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Expert Q&A: Why Artist Richard Vijgen Used Altair® Feko® for his Exhibition at the 2024 S+T+ARTS AIR Festival

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Richard Vijgen certainly isn't one of Altair's typical customers. A digital artist and guest lecturer whose work has been featured in publications and institutions such as The Yale Architectural Journal, Volume Magazine, Centre Pompidou, the Los Angeles County Museum of Modern Art, The Barbican Gallery, and much more, Vijgen "designs instruments, objects and environments that let you experience the invisible dimensions of the highly technological world around us," according to his website.

His latest work, titled "Electric Atmospheres: Electric Atmospheres: Revealing The Hidden Beauty of Digital Signals," will debut at the S+T+ARTS AIR Festival in Barcelona, Spain, taking place on October 29-30. Its objective is to explore and visualize how the invisible world of electromagnetic signals and waves – such as cellular signals, Wi-Fi signals, radio waves, and beyond – interact with the very physical, very tangible world around us such as buildings, surfaces, and the air itself.

Powering Vijgen's latest project is Altair® Feko®, the market's leading high-frequency electromagnetic simulation tool. For "Electric Atmospheres," Vijgen used Feko to simulate the behavior of an individual's "electromagnetic footprint" in various locations within Barcelona and Rotterdam.

The Altair editorial team sat down with Vijgen ahead of the debut of "Electric Atmospheres" to discuss the project in detail, including what inspired it, what Vijgen hopes audiences take away from it, and how Feko helped bring it to life.

Q: Before we dive into your upcoming project for the S+T+ARTS AIR Festival, can you tell us a little about yourself and what your work is focused on?

Richard Vijgen: Sure. As an artist, I work a lot with data visualization. I'm interested in the fact that we use a lot of technology that, increasingly, most people don't fully understand. For example, when we use things like phones, apps, algorithms, and artificial intelligence (AI), we're only really using the user-facing side of things. We usually don't really understand how these things work and how we can or should relate to them. In my work, I'm trying to explore that question, trying to convey and

connect the abstract (and often invisible) nature of these systems into something that's visual, something you can experience. I'm not necessarily trying to explain how specific technologies work; it's more of trying to give people an image, a face, a way to relate to these technologies in a more intuitive way.

Q: Let's discuss your background a bit. What drew you to these types of questions and this type of artistic work?

RV: I was trained as a graphic designer, so I've always been interested in making images and structuring information visually. Over the past 20 years, computers and data have become so important, so although I was trained to structure information within things like book or print or poster design, I had the sense that the structure and scale of information was changing. As a graphic designer, I was interested in how I (and people generally) relate to information. For example, how do you design a huge database instead of a book? Or how do you design information that's changing, rather than information that's fixed on a page?

I was interested in finding new strategies to deal with this new and different behavior of information, which could be changing and algorithmic. As such, I had to learn how to code in order to deal with that scale of information. As I did that more, I got interested in that process itself, using code to visualize information. And so it became a subject that I wanted to try and understand more – not just what's presented on my screen, but also how it gets there, the underlying infrastructure that you can't normally see.

Q: With the subject your work touches on so often – making visible the technologically "invisible"– do you feel there are a lot of artists covering this subject? Or is this a subject you pursued to make it more available to audiences?

RV: I mean, there are a lot of artists that explore technology and new technologies, specifically. I also teach at an art school where we have a course that's dedicated to that: using technology to make art. What I see right now is that there's a lot of interest from artists, for example, in things like generative AI.

That said, I think my approach is a bit different. I'm not so much interested in the applications of, for example, AI and how to use prompting to generate images; I'm more into underlying structures. So I'm more interested in, say, how patterns can emerge from noise, and how these algorithms can do what they do. I'm always a bit more focused on the fundamental side that's closer to the technology itself than to the applications built on top of it. In that sense, I think what I do is quite specific, and I don't know a lot of artists who deal with this subject.

Q: Let's talk a bit about the S+T+ARTS AIR Festival. Can you tell us more about what this event is, what the organization is, and how this project relates to both?

RV: Sure. S+T+ARTS is an initiative by the European Commission with the goal of matching artists with scientists, and letting artists propose an art/research project these scientific institutions wouldn't normally cover. The idea is that with this collaboration between artists and scientists, different, novel types of projects can emerge – different from what would come from solely science/academia or art. It's also designed to further the technical capabilities of the artists involved. In essence, it's trying to cover new ground and hopefully uncover some new directions that could be interesting for further research.

10 artists were selected to participate, and each artist gets paired with a different institution. In my case, I was paired with the Barcelona Supercomputing Center (BSC). The idea I proposed was to visualize the information that always floats around us in the form of electromagnetic waves, to visualize these waves using the computing power BSC has. I'd never tried a simulation-based approach before; I'd never felt it was within the scope of my practice. But with BSC's computing capabilities, simulation made a lot more sense.

The S+T+ARTS AIR Festival itself is sort of a mix between an art exhibition and a technology conference. It's interesting to note that it's taking place during another big art event in Barcelona called Manifesta, which is a sort of traveling art biennial that goes to a different European city every two years. So this festival is presented in the context of the broader art events going on in Barcelona at the time. Most likely it will draw some of the crowds that come to see art events, but also some people from S+T+ARTS and the participating institutions. S+T+ARTS is also inviting people from the scientific community to come as well, so it'll truly be a mixed audience.

Q: Let's now talk more about your project for S+T+ARTS: "Electric Atmospheres: Revealing the Hidden Beauty of Digital Signals." First, let's talk about your use of Feko to visualize electromagnetic signals. Why did you select Feko for this project? What made it the right tool for the job?

RV: Well, there aren't that many programs that can do [what Feko does]. There are really only two or three tools to choose from. Honestly what made Feko the right tool was largely the support I got from Altair and its technical experts. You know, this is not a tool that the average person is going to use, meaning if you're not an expert in this type of software and you're just starting out, you need some help. I contacted three companies, but it was quite clear from the beginning that it was easiest to communicate with Altair. Their representatives seemed very interested and supportive and they connected me with some people who were doing virtual Feko training courses.

Feko – and Altair – also made it easy to get this project done with BSC. For the other two companies I reached out to besides Altair, it seemed difficult for them to relate to or take interest in a project like this because, of course, it's quite far removed from the typical clients and projects they have. But

from the start it was an easy conversation with Altair. There was quite a bit of interest and enthusiasm from their side, which made it an obvious choice to pick Feko.

And in addition to the tool's capabilities, Altair's licensing was very feasible for me – and that was a big deal. For this project, we needed to be able to run the software on a certain scale. There was one other company that I talked to that was quite restrictive, meaning they'd allow us to use their software but only on a limited number of cores. It's understandable, but for us, it would defeat the purpose of working with a supercomputer if you're very limited in the scale at which you can run it. Altair didn't have a problem meeting us where we needed to be.

Q: How has it been using Feko as someone who, like you mentioned earlier, doesn't have a technical/engineering background?

RV: I mean, it's a challenge, of course, because I'm getting into a territory that I'm that I'm not expert in while using expert software. But I was able to get a license from my computer quickly, so I was able to experiment with it quite quickly as well. The nice thing is that Feko allows you to experiment, to try and fail and see what you're doing. If it was just me doing theoretical wave simulation on paper, for instance, I wouldn't have any sort of feedback. Feko allows you to play around so you see what works and what doesn't. So even though it's complex, I found it quite doable to figure it out. There are a lot of presets and assets you can use to get started right away. After a few days, you get the hang of it.

Moreover, I was able to ask questions of Altair's team and there was very prompt technical assistance. Their technical support really took my work seriously, and even sometimes made sample projects for me to try out. They did a lot more than I would've expected. It got me up and running quite quickly.



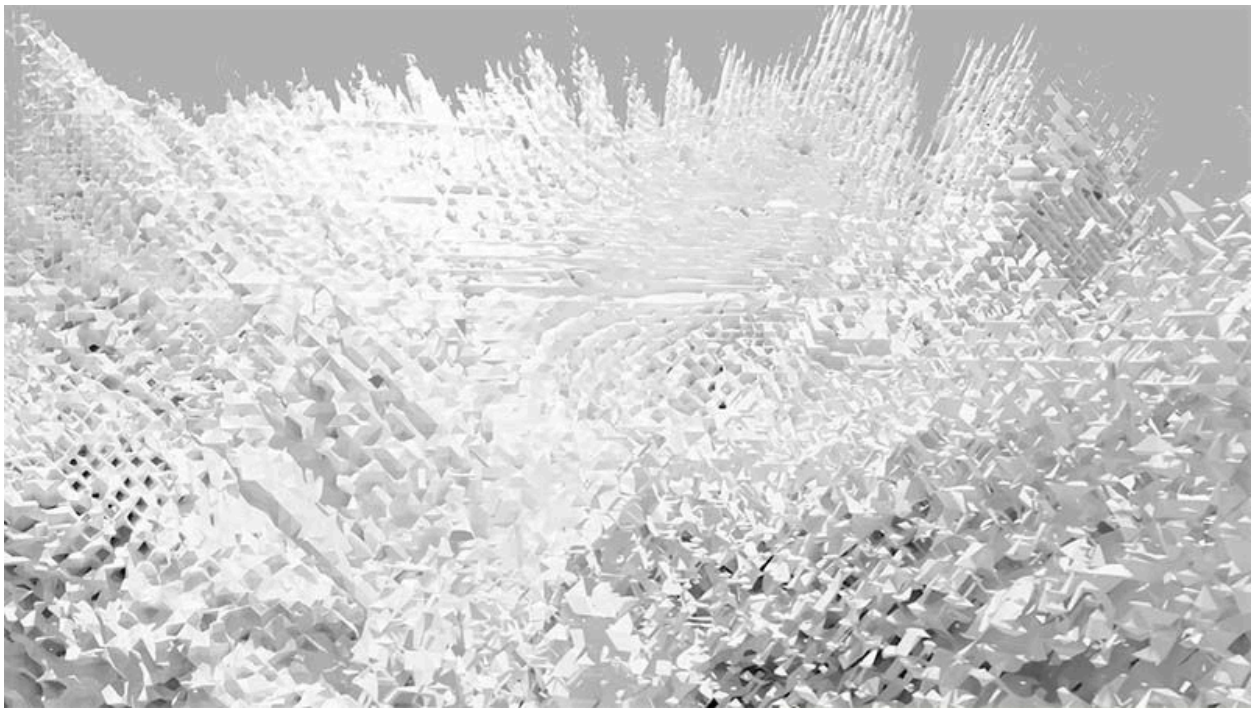
A visualization of electromagnetic signals using Feko, as seen in "Electric Atmospheres."

Q: Using Feko, have there been any results that have surprised or intrigued you? Have there been any standout discoveries?

RV: For sure. The results have been all those things. Like I said, my question dealt with what it looks like if you have, say, a cell phone, and you're situated in a busy city street. Wherever you go with it, there's a cloud of electromagnetic waves and/or particles coming from this device. These waves and particles interact with the air, interact with the city; this cloud is interacting with and bouncing from these buildings and their shapes and materials. So I was wondering, what does that look like? What does that space or volume of invisible waves/particles look like? We really have no way of knowing what it’s going to look like beforehand.

Once we got the first simulation, it was quite dramatic. The shape and scale of this electromagnetic cloud is really quite explosive. I was really amazed when I saw it, the effect of a single cell phone in relation to the scale of a city. It has interesting textures and weird shapes that are impacted by the architecture and surrounding buildings. It was what I’d hoped for, in a way – that it’d be specific and not something “boring” like a sphere or blob.

As an artist, it's always great when you do an experiment where you don't know what the outcome is going to look like and yet it exceeds your expectations. It has texture; it has scale; it looks like something you’d never have come up with. It’s really showing us something that’s always happening around us even though we’re not aware of it. That's what makes it super interesting, artistically, because I wasn’t really trying to solve any specific problem. I was just curious what this electromagnetic entity would look like. And it's really interesting when a tool that's designed to be functional – like Feko – suddenly gives you something very imaginative and artistic.



"It's really interesting when a tool that's designed to be functional – like Feko – suddenly gives you something very imaginative and artistic." - Richard Vijgen, speaking of "Electric Atmospheres."

Q: Moving beyond Feko now to your project generally, there are a lot of contradictions running throughout this work: public and private space; art and science; visible and invisible, digital and physical; and so forth. What are some of this project's main themes along these lines? Beyond that, what do you really want people to take away from "Electric Atmospheres"?

RV: Well, first, I think this project shows you a glimpse into a dimension of the world being an electromagnetic space in a way that invites curiosity – no matter if you're an artist, a scientist, or a regular person. Because I think when you see these images, they invite all kinds of questions that are both scientific and artistic.

Additionally, I think when you show this to a general audience, it changes their conception of wireless network. I think typically, when people imagine how their phones work, they think of a straight line of information flowing from their phone to a cell tower and back; a sort of beam. When you see this image, you realize the reality is much more interesting and dynamic. It also challenges the notion of public and private space, because everyone in a city essentially has this massive thing following their position. It occupies a huge amount of space. I compare it to the notion of an "aura," something floating around you. It's a kind of presence. It represents the space one takes up in a city, yet it doesn't adhere to traditional notions of public and private space because it just goes straight through all the office buildings and residential buildings and beyond.

This project isn't rooted in the sense of a problem to be solved. It's more about having a more complete understanding of what it means to be in a city (or anywhere else) in the 21st century. It's

also a way to explore how our cities are built and organized and how they function as technology progresses. It could also spark ideas as to how you'd build a brand-new city optimized for wireless signals, as opposed to these otherwise old and historic cities that were certainly not originally built with that purpose in mind.

Q: Are there any final big thoughts you want to leave your audience with, both within this article and at the S+T+ARTS AIR Festival itself?

RV: In our age there's so heavy an emphasis on data analytics and information; there are things like towers and data centers going up everywhere to support this need. That said, a lot of this information isn't visible in our day-to-day lives or physical environment. That lack of knowledge and visibility invites fear. During COVID, for example, there were examples of people setting fire and shooting at cell towers and whatnot. I think not having an understanding or way to relate to things makes it easy to project fears onto it. This project is partly about dispelling the myths around these signals.

But more broadly, I wanted to explore if there could be beauty in these signals. Can there be joy in this marvel that is wireless technology? Could that all add up to a new understanding of space that we can appreciate? Can you enjoy the aesthetic of wireless signals? That's what it all boils down to.

To learn more about Feko, visit

https://altair.com/feko. And be sure to click the following links to learn more about Richard Vijgen and the S+T+ARTS AIR Festival.