

Cameras Become Intelligent !

It's much easier now than it was ten or 20 years ago to monitor train stations, airports, and many other public spaces — and that's due in no small part to Dr. Visvanathan Ramesh and his team. For more than 20 years (the last 13 of them at Siemens), Ramesh, 46, has been concentrating on the development of systems for automatic image processing. He is head of the Real-Time Vision and Modeling department at Siemens Corporate Research. Ramesh works in Princeton, U.S., but his co-workers are to be found in the Indian city of Bengaluru (formerly Bangalore) and in Munich. "Our successes are based on collaborative efforts, so I'm on the road very often," he says.

Ramesh is working on building machines that can "see." In the field of security technology, in particular, soon after the installation of the first surveillance cameras it became clear that merely recording videos or watching videos for potentially dangerous situations is of little use if these images are not pre-screened intelligently by machines so that humans can watch only events of potential interest and respond in a timely and effective manner. "A major aspect of intelligence is about recognizing what information is important and what can be disregarded," says Ramesh.

The computing power available for a given price has exponentially increased over the years. The new surveillance cameras are able to be equipped with their own processors, so they can carry out part of the required computation themselves. These factors have made it possible for the first time to use new, complex algorithms for automatic image recognition. Ramesh has designed an architecture to facilitate development of various applications of video analysis. What level of performance is required for a video analysis system used to monitor subway stations? What are conditions like in tunnels used by motor vehicles? What are the difficulties involved in monitoring a crowd of people?

"Each scenario has its typical interference factors," Ramesh explains. In subway stations, for example, ambient light conditions on the platform change when a train pulls in. Or pieces of luggage could have a color similar to that of the floor surface, making them difficult to recognize. People are constantly obscuring one another in recorded images. How is it still possible to track individual persons? In tunnels, vehicle

headlights are a source of constant interference. By devising statistical models of these disruptive influences for a large number of scenarios, the researchers working with Ramesh developed sophisticated algorithms so that the system can ignore these interference factors. Siemens has been granted patents for algorithms dealing with each of the scenarios, and has applied for a patent for the architecture by which the various model situations are combined to form a program for a specific application. Ramesh is thus responsible for 101 inventions, and patents have been granted for 23 of them.

A native of India, Ramesh traveled to the U.S. in 1985 to study electrical engineering. “After my first university degree in Madras, I worked for a Danish technology company in Mumbai. I quickly found that I wanted to learn and research much more. So I went to the United States,” says Ramesh. His constant readiness to learn new things is something he learned from his mother: “She showed me how patience, sacrifice, hard work and concentration lead to lasting results.” For his doctorate, which he acquired in 1995 at the University of Washington in Seattle, Ramesh researched how one can predict the performance limitations of algorithms that can understand images. His statistical modeling and analysis tools have now become the basis for quite a few programs, including those used for detecting abandoned luggage and for monitoring tunnels and highways. Ramesh’s most recent invention is leading to improved traffic-monitoring systems. It has an enhanced architecture that allows various modules to be combined in order to equip the system with more features, which also results in fewer false alarms. It can recognize very slow or even broken-down vehicles, and detects traffic jams that occur.