Just the interesting bits

Security: A new approach to video analysis provides a lightning-quick way to scan hours of footage recorded by security cameras

VIDEO cameras are popping up everywhere. On a typical day in a big city you may be filmed by hundreds of closed-circuit television (CCTV) cameras. The combined output of all these systems is far greater than the capacity of security staff to watch all the images. So various tricks are used to automate the process.

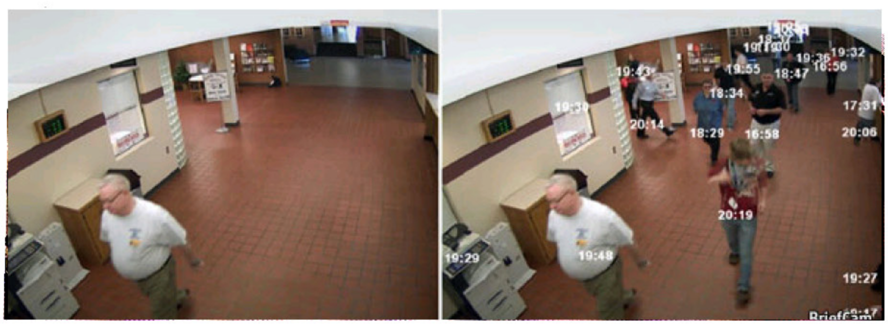
Some systems work in "real time" to alert security staff to a potential incident being filmed by a camera. They may be able to read number plates on cars and identify certain faces, for example. Other real-time systems use algorithms to detect suspicious behaviour, such as a group loitering near a door where entry is barred, or to spot items of luggage that seem to have been left unattended.

Then there is the task of searching through a mass of recorded images to see if anything has happened or to find a clip of an incident known to have taken place. Some of the CCTV cameras watching a bank's cash machines now make that job easier by linking video footage to transaction data. Other systems use analytical techniques, much like the real-time ones, to try to identify specific incidents. Error rates, though, can be high. Often there is no alternative to watching the playback manually; and if the footage is speeded up to make that process a little more bearable, things can be missed.

Now an image-processing technology developed by BriefCam, an Israeli company, makes looking through CCTV footage a breeze. In some cases, 24 hours of video from a security camera can be searched in less than a minute. The process works by showing only the bits that move. It essentially creates a summary of all moving events and plays that back as a synopsis superimposed over the static background image. So a camera watching a gate through which only a dozen people pass each day would appear to be a much busier gate, with a dozen people using it in a few seconds. Because the video is not speeded up, each person moves at his or her actual pace. And at any time during the review an operator can switch to see the original video footage.

The process begins as the video is recorded. Using motion-detection algorithms, the BriefCam software separates the background (static or non-moving objects) from the moving objects, tracking and analysing any motion within the frame. It uses this information to create a database of backgrounds, events, objects and activities. When the video summary is needed, all moving events from the period of interest are collected and time-shifted to create the synopsis.

Because the summary displays all moving events, it is less likely than software to miss something. It still relies on the instinct and experience of human operators, but it makes better use of their time by editing out all the boring bits. ■



Don't all rush at once—actually, do

Japan's winds of change

Energy: Redesigned wind turbines can wring more power out of mountain winds, which are otherwise difficult to exploit

ONE reason for Japan's reliance on nuclear power—with all its attendant difficulties of building reactors safely in an earthquake zone—is its lack of indigenous energy sources. Yet it does have one that seems under-exploited, namely the wind. According to a report published in 2009 by the Global Wind Energy Council, Japan, which generates 8.7% of the world's economic output, has just 1.3% of its windpower capacity. The world's third-largest economy is 13th in global windpower.

According to Chuichi Arakawa, a mechanical engineer at the University of Tokyo, that is because Japan has too much of the wrong sort of wind. The typhoons which regularly strike the place are simply too powerful. (In 2003, for example, such a storm crippled six turbines on Miyakojima, near Okinawa.) And the ordinary winds are less useful than they might be because Japan is so mountainous. For engineering reasons turbines must be mounted on vertical poles, regardless of the slope of the landscape. But on a hillside that means the wind (which tends to follow the ground when it is close to the surface) hits the blades of the turbines at an angle, instead of face on. That makes power generation less efficient.

Help, though, is on the way. Engineers at Fuji Heavy Industries (FHI), a large manufacturing company, have come up with a turbine that they think can withstand the sort of battering that brought down those on Miyakojima, and also turn the irregular mountain winds to advantage. The crucial differences between FHI's new turbine and a traditional one are in the location and setting of the blades. In a traditional turbine the blades are in front of both the pole and the nacelle (the structure that houses the generator). In addition, the plane of the blades is parallel to the pole. This is called an upwind design.

By contrast, FHI has opted for a downwind design, which puts the blades behind both nacelle and pole. This allows the rotor plane to be tilted so that it faces directly into winds blowing up the hill without snagging on the pole. According to Shigeo Yoshida, who is in charge of research for the project, that makes the arrangement 5-8% more efficient in such circumstances than an upwind turbine would be.

As a bonus, the downwind design is less temperamental in high winds. That is because the blades, being behind the pole and at an angle to it, can be given more freedom to yaw about than they would have in an upwind turbine. This puts less strain on them than if they were fixed. So far 25 downwind turbines have been constructed in Japan, and dozens more are in the pipeline. Windpower will remain an unpredictable power source, of course. But as Japan has recently been reminded, a bit more diversity of supply would not hurt.