## Smart cities: Achieving Self awareness through Intelligent Video Surveillance

Intelligent Video Surveillance applications over crowds have been enabled for a few years now, for counting people, detecting dangers, and helping to manage the pedestrian traffic fluidity. The worldwide image processing research community is still working on some difficult applications, which, despite some aggressive marketing, are still far from reliable application availability : re-identification, hand detection, gun detection...

At EVITECH, with our customers, we have identified multiple very interesting uses of the results of these applications for video networks operators. Among them, the following ones :

### Cities

- « Vehicles stopped and even parked in double file are a plague in this area. » *we absolutely need early detection tools in order to intervene or even apply a video procedure.*
- « At night, some places are conducive to some traffic. » *we want to be aware quickly when groups are formed on some unexpected places (outside a festival, a pub, etc).*

- « After a certain time at night, being aware about running people may help. » *During day, joggers and people late for catching a train may run. But, after midnight, running people often corresponds to more risky situations (a fight, or a chase).*


- "... early detection of wall taggings..." : *Wall illegal tagging often affect public walls, bridges, and often affect city order spirit, and are unwelcome for city safety. They imply costs for cleaning and re-painting the walls.* ***EVITECH Jaguar*** *detection help detecting this drawings while they are made, hence also help to catch their authors, so they can be condemned to clean the tag.*

- " ... we wanted to reduce handbags snatching in the city downtown..." *: Many individual attacks happen on immobile, vulnerable people. Standing at the traffic light is a good situation for snatchers. IVS applications, such as* ***EVITECH LYNX zone counting*** *over cameras watching traffic lights queues may count for the number of people x number of minutes waiting and optimize traffic lights changes to reduce this.*
- « Being aware of people crossing streets outside pedestrian crossing, or at red light, allows to measure risks. » *With video analytics, possibly coupled with an electrical relay on the traffic light, surveillance can be active at will.*
- « We need to know and measure traffic offenses, in order to measure risks. » *Reverse drive cases, or over speed limit are risky situations. Without trying to catch them in real time (because these situations are the responsibility of national police) we want to measure them in order to settle speed bumps wisely, and concentrate controls on risky periods.*

## Social housing

- "... we noticed a sudden raise in the number of visitors in habitation buildings ..." : *Habitation buildings entries are usually used, by people living there, to enter and leave their flat. They do that a couple of times a day. On the overall population of the building, there is a typical frequentation curve for open days and week-ends, e. g. with 70-100 moves per day for a 15 flats entry. However, if this number raises up to 500 moves per day, there is an obvious link with the installation of a traffic in the building. IVS applications such as* ***EVITECH LYNX flow counting*** *over the entry camera will rapidly reveal this.*
- "as soon as a group is formed in a parking, we need to send a guardian" : *Parking lots, especially underground, are place where situations degenerate very quickly, whether it is a quarrel or a vehicle show, turning into rodeo. As soon as we know, we send the guardian who stops the situation with a few words.*
- "smoke detection, particularly around rubbish bins, is critical for this housing".

## Transports

- " ... we wanted people not to miss their plane/train..." *: boarding controls may contain several steps such as ticket control, identity control, customs, etc. It is important to adapt the number of control gates to the audience so that nobody misses his/her travel, while reducing the number of control officers, for costs purpose. IVS applications, such as* ***EVITECH LYNX zone counting and line counting*** *efficiently contribute to this application, by producing counting statistics which will enable a proper forecast of affluence, and deliver in real-time the waiting time expectation of the queues. Situation aware software with maps or 3D view can easily be interfaced and display counters, or waiting times, for site management authorities.*

- "... we didn't want some wagons/lanes to stay empty while others are crowded..." *: the disposition of escalators in stations of a train line may lead to an important disparity in train filling. Likewise, the arrival of a train can saturate some escalators or corridors while others stay empty. IVS applications, such as* ***EVITECH LYNX line counting****, help driving public displays in order to orientate part of the people stream to empty places.*

- " ... we wanted to avoid incidents due to too dense crowds..." : *a descending escalator can lead to a place where sometimes people jammings occur. In such situations, as well as in the case of several corridors leading to one, it is important to be able to control the moves of the crowds, the gates, or the escalator engine in order to stop people before an incident occurs. IVS applications, such as* ***EVITECH LYNX line and zone counting, or LYNX immobile groups in crowds detection function*** *help raising alarms on such situations, for crowd control operators, so they can stop the engines, launch a voice message, or close some doors before anything bad occurs. Situation aware software with maps or 3D view can easily be interfaced and display alarms for site management authorities.*
- " ... our shops rental pricing must be optimal..." : *the shops in a mall, a train station, or an airport meet very different situations, due to frequentation. Highly frequented shops rental should be higher than the rental of low frequented ones. IVS applications, such as* ***EVITECH LYNX line and zone***

***counting**, help measuring the people traffic around the shops, their speed, the number of people stopping there, as well as the empty hours. Further statistical analysis of this data helps pricing the rentals as well as optimizing the organization of the place.*

- "... knowing when and where there is fraud at turnstile helped organizing controls..." *: Ticket controls by turnstiles can be avoided by some who jump over them, or pass simultaneously with another person. Knowing where and when this fraud occurs helps improving the control systems (e. g. adding doors after turnstiles), or addressing controls at proper hours of the day, over the proper turnstiles. It can also help obtaining the actual public funding for a public transport network, for the real number of people transported. IVS applications, such as **EVITECH LYNX line counting**, in addition with actual turnstile rotation data, help building curves with a precise measure of fraud (> 95%). EVITECH thus demonstrated that fraud rate was maximum at night, but fraud absolute cost was more important in the afternoon.*

- " ... Some contexts may cause panic, we need to react quickly, use the loudspeakers, send guardians..." : *when a tense situation occurs (smoke, loud noise, density, broken showcase,...) there may occur panic situations (sudden race, scramble, falls on the ground) and it is highly critical to detect them quickly and send a message through the loudspeakers, send vigils to the area. The risk of trampling may be more harmful than the original phenomenon (slam, noise, mastered smoke...).*

## Public Malls, Museums, ...

- "... we absolutely don't want someone entering by the exits..." : *Entering by an exit against the crowd is an easy way to enter somewhere, difficult to detect and to manage because of the crowd. However, it can lead to business losses, frustrating situations (e. g. more people to seat than available seats), or introducing a robber in a sensitive site. **EVITECH LYNX behavior detection in crowd function**, helps detecting this situation and can easily raise an alarm and build a video proof that will help managing the incident.*
- "... early detection of failed escalators/ treadmills would greatly increase passengers satisfaction..." : *Many equipment like escalators or treadmills are autonomous, they can fail without being noticed by maintenance agents. However, passengers satisfaction can be highly decreased in such situations, if they miss a train, or e. g. have difficulties to climb stairs. **EVITECH LYNX behavior detection in crowd function**, helps detecting this situation and can warn supervision in case the average speed or speed deviation over such an infrastructure changes, in order to hurry the maintenance intervention and reduce unavailability time. It can also help to make intelligent public display in order to orientate passengers to available systems.*
- "Roofs are vulnerable points." :*particularly those closed to public access, roofs are dangerous for people on them (risk of falls), for people under them (object falls), and during crisis (shooter). We wish to ba aware of this immediatly in case of presence on the roofs.*
- "Smoke detection is also useful, particularly on open spaces where small detectors don't work."
- And also : *Guarantee not to overcome a maximum authorized frequentation in a public site.*

## And generally

- "Video center operators don't watch images anymore ..." : *The more cameras, the more screens (or screen areas), ... up to a limit of the wall size ! Then, each screen area successively presents one camera scene every 10 or 15 seconds. Operators don't see anything anymore since they don't have enough time and eyes and brains to watch everything, especially when they have to manage remote actions and appliances (gates, traffic lights, etc). Video*

*analytics applications allow to revert this situation and to propose a black screen to operators, which would only light when interesting images occur : major events at day (large groups, events in sensitive sites, …) and night (display running people, show lower risks incidents before they get worse…).*

- "With a large number of cameras, we have breakdowns and degradations" : *it is important to detect them, and have them cleaned or fixed quickly, discouraging further degradations.*

**About EVITECH :**

Created in 2005, EVITECH is an innovative company (French JEI status), member of the SYSTEM@TIC cluster since 2006 (involved in many collaborative R&D projects). EVITECH received the support of the MoD, OSEO, and other french security authorities . EVITECH is also a member of the Optics Valley association. EVITECH won the Finance & Technology association prize in 2005 (most promising start-up) and the Usine Nouvelle journal “Innovation Trophy” in 2009. EVITECH develops and sells video analytics solutions for civil and military applications : Jaguar (intruder detection, fire, oil & gas leak), and Lynx (crowd supervision).