

# Megapixel IP network installation for research project at Queen Mary, University of London

**Queen Mary, University of London**, one of London and the UK's leading research-focused higher education institutions, has begun work on a three year grant-funded research project to gather real world data and build models and algorithms for software application development relating to BEWARE. This stands for Behaviour based Enhancement of Wide-Area Situational Awareness in a Distributed Network of CCTV Cameras, and has important implications for security in the UK.

Running from 2007 to 2010, the research project is funded to the tune of £600,000 by the Engineering and Physical Sciences Research Council (EPSRC). Queen Mary is partnered by a number of organisations, including Smart CCTV Ltd, run by Nick Hewitson, an expert in video analytics, who helped them to write their grant application. In February of this year, Smart CCTV installed a network of megapixel IP cameras to enable Professor Sean Gong and his team to meet the requirements of the research.

### Project background

As described on the EPSRC's website (<http://www.epsrc.ac.uk>), there are now large networks of CCTV cameras collecting colossal amounts of video data, of which many deploy not only fixed but also mobile cameras on wireless connections with an increasing number of the cameras being either PTZ controllable or embedded smart cameras.

A multi-camera system has the potential for gaining better viewpoints resulting in both improved imaging quality and more relevant details being captured. However, more is not necessarily better. Such a system can also cause overflow of information and confusion if data content is not analysed in real-time to give the correct camera selection and capturing decision.

Moreover, current PTZ cameras are mostly controlled manually by operators based on ad hoc criteria. There is an urgent need for the development of automated systems to monitor behaviours of people cooperatively across a distributed network of cameras and making on-the-fly decisions for more effective content selection in data capturing.



To date, there is no system capable of performing such tasks and fundamental problems need to be tackled. The Queen Mary research project will develop novel techniques for video-based people tagging (consistent labelling) and behaviour monitoring across a distributed network of CCTV cameras for the enhancement of global situational awareness in a wide area.

### Researching solutions to new applications

Dr Tony Xiang explains the challenges that the University needed to meet in specifying the technology to achieve the project.

"The problem we want to address is behaviour analysis using multiple cameras. We need to develop a model for detection and tagging of people across cameras, enabling an automated video analytics system to track the same person between views from camera 1 to camera 2, for example."

Behaviour profiling is needed to build a model of what is the normal/expected behaviour in a camera view or multiple camera views. Once the model is learned using a set of training data, it can be applied to newly captured data for abnormality detection. If the data cannot be accepted as 'normal', the individual who triggered the abnormality would then be selected for continuous monitoring across different camera views. Dr Xiang says that, so far, this kind of behaviour modelling is done only in single camera views, but not across multiple cameras.

The third objective would tie in with both of the first two project objectives and that would be to automate PTZ cameras through software instructions linked with the tagging and behaviour profiling. Dr Xiang says: "Camera actions would be determined by the behaviour profiling. If the smart camera detects suspicious behaviour, it will automatically focus on the tagged person." At the moment, there is some work being done in the CCTV industry on automating PTZ cameras. For example, face detection software can instruct a camera to zoom in on someone's face and send an alert in connection with a database of acceptable or unacceptable persons. The PTZ camera can then follow the person but may lose the ability to be selective once the individual merges into a crowd. The new software to be developed would follow a particular individual based on behaviour profiling and abnormality detection.

### The technical solution

Smart CCTV Ltd recommended a network of Megapixel IP behaviour-recognition smart cameras offering high-definition MJPEG video quality images. There is a danger of lightning strike on the outside wall-mounted cameras, so a NetGear ProSafe Power-over-Ethernet (PoE) switch with a fibre module was used to ensure a viable link between the external cameras and the main backbone system. Plastic camera housing was used to give extra protection.

The network consists of four IQeye 1.3 Megapixel vandal-resistant dome cameras mounted in a variety of locations inside the computer science department (café, corridor, foyer, entrance); one non-dome IQeye 1.3 Megapixel camera watching the pavement area outside, with a software 'privacy window'; and three exterior IQeye Sentinel cameras, with custom-made wall brackets. The Sentinels watch an open area between buildings. All cabling was sub-contracted to specialists, the Hodge's Group, Havant.

The installation team agreed with QML to meet a minimum requirement of 15 frames per second on all eight camera channels, as a starting point. This rate may be more than is required, but equally could be increased if needed.

Having installed IQeye cameras with Milestone Systems' IP video management software at a previous university installation, Smart CCTV knew that the solution would work smoothly. Milestone Systems' XProtect IP video management system was specified as the recording platform to satisfy the project's initial aims of watching people, clarifying data and for testing models.

IQinVision's network video recording software is installed onboard all the IQeye cameras, so that each camera's images can also be recorded as a stand-alone system.

A virtual local area network was developed to accommodate the required bandwidth, and integrated into the existing network. The cameras are viewable on the LAN using an authorised password and accessed through the Milestone interface.

### **Up and running**

Implementation of the system took place in February 2008 and, following detailed training for four research assistants at Smart CCTV's premises in Havant, the three year project is now up and running. The system is working efficiently and the team are using the cameras extensively to capture data.

Dr Tony Xiang of Queen Mary's University said that: "We have an obligation to get best value for money and, as a Government Agency, we asked different companies for competitive proposals. Smart CCTV was the only company that provided the specialist technology that we needed to complete the project, on time and within budget. We particularly needed an IP-based solution that could be easily integrated with our existing building, cabling and network infrastructure."

Nick Hewitson, Managing Director of Smart CCTV, commented that "The combination of the Milestone software platform and IQinVision's Megapixel cameras provides a highly effective and efficient way of collecting and managing high resolution video streams."

### **About IQinVision**

IQinVision is the world leader in megapixel IP video. Since 1998, IQinVision has been designing, manufacturing, and marketing the IQeye family of high-performance network cameras, intelligent cameras, and network video recording (NVR) systems. IQeye network cameras are renowned for image quality, stability, and reliability in the most demanding network conditions and environments. [www.IQeye.com](http://www.IQeye.com)

### **About Milestone Systems**

Milestone is a global leader for open platform IP video surveillance software, sold through partners in 63 countries. Reliable, robust and proven in 25,000+ customer installations, the XProtect™ products support the widest choice in network video hardware and API integrations with other systems. [www.milestonesys.com](http://www.milestonesys.com)

### **About Smart CCTV**

Smart CCTV Ltd is a value added reseller of 'video analytics' products that will allow operators to become more proactive in their response to criminal and undesirable behaviour and thereby improve the quality of life of the people living and working in their area. Smart CCTV Ltd uses the technologies of computer image processing and analysis to supply and sell innovative solutions. [www.smartcctvLtd.com](http://www.smartcctvLtd.com)