Cutting-edge system to enhance security in public areas

IF SINGAPORE tech start-up Cyrus Innovations gets its way, more surveillance cameras at public places could be powered by its cutting-edge video analytics system.

The patent-pending system, which detects unusual activity automatically, is being tested at Sentosa, with the aim of improving the safety, operations and security of the island through an abnormality detection (AD) technology.

"The AD system can alert us to safety issues such as unattended young children playing and wandering into train stations, and unusual crowd activities or anti-social behaviours like fights or tussles that may cause public disturbances," says Mr William Ng, assistant director of operations planning and development at Sentosa Leisure Management, the island management arm of Sentosa Development Corporation (SDC).

"It enhances security, and also alerts us to areas where we can provide a better convenience for our guests," he adds.

The system, developed with funding from Spring Singapore's Technology Enterprise Commercialisation Scheme (TECS), addresses the limitations of current video analytics systems, says Mr Raymond Looi, founder and director of Cyrus Innovations.

"The current approach in video analytics is to specify rules for detecting various known behaviours or incidents, such as intrusion and loitering. In other words, existing video analytics software needs to be told what to look out for, which is time-consuming during set-up," he says.

While this approach works for detecting simple and straightforward scenarios, Mr Looi says it can be difficult to predefine rules for potential security incidents in complex settings, such as huge crowds of people, where each person exhibits a different behaviour.

But if a system could apply machine learning to automatically surface or discover unusual or abnormal behaviours without having to first apply any rule, the limitation of having to set rules can be overcome.

"So instead of detecting any one particular behaviour, the system can surface limitless variations of behaviour, which are discovered as a result of them being simply exceptions from the norm.

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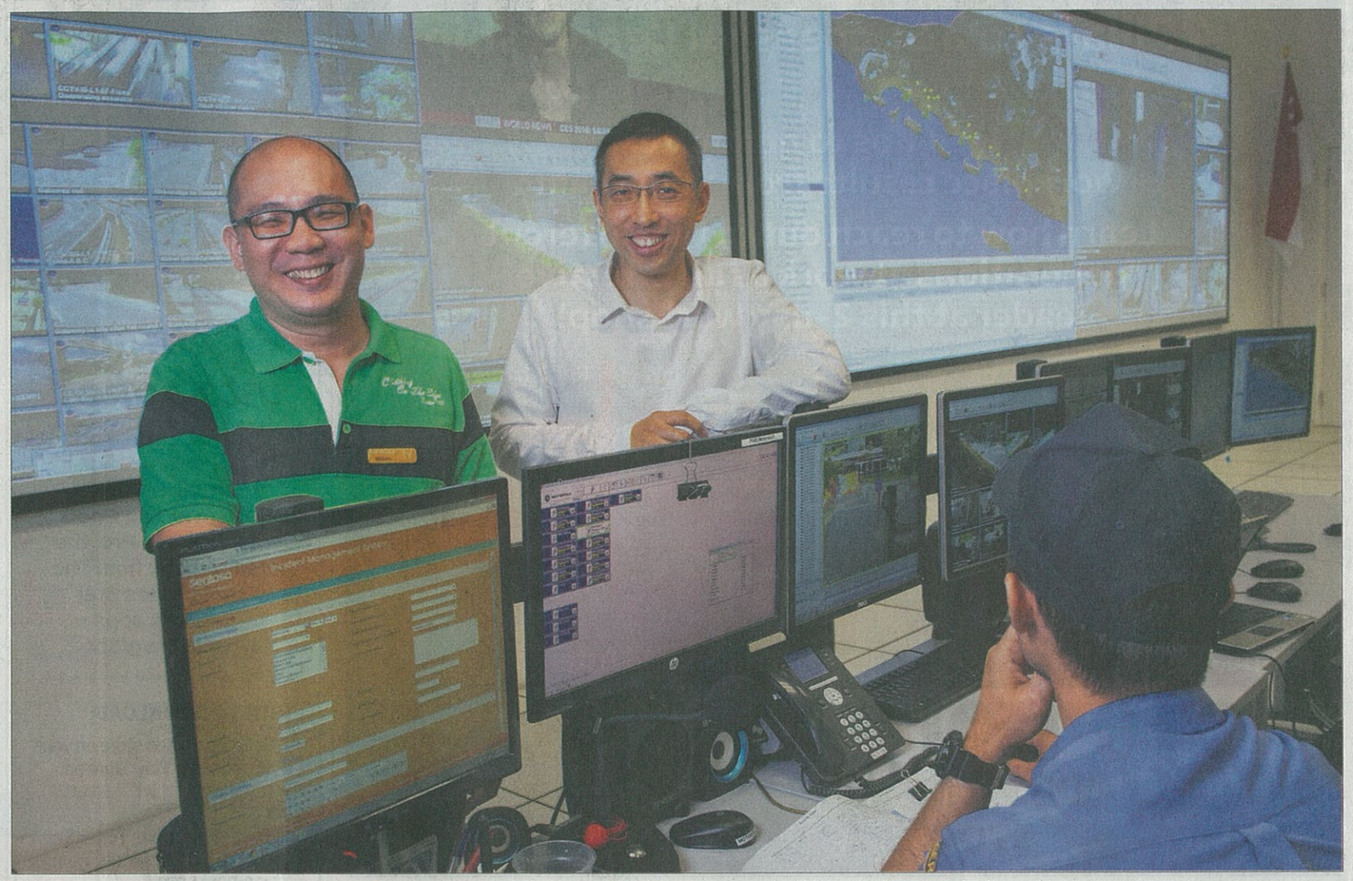
"For example, a terrorist planning an attack may scout a target beforehand. His unusual activities on-site might represent deviations from the norm. He could be loitering longer in an area than what normal passers-by do. Or he could be moving in an area suspiciously different from other crowd activity," Mr Looi explains.

With the rise of terrorist threats, Mr Looi notes that the AD system can enable surveillance cameras to identify more unusual behaviour and activity for scrutiny, and do it more efficiently than a rule-based system.

Like in any new technology development, Cyrus had its share of challenges. For one thing, the machine learning technique, proposed by a researcher it worked with, was not well-adapted for real-life scenarios. As a result, it had to rework everything from scratch, including the machine learning algorithm.

"We also needed a novel architecture, which could allow us to combine our AD technology with rules, since we have extensive knowledge of rule-based systems. Our innovative approach proved to be far better in achieving the desired results," Mr Looi says.

"Seeing its performance, we realised we have achieved something quite significant here."



Mr Ng (left) says the AD system can provide alerts for unusual activity, while Mr Looi appreciates that SDC gave Cyrus ample time to run tests. PHOTO: NURIA LING

Sentosa partnership

Besides tapping the TECS scheme, Cyrus also participated in the Partnerships for Capability Transformation (PACT) initiative, where Spring Singapore works with large organisations such as SDC to identify and implement collaborative projects with small and medium-sized enterprises (SMEs) like Cyrus.

Sentosa — with its network of surveillance cameras, large number of visitors and wide expanse of space — proved to be a good test bed for Cyrus' AD system, offering a wide range of scenarios to test the new technology.

However, since a key feature of the technology was to discover abnormal events and behaviours that one would not know beforehand, Cyrus had difficulties describing to Sentosa rare and out-of-the-ordinary events that it could detect — unlike many existing video analytic systems.

"So how were we going to communicate this to Sentosa? The good thing for us was that SDC understood what we were trying to achieve and was patient with us to let the system run for several months to see what abnormal events it could surface and discover," Mr Looi says.

When the TECS grant ended last November, Cyrus decided to spin off a new company called VI Dimensions to bring its technology to the next level — such as supporting more cameras so that AD can be put on every surveillance camera as a first line of defence.

Mr Ng says: "We will continue another phase of testing with VI Dimensions, to see if abnormality detection can be scaled up for further deployment."

Meanwhile, the new company has already caught the eye of investors, having closed a round of funding from a venture capitalist (VC) recently. One VC had even thought its technology originated from the United States or Israel.

"We can be proud that this was a product fully made in Singapore," Mr Looi says.

Moving forward, Cyrus will become the distribution company for VI Dimensions, with the goal of distributing more home-grown technologies.

"We also hope to change the mindset that ground-breaking technology in Singapore can only be developed within the confines of research institutes and universities," Mr Looi adds.

"With government funding like TECS, SMEs like us can also be innovative in developing cutting-edge technology, and making them applicable and relevant to real-life problems."