How Stressed is Your Airport?

High Performance Analytics – real-time decisions, analysis and performance assessment.

Airports regularly experience significant periods of stress. This stress is hard to accurately quantify. Stress on airports is due to the challenges of complex operations management around the coordination of multiple stakeholders and system components; all of this at the same time as trying to meet operational objectives for facilitation, security and passenger experience.

Your Problem

This complexity is compounded by dependencies between different airport processes and stakeholders in a dynamic and uncertain environment. It is also difficult to track this stress to its root causes within facilitation points such as Check-in, Screening, or Customs.

Our Solution

Obtaining situational awareness is recognised in the military as a critical first step in dealing with complex and uncertain environments. The AoTF is developing a key technology enabler; CCTV based Intelligent Surveillance or Video Analytics (VA). VA helps to address the cost and relative inefficiency of manually monitoring a busy terminal by providing an automated means of monitoring crowds and movement of people in a terminal. We are developing technologies that include automated crowd counting and queue counting, Virtual Gate technology, and soft biometrics. Virtual Gate technology will provide time-stamped counts of people as they move through space. Soft biometrics (human traits) provide the ability to track passengers identified using non-unique traits such as height and colour of clothing to track their movement through the airport.

These VA offer the opportunity to improve perceived security and increase recording capabilities, and they can also provide real business intelligence and real-time operational analytics.

Using technologies such as VA and other sources of data, such as flight and passenger records and surveys, it is possible to develop a sense of situational awareness. However, the data generated is significant, and a model is needed to help distil the most important information for the decision task at hand.

The AoTF is developing a Bayesian Network (BN) for this purpose. This is a living statistical model of airport facilitation. Such models of a terminal capture the different factors relating to passenger traffic, service, and service usage, and relate to metrics of dwell time, throughput and congestion. This enables the decision maker to visualise and simulate the quantitative links between different areas of the airport.
Figure: An integrated solution showing how the pilot BN model for the Entry Control Point at Brisbane International integrates with data models, such as the VA outputs and spatial models. In this diagram, Virtual Gates are used to measure entry rates, exit rates and queue size, and soft biometrics are used to track and measure dwell time for distinct individuals. Measured values update the metrics/factors in the BN, where arrows indicate (quantitative) cause and effect relationships.

Such a model supports decision making by:
(i) generating performance scorecards (ranging from hourly reports to annual reporting),
(ii) estimating system performance such as queue wait time for the purpose of communication, and
(iii) estimating the impacts on whole-of-system performance given ‘what just happened’ and an upcoming flight schedule or resource strategy.

What next?

AoTF is currently engaged in two prototype trials of this technology with Australian Customs, the National Passenger Facilitation Committee, Brisbane Airport and Darwin Airport. These performance framework trials are developing and testing holistic models of the inbound facilitation process as well as testing and refining the real-time

VA in a live and operational airport environment. Timeframes for trials are set from August 2012 - March 2013. Options to bootstrap the development process and improve paths to commercialisation and end-user utilisation are also being pursued.

Want more information? Please contact the Intelligent Surveillance/Complex Systems teams within the AoTF.

Associate Professor Clinton Fookes
+61 7 3138 2458
c.fookes@qut.edu.au

Professor Kerrie Mengersen
+61 7 3138 2063
k.mengersen@qut.edu.au