Appendix K:
Commercial Data Analytics Trials

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Contents

AdMobilize

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Typical Examples:
Vehicle: https://www.youtube.com/watch?v=RpGbk60F2y8
Crowd: https://drive.google.com/file/d/0B209keMdGpcQdUswTGVrZDBRbkU/view
Face: https://www.youtube.com/watch?v=PL3xJErjEgU

Typical Technical setup required:
AdMobilize analytics application could run on the Cloud system or on the local PCs, access to the cameras video stream would be through a RTSP protocol.

Typically in order to configure AdMobilize analytics application the following information would be needed: *IP range, *Subnet mask, *Gateway , *DNS, *IP for PC, *IP for camera rtsp, *Port open (suggest 5003) or 554

We have sent 5 sample videos from QdS locations and asked AdMobilize to give us their comments on the current capabilities and limitations of their video analytics system.
The AdMobilize proposed setup/configure and run the video samples through their video analytics products, and give us back the processed video, at the cost of $1,000 USD/per 10 min of sample video. Based on the following information we already acquired from the company about their capabilities and limitation, we did not believe it would be beneficial to proceed with this proposal or video analytics individual license purchase.

The following is the brief summary of AdMobilize Video Analytics Capabilities and Limitations:

1) **Vehicle metrics:**
   - Analytics application can only provide count and speed of the vehicles
   - The cameras must remain fixed (no scanning PTZ) for a period of time in order to get accurate data
   - Using the screen shot from the sample QdS video, we could see that "virtual" gates that would have to be setup in the analytics software (see the green boarder lines), these green lines would serve to separate and count the cars in a given traffic lane.
   - The typical cost $150 USD/month per camera
   NOTE: Our custom developed Vehicle Counting trial analytics application, based on free OpenCV library function (discussed in Chapter 6.2.1), is also able to count the cars, and with extra development effort it could be also

detect speed of the vehicles. In the next step it might be more interesting to continue development of VdM custom made application for future vehicle analytics deployment.

In either of the applications the initial custom setup would have to be done manually per each fixed camera view.

PKH5 QdS video sample
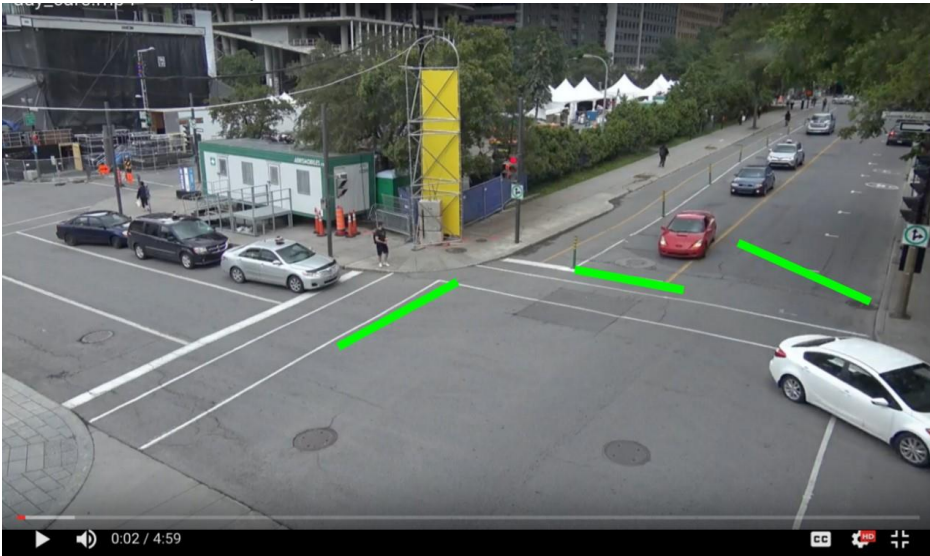
Example of previous AdMobilize works

Example of previous AdMobilize works

2) Crowd metrics:

- estimate live count of the number of people within the feasible region of the camera view
- The crowd estimation solution can only work up to a certain point, du e to loss of detail and the angle of the camera only the people seen in the lower part of the green boarder line could be counted
- Ideally the camera should be installed overhead of the area to be evaluated
- The typical cost $150 USD/month per camera

NOTE: Our custom developed Crowd Estimation trial analytics application, based on Matlab (discussed in Chapter 6.2.2), takes into account the complete view, and thus might be more interesting for potential integration in future Crowd analytics deployment

SCH10 QdS video sample

3) People metrics:

- detect Gender, Age Range, Emotion, dwell time
- some of the camera views from QdS locations may work, but most likely a zoom would be needed for the cameras (see below as an example)
- The typical cost $75 USD/month per camera

NOTE: we have not investigated people metrics, but strongly believe that custom VdM analytics solution could be feasible using free OpenCV library functions or Matlab functions.

MSH6 QdS video sample

iOmniscient

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In order to evaluate the products from iOmniscient, apart from Analytics software and licenses purchase, we would also need to purchase on-site configuration services by the company representative, which by itself would cost $4,300 CAD.

We have negotiated with iOmniscient that to best showcase and present software capabilities under practical conditions, iOmniscient will process our QdS location video sample clips, using their video analytics applications, and they will come back to us with the results of realistic/expected video analytics capabilities (processed video samples).

After reviewing the results and discussing with VdM team we can decide next steps.

We have asked for the demonstration of the following 3 analytics products:

a) unattended-bag
iQ-140 Non Motion Detection Software - for abandoned objects detection
Cost of license per camera $2,480 CAD/year ($207 CAD/month)

b) fire-smoke,
iQ-Smoke Smoke and Fire (Advanced) Software Detection
Cost of license per camera $2,975 CAD/year ($248 CAD/month)

c) crowd-people-count
iQ-125 Live count of the number of people within a region of interest
Cost of license per camera $2,110 CAD/year ($176 CAD/month)

During the discussions with iOmniscient we have been made aware of the following practical limitations of the products:

- For crowd estimation the product generates the result occupancy percentage of given area and will normally generate alarms for specified thresholds (actual count of persons is not given, but could be derived from the percentage and known maximum capacity of the area)
- For crowd and people counting it is desired to have the camera positioned directly over the area to be counted, for shallow viewing angle (from the camera on the lamp posts) scenarios the accuracy won't be as high as it would with a higher angle view since we will be dealing with objects and people obscuring each other from the camera's view.
- Crowd and people counting will work well using typical video cameras during a well illuminated day with clear weather, however, for night or poorly lit, or multicolor illuminated events (like festivals in QdS area) a specialized thermal or Infra-Red camera would be needed.
- For fire-smoke detection the system would need to have a least 30 frames of normal scenario, for learning purposes, before any fire or smoke event can be detected. This could be a limitation if we want to use PTZ camera constantly scanning different areas.
- More custom development would need to be done for any of the analytics applications to work with the PTZ different regions scanning mode

- The system does not have native support for the video files generated by VMS Milesone xProtect software, however, iOmniscient product has an interface with Milestone xProtect that allows to stream video from their media server.
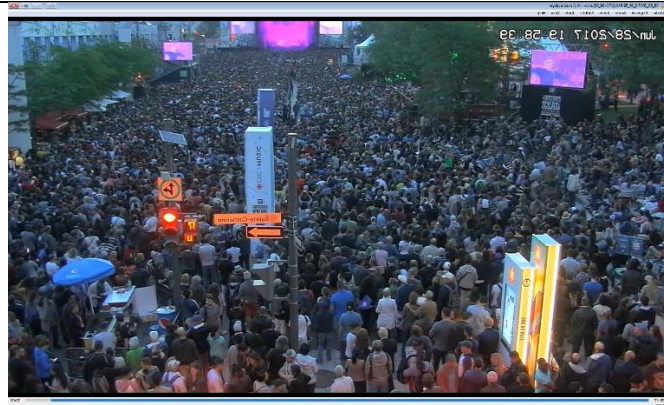
The following are snapshots of sample videos from QdS location that were sent to iOmniscient for processing.
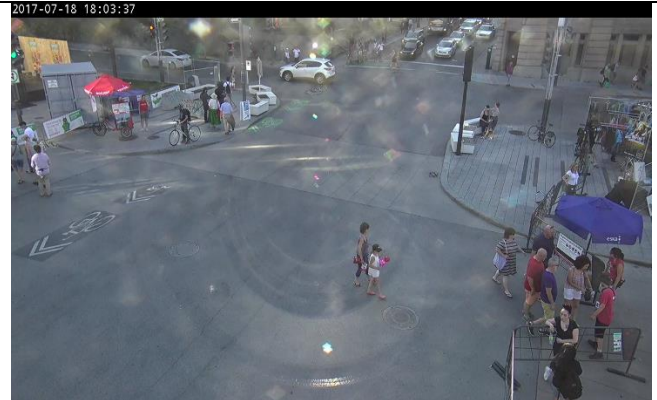
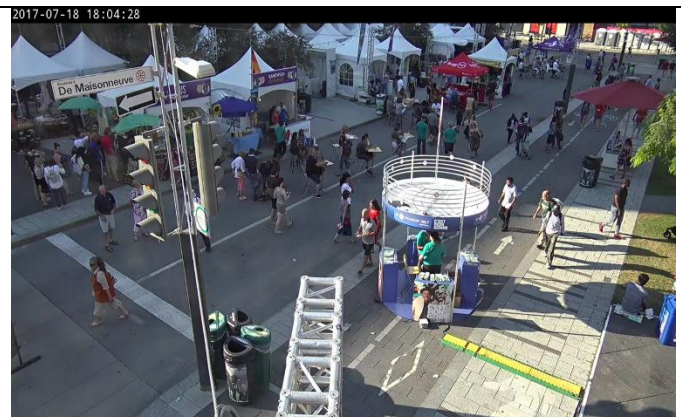|	
SCH10 Fire – No results from iOmniscient (very small flame, difficult case)	SCH10 Smoke – No results from iOmniscient (very faint smoke, difficult case)
SCH10 Crowd occupancy (day only) – many obstructing persons, difficult case - Only low density of person case was analyzed by iOmniscient below	SUH28 Street gate persons count – No results from iOmniscient (however could be easy to implement)
SUH28 Park event crowd occupancy (day only) – No results from iOmniscient (many obscuring objects, difficult crowd counting case)	SUH28 Street event persons count – No results from iOmniscient (many obscuring objects, difficult crowd counting case)
SUH28 Staged abandoned back pack scenario in the above viewed park – No results from iOmniscient	ONH4 staged abandoned backpack street scenario See results below

iOmniscient Processed Video clips
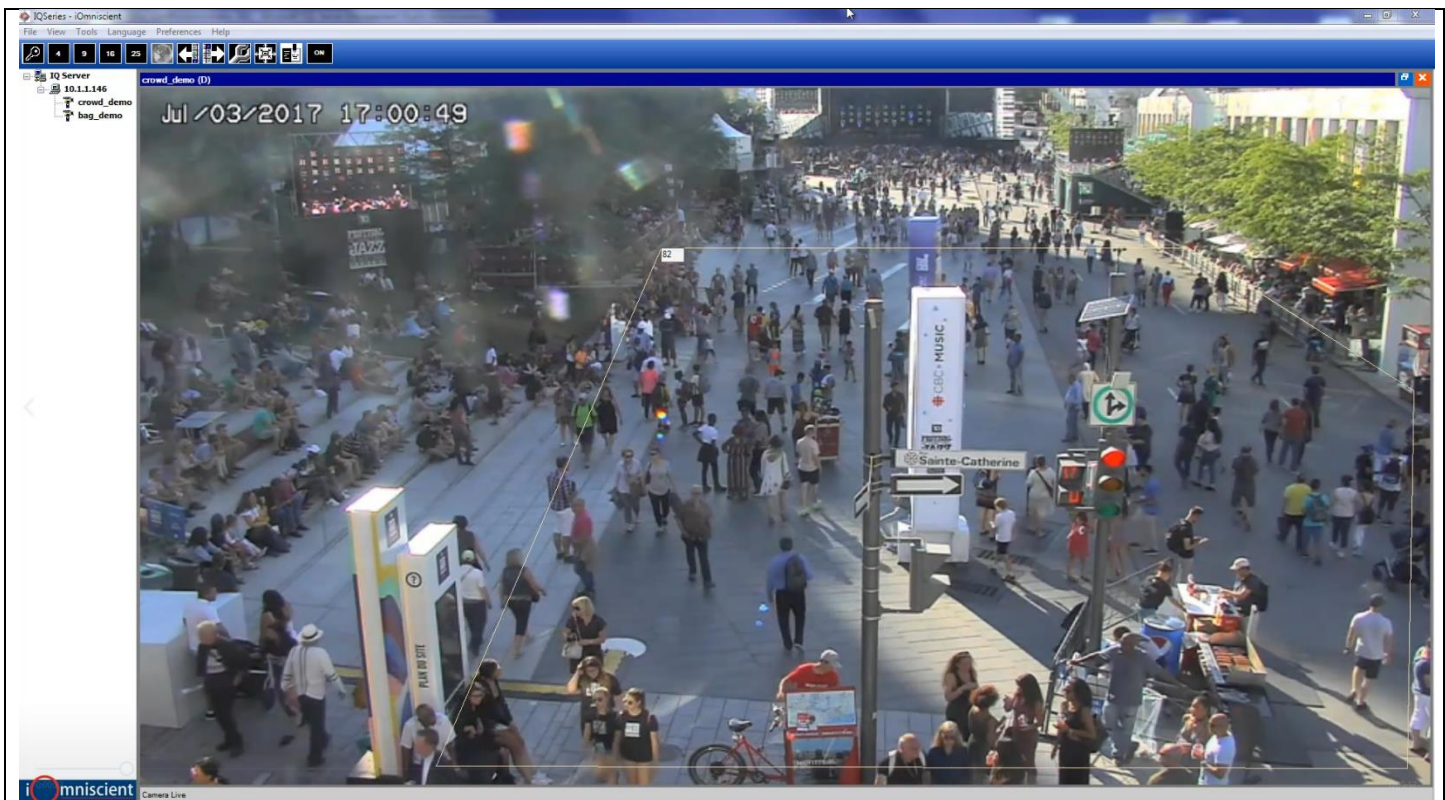
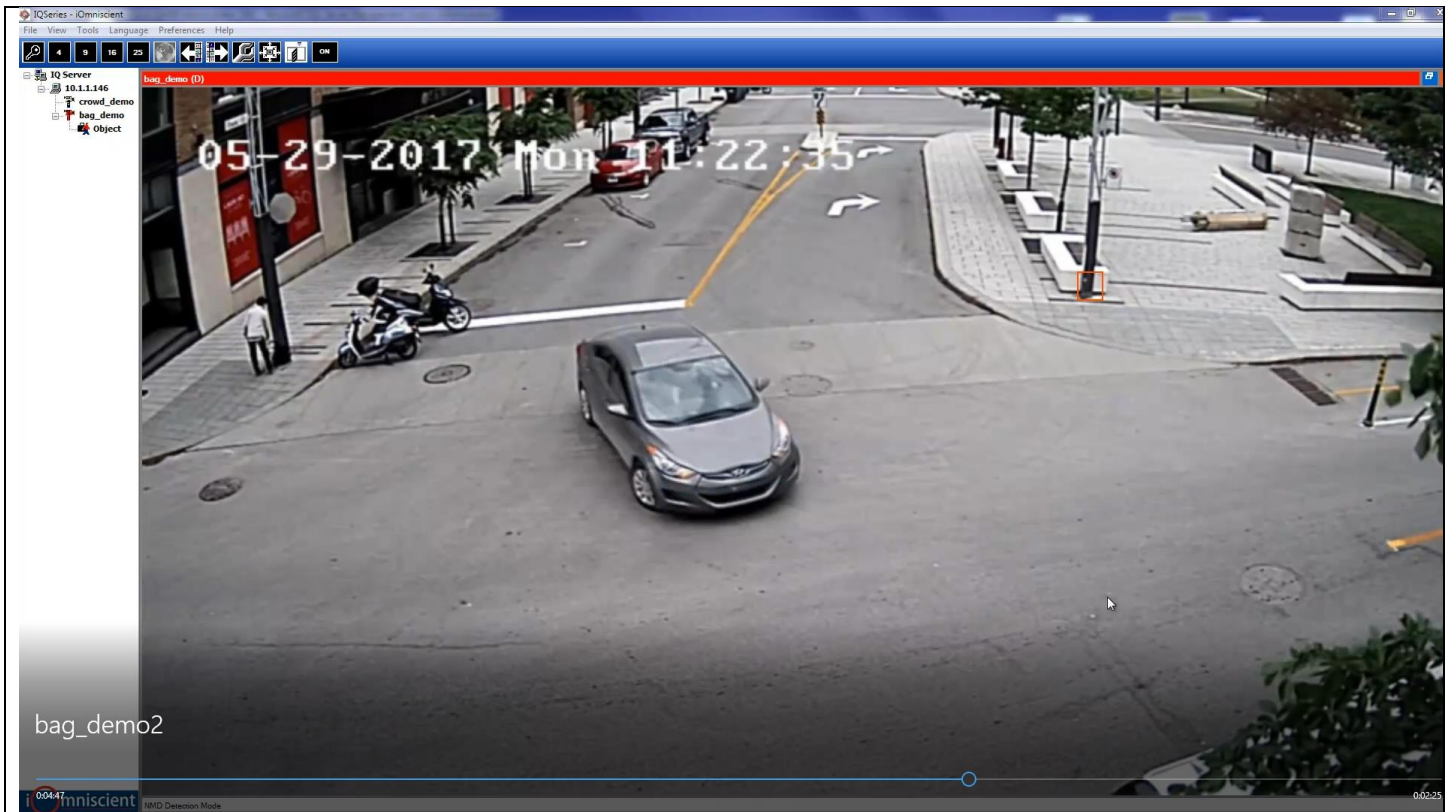Crowd counting – 82 persons software estimated (manual true count ~ 120)
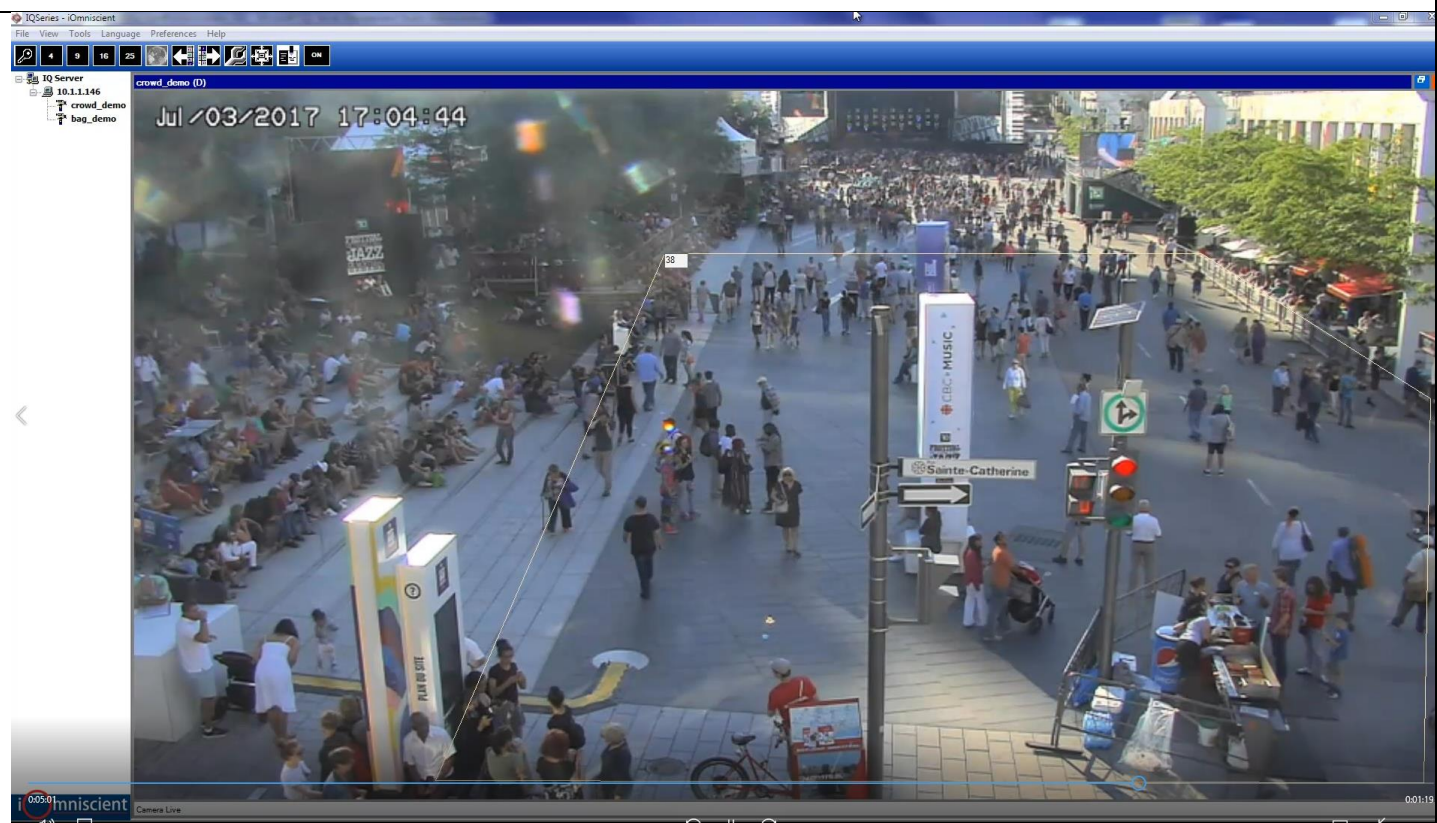
Crowd counting – 38 persons software estimated (manual true count ~ 80, approx.)

Unattended bag detection – bag drop-off with person (right side)

Unattended bag detection – bag drop-off without person (~ 25 seconds after person left the bag alone)

Unattended bag detection – bag drop-off with person (left side)

Unattended bag detection – bag drop-off without person – left side (~ 45 seconds after person left the bag alone)

Concluding Results Discussions

1) **Car counting** – as demonstrated in the main report, custom developed OpenCV based (or Matlab based) car counting applications could easily provide the same functions as the commercial dedicated applications. High camera installation with top overview of the intersection makes it more easy to configure car objects counting application.

2) **Crowd counting** – as demonstrated in the main report, custom developed Matlab based persons counting applications could be made with the same or better accuracy with greater region of interest flexibility, than commercial application provided by AdMobilize or iOmniscent. High camera installation with top overview of the area of interest is critical for high accuracy of count, also good uniform lighting is needed. Main issue in commercial applications: fixed objects and people in the main view, obstruct or partially block the view of persons in the back view, and thus results shown in the example above are with large error. More complex crowd analysis techniques could be used to improve counting accuracy (as shown in main report). Crowd counting at night with poor or multicolor (concert) lighting is conditions is very challenging (may not be feasible) with normal camera, thermal camera might be much better option for this purpose.

3) **Unattended objects detection –** our attempts to perform unattended objects detection using camera vendor provided features did not result in successful reliable detections, we have experienced a lot of false abandoned objects detections and misses. Commercial specialized software from iOmniscent seems to do a good job in abandoned bag detection using fixed camera view. As illustrated in the above pictures two staged instances have been detected within 25 to 45 seconds of a bag left alone under the street pole. Typically, custom configuration for each fixed camera view would be needed. Using multipurpose camera with PTZ capabilities would need custom software application development and could be fairly complex task.

In the next step, in-depth development of each specific video analytics application would have to be pursued. Car/bicycles and crowd/persons type detection and counting could be developed in house using open source development tools, but for security oriented applications, such as: abandoned object, fire detection or facial recognition it might be better to leverage commercial tools, such as provided by iOmniscent, to speed up reliable deployment.

NOTE: Other potentially interesting products (not on the evaluation list):
iQ Facial Recog. Detect lost child/elderly/VIP/other registered person in crowd

Full list of products could be found in the following links:
http://www.iomniscient.com/index.php?option=com_content&view=article&id=160&Itemid=73
http://www.iomniscient.com/index.php?option=com_content&view=article&id=52&Itemid=18

System Architecture:
http://www.iomniscient.com/index.php?option=com_content&view=article&id=95&Itemid=154