience with the simulators are like if you're anything that you're unhappy about proofs, Yes, go for its

**Vignesh Balaji:** Hi. So I just want to add one comment before that is Also part of rotor X. Because I saw rotor Tim was also developed by one of the universities. So I was not sure whether they were also

**Kimberly McGuire:** a roadster tea. That's a good question.

**Vignesh Balaji:** Yeah, I saw a few papers them some two three papers on them. It was developed by a case University of Washington. I'm not sure.

**Kimberly McGuire:** Mm- I'm actually not aware of their simulator to be honest like I know wrote or...

**Vignesh Balaji:** Yeah.

**Kimberly McGuire:** but Rosetta, yeah, It kind of rings a bell, but I kind of thought it was the same thing,...

**Vignesh Balaji:** Yeah.

**Kimberly McGuire:** but it's apparently not the same thing. Right.

**Vignesh Balaji:** I was thinking that probably it might be same thing. Yeah. So yeah,...

**Kimberly McGuire:** No. Yeah.

**Vignesh Balaji:** one thing that's a bit confusing for me is basically. We are talking about a lot of Simulators and I see most of them use Simulink a lot as a starting step, mainly from academics. Yeah. Yeah.

**Kimberly McGuire:** Yeah.

**Vignesh Balaji:** And others also useful for other stuff. What I would like to know is that what makes them different as a very contrasting future. of Kimberly When you start using basic a Simulink model and then you start going to any simulation platform. What makes it so different.

**Kimberly McGuire:** Yeah, that's a very good question because a lot of people are confused and sometimes I'm confused about it as well at least from wrong yeah forth. No.

**Ramon Roche:** Yeah, I think That's part of what we're doing today, just trying to figure out what we set them apart and starting from the perspective of the people that are actually using this so that we can go from there. Hopefully as part of the landscape we can provide this information to everyone else and answer that question. But I agree a lot of these simulators seem like the same and in reality, the core principles behind them or not to say, I mean, I think that's what we should be trying to figure out in the work group.

**Kimberly McGuire:** Yeah. yeah. No worries was a very great. Yeah the addition indeed that there's also something that we kind of want to kind of discuss what are the differences between them at least shimlink what I feel that that is kind of assimilated force more for control theory and some basic

dynamics. Which is also simulator. There's a lot of simulators out there for different purposes. I guess. what's we are kind of maybe missing is what is an arable text simulator? it's concise of at least, What item if I think about gazebo which has a basic dynamics model, it has a basic rendering. And of course, it has all the things that kind of pulls together. So it's not really one part of the simulator. It's kind of like, a combination of

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**Kimberly McGuire:** A couple of simulators let's say and that's why also, somebody also mentioned unreal engine and I kind of more see that as the rendering engine, let's say which is a part of a simulator but yeah.

**Vignesh Balaji:** That was also us by me That was in relation to this.

**Kimberly McGuire:** Yeah.

**Vignesh Balaji:** The reason why I asked is that recently, I saw Simulink has a connection with unreal engines. Specifically you could bring in unreal scenes I first thought it was only presentation and later. I learned that it can also be used for Physics dynamics also like collisions and also other forms of interactions. And I was surprised to see that, so the big question that confuses me is that, So similar has different parts, one is a physics engine, which is very important. Visualization rendering that's also important and you bring in the dynamics of the object. That's how important if you say three parts and starting with the

**Vignesh Balaji:** So basics in later Simulink you write the whole model and the dynamics of how the system so you kind of get the dynamics right and you missed the physics and Physics And visualization. Also, you could do it by some simple objects, but the major confusing thing is that. if they just leave about the visualization part it's hard what to say that What's may need and what do everyone offer? And It's very hard for me to understand them.

**Kimberly McGuire:** And yeah.

**Vignesh Balaji:** Yes. The first place,

**Kimberly McGuire:** Yeah, it's a quiet world and I guess it doesn't help that overall Joseph, their own physics bubbles. but I guess the physics model maybe is not very suitable for arabletics. So that's why you want to maybe replace it with your own model and Simulink which is used to love and control. Engineering my young before you want to maybe pitch in. Let me just double check, whatever what other people have said in the chats.

**Kimberly McGuire:** Yeah, so somebody's is saying this experience with clover based the old gazebo simulate, the model of UV. Toolbox, have been great specially with easier to set up the environment and run UVs in some real world scenarios. I find real soon and you can see but not to be worth the trouble, but I'm happy. Running software in the loop Sims in 660 simulators itself. Okay? So

**Kimberly McGuire:** I guess it's at one point, people do have to move to roast too because Support will drop and that will complicate things but it seems like that a lot of people are actually quite happy with how the old gazebo was handling things. The model up, two books, Yeah. That's a really long time ago. But we should at least added to the list if people are still using it, But thanks for sharing your experience.

And somebody also said that I've been using Drake for accurate dynamics so, I guess that's a physics model for UAVs

**Kimberly McGuire:** So that should Perhaps also be on the list of dynamic models. That's also very interesting. Fix for sharing that my young go for it.

**Mayank Joneja:** Hi, can you guys hear me?

**Kimberly McGuire:** Yeah.

**Mayank Joneja:** Yeah, I just wanted to emphasize that quite often, we overlook the reproducibility of the firmware, or the software interfaces, and in my view, you mentioning the components of what makes a simulator. I think that's quite often an understated part of it, because if you end up having to rewrite your code, or let's say you only end up testing, a very small part of your entire solution. It might be good for an academic exercise for a very small part, or a new thing that you're working on, but might not directly transfer to physical craft. And quite often say closing that same to real gap. Is also a concerned while working with the simulators. So having settled support, being able to directly use a software emulation of Mississippi explore autopilot, or using the exact same Roche's interfaces, where companion computer that you would on your physical craft might also be an important requirement for what makes a simulator with our effort and time.

**Kimberly McGuire:** So, you're talking about how do you call an hardware in the loop capabilities. aren't you?

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**Mayank Joneja:** Yeah, yeah.

**Mayank Joneja:** So that there's minimal friction in terms of going beyond just whatever experimenting in the same and I mean, it all does boil down to what you're using the simulation for. But quite often if it is in service of building, real a solution that ends up being an often overlooked component in your, let's say, accurate physics or a dynamics, and other aspects. So I feel like that should be given equal to

**Kimberly McGuire:** Okay.

**Kimberly McGuire:** Yeah, I think that's a very good and that's definitely missing from the Arrow Baltics landscape right now, like the simulation, that's it. Pages very minimal, but yeah, the real to assume is a very important question because it's really depends indeed. in terms of your application, what you want for instance,

**Kimberly McGuire:** if you want to make a new controller for UAV, And you want to at one point the implement for complete embedded, then I would say then hardware loop will be even more important than perhaps. if you do some kind of Visual navigation, if you do fish on navigation, that you need to have a very good rendering, but if you have a campaign computer that can already pretty much run the same thing as all your main computer, then perhaps, you don't need that much of what Of maybe I'm cutting a lot of fingers of people that are doing visual fishing based, the navigation is simulation is not the real thing. Of course, the best simulation is really. But you have to kind of start somewhere, right? I guess.

**gajendra nagar:** Yes, one thing. So Px4 I think uses this POSIX kind of system. So You can run the same software as you are running on autopilot. It also offers hidl all the things so it is like their maintenance the

forecast, for the Px4 and Then does all the stuff that can be directly, translated to a data. So that is what I wanted to.

**Kimberly McGuire:** Yeah that's a need a very good point. I think a big shore supports it's arted by it for supported even I think also,

**Kimberly McGuire:** sorry, somebody was trying to call me. Yeah. a lot of the main outlets, they have some kind of support of software in heartbeat in the loop. We have a couple of more race hands but not allow. You were first

**Bonolo Mathibela:** Hi, I just wanted to add open 3D engine to the list. Of simulators that we're discussing and...

**Kimberly McGuire:** Yeah, of course.

**Bonolo Mathibela:** So I haven't used it. it's fairly new but there's a lot of big companies that are backing this project.

**Kimberly McGuire:** Open 3D simulator. I'm just putting it in the chat so I'll open Treaty engine okay.

**Bonolo Mathibela:** It's an open 3D in engine.

**Kimberly McGuire:** Can you perhaps like a post a link in the chat so that we have some kind of how do you call a paper trail? Because my capability of writing at the same time,...

**Bonolo Mathibela:** Yeah.

**Kimberly McGuire:** the notes and let's say and to have also currently discussion is really really minimal I'll say, I'm relying a lot on the transcript. open 3D engines. very good. Okay, That's take a look at that. All right. There was somebody else that had us a hand soap issue. Go for it.

**Addisu Taddese:** And thank I am actually one of the core developers of gazebo. and I,...

**Kimberly McGuire:** Hi.

**Addisu Taddese:** I wanted to just get, if anyone has feedback on, why they're Might have been having trouble with the new gazebo or anything like that. I'll be happy to take notes so please feel free to share that. Also with gazebo classic, like you said it's gonna be gone pretty soon. If you are using Ross to the next version of Frosty will not have Gazebo Classic support so it would be good to start thinking about migrating. So yeah, just wanted to throw that up there. Thank you.

**Kimberly McGuire:** I didn't know that you were going to that. We have one of the core developers who kiss you? Apparently because the old gazebos is used quite a lot. If you look at the pool, that's kind of like the main winner. But yeah, indeed as she said, it's good at one point change and I have to one point also kind of give to another swirl. Let's say because a while ago, when I tried it out and they work, there were still a couple things missing in terms of the ignition messages. And that were a bit some, but yeah. Cool.

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**Kimberly McGuire:** there was somebody who had the sense of still.

**Kimberly McGuire:** Okay, nobody had sense of So I'm not sure if it's The experience of the simulators was the topic that we actually are talking about, I guess, some people already explained What is important in the simulator or what is important in the simulator? For our robotics, What are the main qualities that it's important for your research? Or work or R&D work.

**Kimberly McGuire:** That's a question. I'm just putting another.

**Kimberly McGuire:** Yes.

**gajendra nagar:** So, for me, mostly I work with the autopilot and Trying to deploy system from simulation together. and so for me, the most important things are like, engine rate and accuracy of Physics and also if I'm testing some controller. So I want to like, if there is so in gazebo engine online, normal machine text, a lot of cities. So

**gajendra nagar:** Open the visual systems. So doing simulation for a visual system is still. I haven't tried unreal engine or other things but in gazebo I don't know. It would be a good thing or not so I haven't tried that. So, from visual side, I just put Real hardware and right. These are the two things that I mostly work.

**Kimberly McGuire:** All rights. So kind of mostly control but also a bit of fishing basis. I understand. Yeah.

**gajendra nagar:** yeah, so look like

**Kimberly McGuire:** And I guess maybe a question for you is it important that the simulators able to do both really well at the same time?

**gajendra nagar:** I think simulating the real world of vision systems is a really hard thing to do. So, at least, if there is a similar to that can simulate initial things like, basic exposure or The realistic texture kind of thing.

**Kimberly McGuire:** Alright, it's real to shim is very important.

**Kimberly McGuire:** All right. That's a very good point. I guess. let's see, in the trailer. Just a family like physics engines. Very important by the Graffiti for interactions So it's not maybe necessarily the control off it but I guess the control gravity that's the one thing. So this kind of goes and anything that you would like to add to That's Ganesh, are you only interested in the physics interaction or is there anything more to see once?

**Vignesh Balaji:** yeah, one of the things that's interesting also with interaction with objects, not only the gravity as Aerial ics The interactions objects. Is gaining a lot of interest. and I find that there is simulator...

**Kimberly McGuire:** He?

**Vignesh Balaji:** which properly talks about that. Interaction with the

**Kimberly McGuire:** Okay.

**Vignesh Balaji:** Aerial robots. Interacting with objects. And that's one thing I found.

**Kimberly McGuire:** Okay.



**Vignesh Balaji:** I also looked into your

**Vignesh Balaji:** Workshop. And yeah,...

**Kimberly McGuire:** nice.

**Vignesh Balaji:** but I didn't find things on that. Yeah, yeah.

**Kimberly McGuire:** No, those are still very rare. I must say that there's a lot of papers out there that are doing research on aerial manipulation with ropes between drones and things and that they do like rope dynamics. Yeah,

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**Vignesh Balaji:** I'm exactly so much interested in deformable objects, like ropes and Cables and things here, things like that...

**Kimberly McGuire:** yeah.

**Vignesh Balaji:** but I never found any simulator in that and people are developing their own simulators. Probably writing it on some matlab and finding their own system status. But that's one thing you see and also with another form of interaction like one thing is that I find Action with water, is something that is extremely. Actually not there.

**Kimberly McGuire:** I guess we have to go to The Marine working show for the working group.

**Vignesh Balaji:** yeah, yeah I did look at that but yeah, they have something on that but not Drones and what about drones and the objects. But I was not able to find it, probably I didn't get into so deep into that but still

**Kimberly McGuire:** Yeah, it's going to be very specific. It's like drones and water because there isn't it work of in a drones for eventually at one point going into water and turning into a submarine type of thing.

**Vignesh Balaji:** Yeah. Yeah.

**Kimberly McGuire:** So Those people also have very much difficult to you making a simulator.

**Vignesh Balaji:** So I saw that. What do they generally do? Is that they generally take water as a viscous medium and they just say that it completely is concerned,...

**Kimberly McGuire:** Yeah.

**Vignesh Balaji:** but that's not exactly what but I see there's some research. This is going on at the interface of interaction with the water, maybe picking some objects on the water.

**Kimberly McGuire:** I like that's yeah.

**Vignesh Balaji:** I have now found that. Is what I'm so interested in.

**Kimberly McGuire:** That is. Yeah, I'm afraid that he won't have the right something here. So that's very specific. But it's interesting though it's a very very specific. Application. But I hope that's a minute. Ariel Manipulation at least improves with I've seen a lot of papers now out.

**Vignesh Balaji:** Yes.

**Kimberly McGuire:** Hopefully they will one point converge and they will actually submit something because hebo and...

**Vignesh Balaji:** that's also something,...

**Kimberly McGuire:** then people are able to use it.

**Vignesh Balaji:** I didn't see, because with the aerial manipulators, both active and passive, I see people have used

**Vignesh Balaji:** Gazebo to actually make their own manipulators, but I heard that that's not specifically tuned for those use cases people build on top of it. But I haven't found any simulator this space specific on this.

**Kimberly McGuire:** Okay. Yeah,...

**Vignesh Balaji:** Use case.

**Kimberly McGuire:** that's but it's all good inputs for the future.

**Vignesh Balaji:** Thank you.

**Kimberly McGuire:** I think in your case, maybe if you post something on this course or something like the Earth orders, the Ripple Stick Exchange perhaps somebody can help out of that because I won't be able to help out of this.

**Vignesh Balaji:** What would you on discord?

**Kimberly McGuire:** Yeah. I would say no, maybe not that early on this course, but more of maybe the robotics tech exchange where you can ask rose questions and...

**Vignesh Balaji:** Yeah.

**Kimberly McGuire:** robotic questions and maybe somebody can kind of Point you the right direction. Yeah. But I think yeah...

**Vignesh Balaji:** Okay.

**Kimberly McGuire:** because those are in these first bit but they're supposed to be some work out there but yeah.

**Vignesh Balaji:** Okay.

**Kimberly McGuire:** And we're probably have to kind of continue first

**Kimberly McGuire:** Yeah, because there was somebody that actually mentioned in the chat, somebody works with agriculture, spraying drones and he wants simulate to be able to load environments as open drum map and be able to connect to the multiple autopilots. That's some important characteristic, but I guess multiple auto the software in the loop. I assume right. Sgn\_

**Kimberly McGuire:** I guess. All Yeah. So load multiple requirements, I guess let me just also add that to the lists loads real world environments.

**Kimberly McGuire:** Yeah, I'm probably going to really look at This recording for So there's a couple people will hands my young go first. You also put something in jets, maybe you can

**Mayank Joneja:** Yeah, so I just put my point on firmware and settle there. So, simulation of software interfaces as what I think is important. And since you mentioned parallelism, in one of your previous slides, for the case of swarming, I really think, as we start to build swimming behaviors network, simulation will definitely be something, which will be very useful for those use cases. So, being able to see packet drops reliable communication, and kind of integrating existing network simulators like Ns3 into gazebo or some similar simulator will be of a lot of interest because this would severely hamper. how emissions get carried out by drone swans. So I think network simulation is something which we're not even considering right now, because we're thinking of SINGLE-DOWN missions right now. And when we come to paralyzing and not just doing the physics for, let's say multiple roles. Informs also how they talk to each other, how busy the channel.

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**Mayank Joneja:** that will definitely have an impact.

**Kimberly McGuire:** Yeah, that is a very important part indeed. I totally agree. I'm a Fullstreaming myself and I don't forget to network simulation as well. At least, what I've seen so far. The only simulates that I have Of course you can write plugins yourself for networks, that's always possible. But the one that actually has net work, simulation out of the box. Is what I've seen so far is Webb Pools.

**Mayank Joneja:** Nice.

**Kimberly McGuire:** Yeah, but of course maybe there's more out there but of course There might be a more out there, but in terms of simulates itself, they kind of shume perfect communication and no packet loss and...

**Mayank Joneja:** Yes. Yes.

**Kimberly McGuire:** Perfect rules.

**Kimberly McGuire:** Yeah, so yeah.

**Mayank Joneja:** No concept of quality of service or rssi. no, multiple

**Kimberly McGuire:** No Becca no, packet. Collisions or whatsoever? Yeah the perfect world and...

**Mayank Joneja:** Yeah. even with 300,...

**Kimberly McGuire:** that doesn't happen.

**Mayank Joneja:** even with 300 rules,

**Kimberly McGuire:** Make sense, it's magic. Yeah, that's a really good one Yeah, that's something to do not be together but that's also something that's a lot of simulated tend to. Yeah, ignore let's say you also mentioned network connection. I would also like to add that. There's also a couple of simulators that actually simulates the whole process of micro processors and embedded systems as well and that's really going hardcore, really are simulating the behavior often seo microprocessor for you, for instance like that. And that's might go a little bit too far.

**Kimberly McGuire:** Maybe it's fine to just be able to compile for the sheep program for the computer but there's also a lot of things that actually go on in the interconnection.io of that as well, and things. Might also go wrong there.

**Mayank Joneja:** I think that comes down to the motivation. I think this was mentioned even in that seminar, you shared the workshop from Akram, where if you're doing it for verification and...

**Kimberly McGuire:** Mm-hmm

**Mayank Joneja:** validation? Whenever there's a safety component involved, you would want to simulate the behavior of the processing platform and how the firmware would react in certain corner cases down to the D. That's where those sort of simulators would really play around,...

**Kimberly McGuire:** Yeah.

**Mayank Joneja:** but if you're looking at high level behaviors with some course, understanding of the physics and things like that and you're focusing on let's say path planning and your overall mission at a higher level, then maybe that's not the last thing you want to worry about or you do those things independently.

**Kimberly McGuire:** Yeah exactly or yeah or you don't maybe just go for the heart rate. That's also possible. Yeah.

**Kimberly McGuire:** Mm-hmm

**Kimberly McGuire:** All I think we had one more hand in the air. Go for it. Or gajendra.

**gajendra nagar:** Yeah, so one thing that I wanted to say is so simulating aerodynamic effects, but not very high fitted level but it's like something like when system in the real world and transfer it to similar something. because,

**Kimberly McGuire:** so, for instance, that you actually do the experiments in real life and then you try to kind of Replicate the sampling.

**gajendra nagar:** Yeah, generate the model So if simulator can take identified system, that would be like, I am flying the real system if there is enough data.

**Kimberly McGuire:** That is a good points, Effects. Yeah, although this is a very long time aerodynamics expert. If you want to do it properly.

**gajendra nagar:** Yeah, that's why I said System, I education with enough data should be fine because that can get very interesting.

**Kimberly McGuire:** Yeah.

**Kimberly McGuire:** I have heard of work. I haven't really looked into board before but it was really interesting that they do with deep learning or networks that they are training based on aerodynamic data and the network is pretty much the Then model lookups. And that was able to do. It's quite quite accurate as very fast. So I'm not sure if they ever did something like that for a dynamics though, but for Collision physics. They did. I really have to look into that, but yeah, it's good point. I've put it in there. Let's see if there's any other problems. CG Ed is mentioning fun. I've had a lot of trouble with commercial available I guess the J. I have never heard about those. Ones. Is that Dji or

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**Kimberly McGuire:** I might simulate something with peaks for Artify by get different behavior live, real life and that is the problem with you use clothes force autopilots.

**Kimberly McGuire:** I guess maybe you're talking about it. So I have anybody used run and software in the loop of commercial available out of pilots or other than peaks, for an autopilot. It's a question for you guys.

**gajendra nagar:** I did use one commercially available out of highlight, but

**gajendra nagar:** Support, even you have to pay for the support. So I think that will not make sense here.

**Kimberly McGuire:** Did you get a good? software in the loop.

**gajendra nagar:**

**Kimberly McGuire:** Did you get a software and a loop possibility there for, a simulator?

**gajendra nagar:** Yeah, so mostly it was working with the explain.

**Kimberly McGuire:** Okay. Yeah.

**gajendra nagar:** So they had some models made for explain and explain there are similar

**Kimberly McGuire:** that's, and vignesh Ariel Shimlich uses showing Easter on the silver services. I think that aerodynamic effects already holds Tim saying ability to easily define new vehicles. I'll put that also in this that's also important but I guess that's easily. New vehicles, but I guess the question is because people into this is quite easy of filing a new one, but it's more of one from scratch. Perhaps building a quad culture in simulator. Is that what you mean Tim? Or Just taking an existing existing assimilate platform and putting us into the simulator.

**Kimberly McGuire:** yeah, so Tim is asking is because people easy to define new vehicles. you can spawn new vehicles but the vehicle needs to be already existence and then you would probably also if you want to have A new model. Yeah, that is a good one. Because you would need to make either an uterus fall for that or an SDF file.

**Kimberly McGuire:** Depends on how complicated your vehicle is. Quadcopter is pretty easy, but if you do a quadcopter with a arm on it, then it becomes a little bit more complicated and I must okay, so Tim saying that can be easily done in real flight so that's interesting. I've had good experience with web bolts myself. When I try to make a new vehicle in there gazebo. You kind of have to do this from the order of Felbook, perhaps, I do. So I don't know if you want to is there some kind of tool out there where you're able to make a new platform Depot very easily.

**Addisu Taddese:** I think.

**Kimberly McGuire:** Maybe like an official way or...

**Kimberly McGuire:** something like that.

**Addisu Taddese:** Yeah, that part is definitely lacking from gazebo.

**Addisu Taddese:** I wouldn't say it's easy to make models from scratch. Unless you already for SDF. we have some tooling for, getting your

**Addisu Taddese:** Assets like meshes and things into gazebo and then creating the joints there. And gazebo classic as that and Gazebo knew also has that but It's kind of like that is the realm of cat tools, So we're trying to focus on maybe making the export from cat tools to gazebo better, and not necessarily improving, Gazebo's own model editing capabilities but there's some features

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**Kimberly McGuire:** All Good to Yeah I guess it's like how more complicated your role is that you need to set up. The more complicated is to make the sefl or EFL and so yeah I guess things can be improved or more through the can be Implemented.

**Kimberly McGuire:** But I guess a team isn't saying you need to cut mobile to import but then perhaps there needs to be an easier way to define the controls of physics of the vehicle. Yeah, I guess that's a good point. I'm hoping you're getting a lot of input From for the vertical team? Yeah.

**Addisu Taddese:** Yes, absolutely. Taking us.

**Kimberly McGuire:** All right, so let me just because I was missing couple of questions in the chat, simulation Electronics, battery modeling, voltec or even motor performance. Yes, indeeds, I've put them on the list. That's where very important as well. yeah. I think we have to maybe.

**Kimberly McGuire:** We have to kind of watch the time here. I think we can still keep on discussion for a few more minutes but five to Five to the end. So I would like to also do the regular announcements, if that's okay.

**Kimberly McGuire:** So let's see if s Is there anything missing you think from this list, we have quite a lot of things. There is anything that anybody would like to add

**Kimberly McGuire:** So, grounds control, simulation needs to be part of the simulator. I'll add a two, although there might be

**Kimberly McGuire:** Yeah, I guess That might be also maybe without a pilots. Specific thing, I would say. but grounds control simulation

**Kimberly McGuire:** All right, ground station. yeah. And of course the sheety high tea. Interfaces. Ground control crowd station.

**Kimberly McGuire:** All right, I think that's it. And of course if anybody else thinks there's more things missing is an there is, of course, a connected to the discourse. Threats Of this meeting. I've also started up a separate threat for just discussion about simulators, so if there's anything else missing, you can add it there. So we can keep on discussion of what is missing in the general. But I kind of feel that we're probably going to have another meeting about this at one point. So yeah, I don't know, if anybody wants to kind of like

**Kimberly McGuire:** Discuss about the rendering forces, Dynamic model first spiralism to be honest. I feel that most of you are more funds of let's say The physics model needs to be pretty accurate. And that the vision model it should be kind of realistic but it's not going to be realistic enough for the real thing anyway, I don't know if that's a good. Yeah, my own comfort.

**Mayank Joneja:** It depends on the use case. If I'm building something with vio inside a warehouse,...

**Kimberly McGuire:** Yeah.

**Mayank Joneja:** I want the visuals to be a bit more realistic as well, because I would go for some, when it comes to self-driving, cars, Carla and all are better because they use the unreal engine. So if I'm doing vision based stuff, they aren't let's say some basic optical flow and I'm building a slam pipeline for indoor navigation. Then I would definitely want the visual part I focus on that sort of a simulator, but if it's outdoors,

**Kimberly McGuire:** Like using an unreal rendering engine.

**Mayank Joneja:** Yeah yeah a much better rendering engine which would give me the camera inputs which are very similar to photo realistic basically so that the centurial gap is released...

**Kimberly McGuire:** Yeah.

**Mayank Joneja:** but if it comes to relying on outdoor flights which are GPS driven, then it's okay if the sim looks slightly mine crafty I guess.

**Kimberly McGuire:** Good Minecraft. Yeah, okay I hope that's like it because you're flying all the way up high. It doesn't have to be super accurate if it's out or...

**Mayank Joneja:** Exactly. And You.

**Kimberly McGuire:** GPS flights.

**Mayank Joneja:** Yeah, I mean it depends on the use case, I mean you could have mixed modalities wherein, let's say when it's going for a landing menu and then you need your aroma Lucky our course to actually look for the realistic and good. Then I would want that because I don't want a lower resolution market which is throwing off my optical on my landing like pizza. But I think the photo realism aspect comes beyond aesthetics the functional purposes. If you're doing a lot of vision day stuff, if you're

autonomy, Stack is more GPS on other sensor, driven. Then, for example, if you're doing ultrawide band, I would want better network, simulation, right? Because I want Maybe a better physics, simulation of the packet, laws and other kind of aspects of those things.

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**Kimberly McGuire:** You yeah, yeah that's this. Of course across I think there was a Router s had a fork called Crazy s, which was for the crazy flies who actually made their own Ultra. Wipens simulator plugin for that for gazebo.

**Mayank Joneja:** Nice.

**Kimberly McGuire:** Not sure if they were all the way to back at lost though. how do you call ...

**Mayank Joneja:** Yeah.

**Kimberly McGuire:** wall bouncing off, or this metal in the environment.

**Mayank Joneja:** multiple propagation and shading and effects like that.

**Kimberly McGuire:** Yeah, exactly yeah. So I don't think they went all the way there but

**Mayank Joneja:** But at least signal strength as inverse square law is the basic. I would expect if I'm doing something using radio a lot. even for the GPS,...

**Kimberly McGuire:** Yeah.

**Mayank Joneja:** if I'm flying in an open environment, I'm good. But let's say, I know I'm going to be running missions around a lot of mountains or near buildings. Then multi-part simulation would be a lot more important to me because I know that's something I'll face every day in the operations.

**Kimberly McGuire:** For Mountain and navigation. I will put it right there. Yeah, I guess. a friend request Dynamics model. First Burialism is more like how fast Simulator for swarms. And I guess also for a part for reinforcement learning, but it's very, very application specific and dynamics model. There's multiple out there, but it's more of like if you're doing fishing bass navigation and you just focusing on high level stuff, then the Facebook model doesn't need to be very complicated, but if you want to make a new controller that this stops the line can recover from any winco. So however, then the next model and the aerodynamics model of affects is also going to be very important.

**Kimberly McGuire:** Yeah. it's a lot more to consider that I initially thought. I knew that already, but it's good to have kind of a nice discussion about that, how fast and light this excuse so maybe in the future once we have the role for robotic simulator paper routes, then maybe I can give a presentation at this world at this working group, as well about that at least How are All those as different aspects and now it's how they compare to each other Mayank. Yeah.

**Mayank Joneja:** I'm sorry, I just meant to clap and...

**Kimberly McGuire:** Okay.

**Mayank Joneja:** I ended up using my hand.



**Kimberly McGuire:** Yes, thank So I'm really going to then start with the final part of this meeting. I'm really happy with all the discussions so far. I think it's very good to kind of for really make an outline and really have perhaps an idea where to focus on at one point. So of course, announcement rosecon 2023. Next week, who's going?

**Kimberly McGuire:** Just raise your hands or do clap or something like that. So, nobody's going.

**Kimberly McGuire:** This is going great. I'm very sad to say that I'm not able to come.

**Kimberly McGuire:** I was looking for it all week, but fortunately, I have some personal circumstances that doesn't allow me to go. so, next year, I'll be there, I'll be there but Of course I want to like anybody said That's able to go there. Yeah, it was a wish them, a lot of luck, and a lot of fun, of course. So there are two presentation at Thursday that you shouldn't miss either on the site or maybe as a stream if that's available. Which is not the Thursday keynote is up and away adventures in our both expire Ramon And I also helped lots out with preparing dispute. That's talk as well. And at 10 o'clock it's going to be error. Stack my bigel. So he also joined some meetings before about our stick too. And so she kind of join that and support arable this community.

**Kimberly McGuire:** All right So the very next meeting two weeks is canceled because it's just going to be right after Rosecon and we all need a breather. I'm also not able to participate myself. So the next one is going to be Wednesday, the 8th of November 2pm universal time and be aware of the daylight saving. So the people in Europe and things like it will probably be an hour earlier than So 2pm, universal time. And the scientific presentation Ramon will actually give a presentation about Ph4, so that's going to be nice. And so get up organization. The link is right here. Github.com Roche.

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**Kimberly McGuire:** where we have the arrow over the planscape with the link of simulates and things. that you can just change. If you Just make a PR as a community information with the meeting information and you can add yourself as a member. Anybody can join at this point this Community working group. Anyway, and if you want to do a presentation or scientific presentation about your project with arabetics and roles or just want to show what you're working on or a PR that you're working on something like That's give me an email kimberly.io or Ramon are Roche. It's foundation.com. And that's it. I think this was a very nice discussion so thanks again today for joining

Meeting ended after 00:56:15 🙌