dcm

Introducing

Dynamic Crowd Measurement

Created By
Dynamic Crowd Measurement

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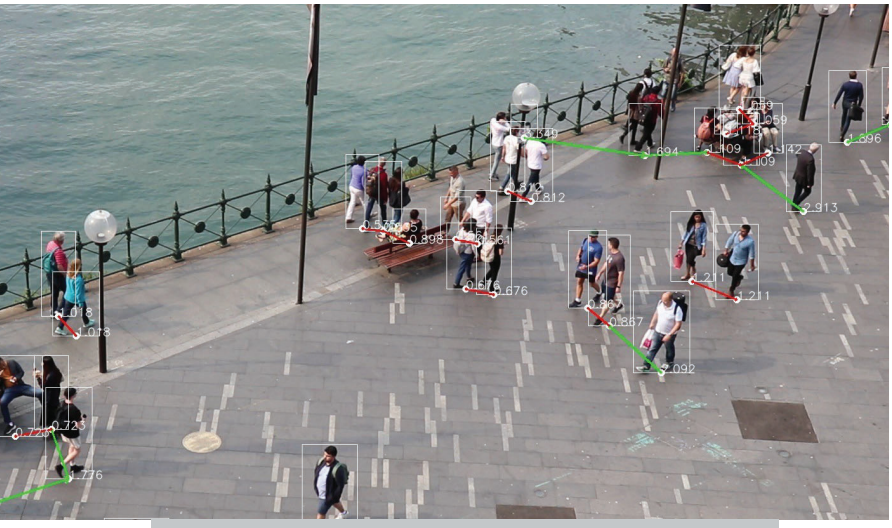
DATA DRIVEN INTELLIGENCE

DYNAMIC CROWD MEASUREMENT (DCM) PROVIDES UNIQUE REAL-TIME PEDESTRIAN DATA ON THE RELATIONSHIP BETWEEN CROWD DENSITY, FLOW AND MOOD.



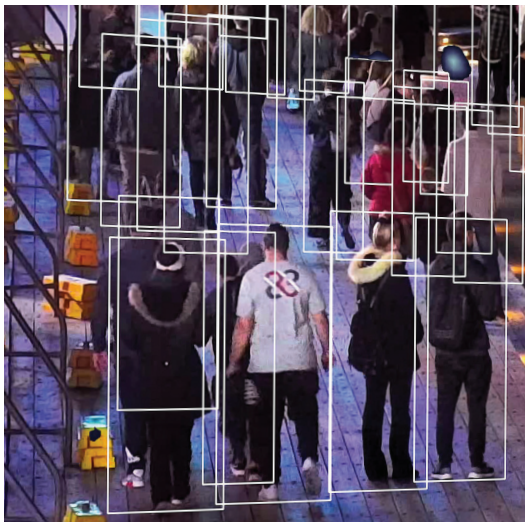


Figure 1: Leveraging AI for real-time pedestrian data.

The core of our company is the technology to measure new metrics in crowds. Dynamic crowd measurement developed from the need to solve the crowd management puzzle. Why do you need more or less guards and when? When do pedestrians become a crowd and when does a crowd need crowd management?

The answer lies in the tactical definition of successful crowd management which we decided should be: that the crowd goes home in a neutral or positive mood. So we developed software to measure crowd mood via CCTV digital image analysis as well as measuring crowd density and crowd flow velocity as inputs.

It works in near real time and provides 4-7 mins warning when crowd mood starts to change. It also provides exceptional modelling and resource allocation potential. Now place managers, station masters and staff can manage according to actual crowd data rather than subjective feelings. At Vivid Sydney we are able to achieve savings of 30% of staff costs by using resources on call rather than static resourcing.

By automatically analysing multiple video streams, DCM provides an online spatial temporal pedestrian model, which informs predictive analytics by exploiting patterns and emotional changes to effectively aid in decision making.

The responsive dashboard provides high situational awareness through its ability to instantly observe, analyse and review accurate crowd information at multiple key locations. The software displays analytics based on detected pedestrians and estimate their position over time – accurately calculating the distance between them and reporting on quantitative measures of social distancing compliance.

Private individual information is never collected, since individuals are never identified and no cross-database checks are conducted. Extracted analytics from crowds are stored anonymously and provide playback features to assist in staff intervention tracking, data reporting, future development and assessment of social distancing interventions.

DCM Website

Figure 2: Dashboard viewing on mobile and desktop with a highlight of characteristics being measured.

Behind the Technology

DCM can be used to react in real time to implement crowd management. The resultant emergent behaviour can be measured, predicted and used for safe management or future design input. DCM recognises and exploits patterns contained in large data sets to inform predictive modelling, allowing a 4-15 min warning of crowd mood falling. This data can then be used to develop 'trigger points' and phase changes to implement crowd management techniques and reduce crowd congestion to the desired target levels. It can be installed on existing camera systems, given camera suitability, or use event specific standalone cameras.

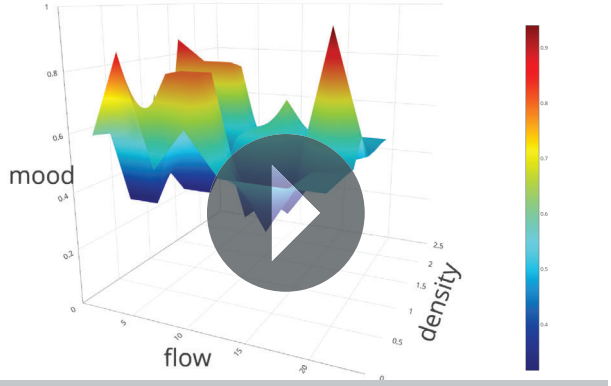


Figure 3: Interactive Graph. Raw data analysis demonstrating the visual relationship between density and mood.

The specific metrics are; crowd density of persons measured in persons per square metre, crowd flow speed (velocity) measured in meters per second and crowd mood measured in categories of positive, neutral or negative. Additionally, the software is then able to visualise the relationship between all three of these categories, i.e. density, velocity and mood, and in turn provide analytics to industry leaders to aid in decision making for good crowd management. The software enables effective and optimised crowd management interventions, that is, to ensure crowds are kept in positive or neutral moods to ensure effective services and safe environments for patrons. The accurate spatial temporal pedestrian models generated by the software provides for an effective technique in implementing crowd safety measures and/or initiating future design output.

Objectives

The objective of the technology is to understand, model, and manage people in spaces, by monitoring movement and occupancy levels in real-time and making adjustments to improve safety and ensure positive customer experience. Integration of the Crowd Management (CM) and Social Distancing (SD) tool with other systems can provide streamlined management of crowds and aiding decision making.

The DCM solution benefits provide :

1. Data to model future design capability.
2. Evidence to anticipate decisions for better place management
3. Contribution to real-time management of pedestrians and crowds based on real-time data rather than on prior risk assessments, models or assumptions.
3. Better planning for crowd staffing, budgeting, training and management purposes

Social Distancing

COVID-19 has reset the rules of public gatherings. The current concern of a second wave infections has presented governments and event organisers with a challenge to observe and maintain social distancing. Leading the recovery will be public spaces and places where social distancing can be actively monitored such as airports, public areas and transport hubs. The DCM solution will provide quantitative measures of Social Distancing which can be used in the following scenarios:

1. Evidence for replacing or imposing social distancing measures.
2. Real time identification of bottlenecks and spatial regions susceptible to shorter average distance between pedestrians
3. Support research and development of predictive outbreak models, which are based on assumptions around social distancing.

DCM Social Distancing

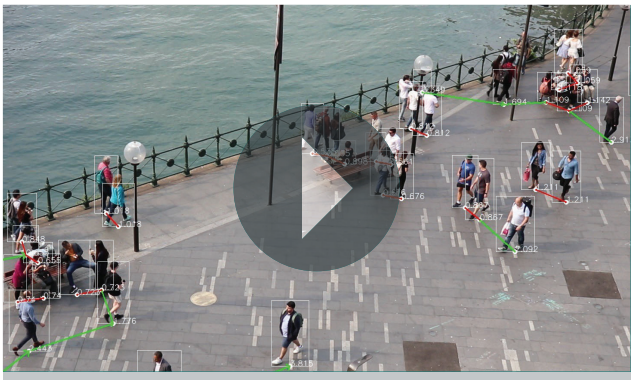


Figure 4: Video. The Science of Measuring Social Distancing

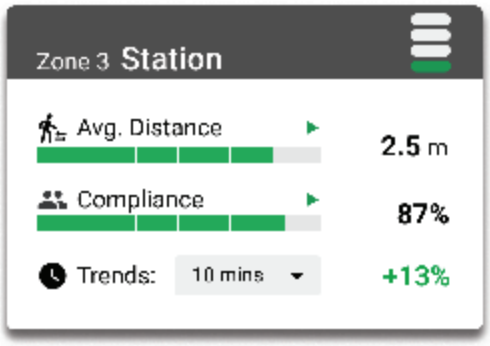


Figure 5: Visualisation of social distancing at a location.

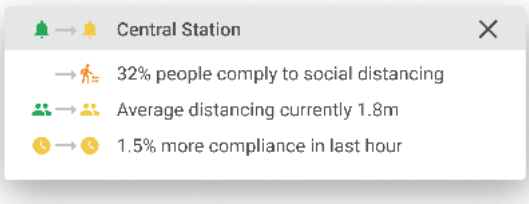


Figure 6: Compliance Notifications.

Key Product Features

Geospatial Heatmap
Facilitates effective identification of hot spots for density, velocity, mood and social distancing.

Zone Monitoring
Indicates real-time measurements of density, velocity, mood and social distancing compliance in each location.

Data Playback
Provides real-time and retrospective data analysis. Enables users to validate data against a live image and heat map to gain deep understanding of key moments and metrics (specifically useful for activity benchmarking, planning input and enforcement of social distancing).

Notifications Manager
Provides updates on changes to crowd metrics and alert levels.

Figure 6: Geospatial Heatmap and Zone monitoring.

Business Benefits

Staff Know Where to Act
Real-time crowd density and flow analytics taken from various areas throughout precinct provide almost instantaneous metrics via a live dashboard to all users.

Staff know When to Act
Users are prompted with a 4-15 minute advance warning in anticipation of phase changes in crowd moods. Additional data aggregation such as transport arrivals can be combined and included.

Staff Know How to Act
DCM forecasts what actions are required and identifies management intervention for mood manipulation. Data is used for scenario training material to develop Pre planned management technics aligned with clients existing protocols and risk appetite.

Customer Experience Measurement
The technology can interpret facial expressions and determine passenger mood, providing for accurate feedback and customer experience data collation.

Efficient Staff Allocation
Weekly forecasting is able to identify when staff are needed most, keeping last-minute job requests to staff and overall costs, at a minimum. The Annual and Event forecasting feature allows for efficient staff planning during unique events and can be used as input for long term capacity planning.

Easy reporting
Periodic sentiment reporting can be automated and supported visually.

The Team

The development of this technology has been driven from the bottom up by an experienced team of leading crowd managers combined with technical developers, university professors and a group of specialised deep neural and data scientists. This pathway from practical crowd management to technical expertise is atypical in technical development and a major factor in the practical solution offered.

DCM Org Chart

Scalability

This technology has highly scalable prospects as the software is also designed to be loaded onto pre-existing control room servers and use existing CCTV cameras. If existing cameras have 1080-pixel coverage, the process is as straightforward as installing, calibrating, test and trail process before the staff consultation and training. Additional cameras or laser imaging detection and ranging (LIDARS) are often desired to elevate the collection of data and can be added once the analytical capacity becomes apparent. Full training is provided, as well as user guides and e-learning videos to assist in the implementation and development of staff training.

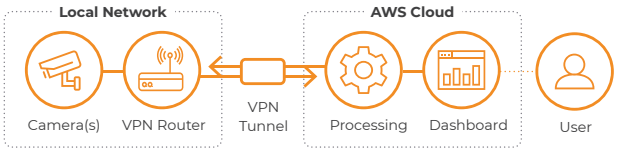


Figure 9: Technical Setup Overview.

Resilience and Security

DCM provides cloud infrastructure that allows existing installation CCTV footage to be processed in a highly secure environment that maintains privacy of individuals. Our software ensures pedestrians are never identified and are assigned anonymous labels, ensuring the imagery is deleted from DCM serves after getting processed. All data analytics are owned and retained by the client.

WWW.DYNAMICCROWDMEASUREMENT.COM

www.dynamiccrowdmeasurment.com/social-distancing

linkedin.com/company/dynamic-crowd-measurement

ADDRESS

79-81 Regent Street
Redfern, NSW 2016

ABN: 92 624 691 630

ML# 000104655.

CONTACT

TRAVIS SEMMENS
Co-Founder
M: + 61 402 969 933
E: tsemmens@dynamiccrowdmeasurement.com
linkedin.com/in/travis-semmens-8479b730/