Avideh Zakhor: The brains behind Google Earth and Street View

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For one of Silicon Valley's most important inventions, we can thank Avideh Zakhor, creator of the technology that brought us Google Earth and Street View.

Before there was Google Earth and Street View showing us around the world, there was Zakhor and her team driving a truck loaded with sensors around Berkeley and flying in a helicopter overhead to gather imagery, mapping part of the city in three dimensions.

And then there was Zakhor, a UC Berkeley professor of electrical engineering and computer science for nearly 30 years, turning her research into a Defense Department-funded startup. After the funding ended she sold the company to Google for a price she declined to reveal. Google turned her innovations into Earth and Street View, used it to advance Google Maps and is pushing it forward into a future in which cars drive themselves.

But before all this there was a girl whose life in Iran was thrown into turmoil by revolution, and who ended up in the United Kingdom, then at Caltech, and then at MIT for a Ph.D. in electrical engineering.

Today, the entrepreneur and UC Berkeley professor of electrical engineering and computer science is also at the center of two flashpoints in today's tech industry: she's a woman, and an immigrant. She has thoughts on both.

And of late, Zakhor has turned her intellect and energies from outside to inside, founding Indoor Reality to create maps of building interiors she says could provide a last-mile solution for Amazon drone deliveries, build architectural models where no blueprints exist, and enable cutting-edge virtual real estate tours. She talked to us recently about her startup, her ground-breaking technology, her experience as a woman in a male-dominated field, and the tech industry's need for foreign talent. Her comments have been edited for length and clarity.

Q: When you invented the technology that would lead to Google Earth, what problem were you trying to solve?

A: I became really interested in 3-D modeling of cities. You put some sensors on top of some cars and you drive around and you make 3-D models of all the buildings and objects that you see around you. We managed to produce a complete 3-D model of a four-by-four block in downtown Berkeley.

DARPA (the Pentagon's research arm) heard about this project. There was a tremendous amount of interest in mapping Baghdad. Two years into the DARPA program, Google came and acquired our technology. I felt that Google would be a good company. They have essentially a volcano of cash - they can put enough resources into it to actually map the entire globe. We (had) invented a fast, automatic way of generating 3-D models of cities, and that is one of the key components of Google Earth. When you're using Google Maps ... you can switch from Maps to satellite view to Street View to Earth - Google has bundled them all together.

Q: What are the primary applications for Indoor Reality?

A: Pretty soon package delivery companies like Amazon are going to use drones to deliver your packages to the outside of big buildings - then you

want to have robots that deliver those indoors, so you need indoor maps. Virtual reality and augmented reality - if you want to use those indoors it's important to have indoor mapping. Architects need what are called "as-built" models of existing buildings, but for 80 to 90 percent of buildings in the U.S. there are no up-to-date architectural drawings, there are no up-to-date blueprints.

It can also be used for commercial [real estate](link) where without being in the building you can see in the building and you can virtually navigate it. If you want to buy a home without going there, you can do that. Energy audits of buildings is another one.

Q: How serious a problem is the lack of gender equality in tech?

A: It's a very serious problem because in this country we need more science and engineering, more STEM professionals, and if you don't have enough women going into the professions, nearly half the population is being discarded. And these are high-paying jobs.

When I was an undergraduate at Caltech there were many classes where I was the only female - if I was late the professor would come in and say, "Where is she?" It's not an insult, maybe you could think of it as flattering.

It would be good if at an early age we could convince girls to become interested in STEM fields. Maybe then we wouldn't in Silicon Valley have a shortage of STEM workers - it makes it very hard for tech companies to operate; the labor market is very tight. The products that we make in tech companies are going to be used by the entire population. If you have a group of men between 20 and 35 designing this product, in the end the use case for the masses will not be taken into account. One could also take the view that perhaps the style of management by women is slightly different from men.

Q: How can more girls be brought into the tech pipeline?

A: Outreach to elementary schools, middle schools and high schools. Girls are pretty interested in science and math all the way into the end of elementary school and maybe middle school, but when they get to high school, somehow the interest goes away and the numbers drop. Maybe the high school teachers are not as supportive as they should be. If you can just make the pipeline not to dwindle at [high school](#), we're all set.

Q: What's your view of the debate on skilled foreign workers in the tech industry?

A: These highly skilled immigrants coming to the U.S. are vital to our economy - they start companies, they pay taxes, they contribute a lot. Their countries have already invested hundreds of thousands of dollars in educating them - turning them away is a really big mistake economically and from every angle you look at it.

I wish we had more-nuanced and more-refined policies and didn't look at immigration as one basket, one size fits all. Even within the H-1B category it's good to have skilled workers coming to the U.S., but I see the other side of it because many families discourage their children from studying science and engineering because they think that wages are going to be depressed by the influx of H-1B people.

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Name: Avideh Zakhor

Age: 53

City of residence: Berkeley

Education: MIT: MS and Ph.D. in electrical engineering/CS; Caltech: BS electrical engineering

Job titles: CEO, Indoor Reality; professor and Qualcomm Chair in [electrical engineering](#) at UC Berkeley; Hertz Foundation fellow

Family: Married with one child, a son who's 24

Five things about Avideh Zakhor

1. I patrolled beaches in South Wales for one summer as a lifeguard.

2. I'm also a big movie buff, especially foreign movies - if I was not in tech, I would have become a film critic.

3. I'm a very avid biker - I try to bike at least four to five times a week. That leads to unfortunate accidents: I was in the emergency room twice in four months. (And in May, she suffered broken bones from yet another bike accident, a hit-and-run.)

4. Even though I've left Iran for many, many years, I love Persian music - my iPod has 1,400 Persian songs on it.

5. I'm actually also a very big news buff.

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