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## Commercializing a campus creation

### SynapSense shows UCD research's promise

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The work done on Raju Pandey's computer research project at UC Davis between 2003 and 2006 produced the expected trove of top-drawer students who cranked out three doctoral and three master's theses.

It also generated the foundation for one of the more promising tech companies the region has recently produced – so promising that it brought in more than \$12.5 million in venture funding in less than two years.

Pandey leveraged his research to co-found SynapSense Corp., a Folsom startup that developed a system of remote sensors to help rein in the burgeoning power drain exerted by electricity-hungry computer data centers.

At the University of California, Davis, officials are using Pandey's transition to light the path for other researchers and students in hopes of building momentum in moving other discoveries into the commercial arena.

"The university has been very much behind us on this," said Pandey, 45, sitting in a small conference room in SynapSense's Folsom headquarters. "I think they want to create more such companies. Many more people are doing great research there. They have great technology."

There's little question of a market eager for ways to control the power consumption of data centers – especially with heightened concern over greenhouse gas emissions. The facilities gobbled up 1.5 percent of all electricity consumed in the United States in 2006, a percentage expected to double in the next five years.

By some estimates, electricity used to cool data centers accounts for nearly half of the power such facilities consume. And SynapSense projects that its technology could cut cooling costs by 30 percent.

UC Davis has made recent strides in accelerating the transfer of technology to the marketplace, but a home run by Pandey and SynapSense would fully realize the power of the concept.

"Many faculty members can invent a technology with commercial opportunity, but (Pandey) committed himself to seeing the company through its early stages. That differentiates him from others," said Meg Arnold, who helps run InnovationAccess, the UC Davis program designed to bring research discoveries to market.

Even more atypical, he works outside agriculture, the field where UCD has seen its greatest success with tech transfer. The bulk of UCD's licensing revenue comes from strawberry varieties used by big growers, but the school hopes more will come from the 26 startup companies spun off from UC Davis research in the past seven years.

UCD now brings in between \$9 million and \$10 million in royalties a year for licensing its discoveries to outside business. In 2006, that put UCD on a par with UC Berkeley at \$7.7 million and UC Irvine at \$9.9 million, though far behind UC San Francisco where licensing fees from medical-related discoveries brought in

\$127.1 million.

Licensing agreements vary, Arnold said. A well-heeled licensee like a pharmaceutical company might pay royalties plus a large upfront fee. Startups like SynapSense typically pay less initially, making it up in higher royalty percentage based on revenue. In addition, companies with an exclusive license to the technology generally pay patent costs, which often exceed \$20,000.

Citing a confidentiality agreement, Arnold declined to reveal the terms of the SynapSense agreement.

In such agreements, not all the money goes back to the university. Typically, 35 percent of royalties go to the faculty and students credited with the invention, Arnold said.

In getting the ideas off the ground, Pandey said, he wears a dual identity as a researcher and entrepreneur.

"I call it a pencil-sharpening process," he said. "From a technologist's point of view, our goal is to be as perfect as we can be. But then our marketing and sales people say, 'It's sharp enough.'"

Pandey, who was reared in Patna, India, excelled in math and science, and did his undergraduate work at the elite Indian Institute of Technology's Kharagpur campus. He earned his master's at the University of Massachusetts, Amherst, and his doctorate in computer science at the University of Texas in Austin.

He joined the faculty at UC Davis in 1995, and between 2003 and 2005 he and a handful of students worked on a project called Software Environment for Networks of Sensors and Embedded Systems. The work would lead to the founding of SynapSense.

Funded by grants from Intel Corp. and the National Science Foundation, the research focused on how to design sensor systems that operate remotely from a central computer.

That problem is knottier than it may seem, Pandey said.

Designers have to deal with problems such as battery life in remote devices, limited bandwidth in transmitting data, and maintenance at remote sites that you can't conveniently visit. "You can't just walk in and reset the sensor," he said.

Pandey and his students developed an architecture so promising that UC Davis decided to apply for a patent.

"We look at two things, patentability and marketability," Arnold said. The SENSES project seemed to have produced both.

In the capital investment world, the research resonated most strongly with American River Ventures.

"Raju had done his homework about what it takes to start a company," said Barbara Grant, a director of the Roseville-based venture capital firm. "I knew right from the get-go that he was a quality person who worked hard to do everything right."

ARV introduced Pandey to Peter Van Deventer, who had recently left an executive position with Intel Corp. in Folsom in hopes of starting his own company.

"I had started at looking at deals around the world and really found there was a lack of good intellectual property," Van Deventer said. "Then ARV told me they had found a really good technologist and technology, and lo and behold, it was right there in Davis."

Van Deventer said it quickly became apparent that Pandey and his team had developed something significant.

"People all over the world had been trying to develop a commercially viable architecture," he said, "and Raju cracked the code."

The two agreed almost immediately to start a firm seeded by \$1.25 million from ARV and \$250,000 from DFJ Frontier in West Sacramento. "Raju was the technologist," Van Deventer said. "I was the business guy. It was a perfect fit."

In the 21 months since its founding, SynapSense has grown to 40 employees and landed an additional \$11 million in funding. Although the privately held firm does not disclose revenue or many other business details, it has revealed it's involved in projects with the Sacramento Municipal Utility District and IBM.

Pandey said the transition to the private sector has required a change in mindset.

"At the university, everything is defined in terms of how you train your students," he said. "Here, you ask yourself, 'Did I get something done?'"

If Pandey returns to the classroom, as he intends, he said he will be a better teacher for his experience – especially the skills required to conceive and manage a long-term project.

For her part, Arnold hopes that Pandey's influence extends beyond the classroom.

"We want to start to work with companies when they are just ideas in grad students' heads," she said.

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