SMART SURVEY





Advanced Mobility Analytics group's (AMAG) Safe Mobility Alert Real Time (SMART) Digital Platform, offered via Software as a Service (SaaS), is designed to provide analytics and insights for transportation management, operations, and planning. Using video analytics, AI, econometric models, and Deep Learning, the SMART platform benefits from more than a decade of research, refinement, testing, and validation with 23 city customers across 8 countries globally. Crashes are estimated to have been reduced between 20% and 60% as verified by AMAG predictive analytics. These learnings over the past 15 years are embedded in SMART, allowing the road safety community to proactively manage safety on their transport networks.

SMART Surveys (SUR) enables collection of essential traffic data fundamental for transport planning and traffic engineering applications using reliable and tuned AI algorithms with shorter turnaround times and greater granularity than the existing technologies such as pneumatic tube counters. The Surveys module helps collect accurate classified traffic volume counts for more than 8 road user classes (e.g. pedestrians, bicyclists, passenger cars, commercial vehicles, and buses) to support efficient transport planning. Importantly, the road user classes are customisable, meaning that additional road user classes may

be included for specific transport network sites. For example, the platform could detect and track agricultural vehicles for deployment at a rural road segment. The detailed classifications help the planners and engineers design and upgrade facilities to cater to any special needs of specific road user classes such as articulated trucks and buses.

SMART Surveys also extracts classified average speeds data for the same road user classes in 15-minute bins. The classified speeds are essential for assessing the service quality of transport facilities and are instrumental for planning future upgrades. Both classified volume counts and speeds are downloadable in various formats for use

as inputs to and support for micro and macro-scale modelling tasks.

SMART Surveys also provides an online repository for the users to upload old traffic

surveys (in Excel files) for transport locations to provide a single access point for all traffic surveys: both historical and new. Future updates to the module will enable the road users to extract the



SMART Surveys is useful for customers wishing to:

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- Obtain accurate estimations of classified volume counts and speeds
- Conduct reliable and reproducible traffic surveys with low turnaround times
- Upgrade/maintain existing facilities by measuring service quality through flows and speeds
- Design new transport facilities by conducting

surveys on similar nearby facilities

- Assess the performance of transport facilities with respect to a targeted road user class
- Maintain an online repository of old traffic surveys related to a site for easy comparison of performance variation over time



traffic data from old surveys to compare with new ones, which could lend deeper insights into the performance of a transport facility.







Software as a Service (SaaS) architecture

AMAG's digital platform is built for the cloud with mobile-first design in mind and uses cutting-edge technologies ready hosted and available on the cloud for customers just a few clicks away. AMAG's SaaS application does not require the deployment of large

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computing infrastructure at a client's location, rather it is designed to work with a variety of platforms anytime and anywhere. AMAG's SaaS solution also provides a highly scalable application with exemplary computing performance. It is constantly available and able to process data of any size and supports excellent rendering, data querying, and various transactions. The platform is designed with security in mind, as it ensures data security and integrity in every layer of the software. The AMAG Software as a Service enables you to: The AMAG SaaS enables users to:

- Ensure availability, continuity, and performance with enterprise software
- Reduce total cost of ownership and capital expenditure
- Stay up to date with new features
- Improve security with

AMAG's digital platform is capable of hosting on any cloud platform. It is developed using ASP.Net Core and Python for RESTful APIs and microservices. Front-end frameworks such as REACT, Bootstrap, and jQuery are primarily used for user interface (UI) development. Its data layer is capable of using any relational database such as SQL, Oracle and Postgres. For Artificial Intelligence (AI) and Machine Learning (ML) microservices Python is being used. The solution is broken down into multiple

web apps and microservices so that it can be hosted into multiple cloud platforms. The AMAG platform is combined with the following key components. Security components include: identity management (for authentication and login using standard, Single Sign On (SSO) and OAuth (Open authorization)), supports both cookie and JSON Web tokens (JWT), access management (Role and Claim based), and security logging for insights and threat detection. Video analytics and trajectory data

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defense in depth architecture

- Reduce environmental impact with improved energy efficiency
- Focus on road safety analytics, not technology

components are designed to feed video streaming data to cloud storage and contain a microservice to process streamed video for trajectory data extracts. The enterprise applications component is a logical placeholder for a range of web applications such as SMART Safety, Operations, Survey, Infrastructure, and Pavements. Al and ML microservices operate in this layer that runs independently as a background process also manageable through AI web application interface.

AMAG SMART Operations EDGE Camera Solutions



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Secured API Gateway



End User / Operations team

Analysis Process

SUR uses state-of-the-art advanced video analytics employing Al and Deep Learning techniques to measure and detect a variety of road user classes including motorised (passenger cars, motorcycles, trucks, and buses) and non-motorised road users (pedestrians, bicyclists, etc.) for traffic engineering evaluations (service quality, usage trends, pavement loading estimations, etc.) and long-term transport planning.

SUR makes use of cloud-based processing to deliver low-cost traffic surveys to SMART, which is hosted in the AWS Cloud, and delivered as a SaaS platform minimizing IT overhead and ensuring that customers receive regular, high value feature updates, security and bug fixes, and can provide feedback.

Designed with ease of use in mind, SMART Surveys can deliver you accurate and reproducible classified volume counts and average speeds in six simple steps:

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- Create a new site by entering the site location (latitude and longitude) and other general site information
- Create a new survey for the new site (or an existing one) by providing some general survey information
- Upload the videos and supporting files (optional) to the platform
- Calibrate the videos by clicking on corresponding points in the camera image and a satellite image of the location (both automatically extracted by the platform) to relate 2D image coordinates to the 3D real-world coordinates
- Create lanes (or traffic areas) in which the analysis is needed. The data are organised according to these lanes.
- Hit on the start analysis button!







Site Configuration

SMART Surveys could be used to keep tabs on traffic surveys conducted at multiple traffic sites. Thus, site creation and configuration is the most basic task in the module. The Survey Site Maintenance tab under Administration provides the user a list of all the sites created by them. A new site can be created by hitting the "Add" button on the screen, which opens the dialogue box shown on the right. The user can create the site by providing some



Creating New Surveys

New surveys can be created for any site (new or existing) available in the platform. The user can hit the "Add" button on the Sites dashboard to open up the "Create a new survey" dialogue box. Currently, only new video surveys can be analysed. Future updates will enable creating new surveys from imported Excel files to digitise old survey data. Important steps here include selecting

SMART **SURVEY**

simple site level information like the site type, region, name, and description. Once the user provides the latitude and longitude coordinates, the platform uses a geocoding reference service to automatically pull up a map image of the site. This lets the user verify that they have entered the correct locational information.

SMART SURVEY

the site and providing accurate name, description (to distinguish between multiple surveys available at the site), and the start and end dates for the survey. Hitting the "Create" button enables the dialogue box for uploading the survey videos (multiple videos can be uploaded, preferably in one hour chunks) and any supporting files (site images and drawings, description text files, etc.).





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Uploading Videos and Camera Calibration

Any number of videos can be uploaded to the SMART platform. The ideal video duration is 1 hour. Once the video/s are uploaded, the platform automatically extracts an empty image frame (as shown in the image on the right) to

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enable camera calibration. The user needs to select minimum four (maximum 10) corresponding points on the camera image and the satellite image as shown in the figure on the right. This step helps estimate the homography matrix required to accurately relate the image coordinates to the real-world coordinates.

After calibration, survey lanes could be marked on the camera image to organise the results (as shown on the right).

SMART SURVEY

Results

Classified volumes and speeds are the cornerstones of every traffic engineering and transport planning analysis. SUR enables users to follow the above process to quickly analyse uploaded videos and provide accurate volume counts and average speeds. The lane-wise counts and speeds are provided in 15-minute bins that can be downloaded in CSV or PDF formats for further analysis/ reporting.

Import a survey								
		Drop a file or click he	re to choose one					
Survey files to be imported						<u>-</u>	X Search	× III
File Source	Name	Description	Address	Region	Start Date	End Date	Latitude	Longitude
Matrix+- +Silverwater+Rd+&+Parramatta+Rd+&+St+Hilliers+Rd(29th+Aug+2019) (1).xlsx	Classified Intersection Count	A survey conducted at Matrix Test Site	Silverwater Rd / Parramatta Rd / St Hilliers Rd	Auburn	29th August 2019	29th August 2019	-33.8449373	151.0421716



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Import Old Surveys

Additionally, the SUR module provides an online repository to store the old surveys conducted at a site for ready access and reference by the survey team, engineers, and planners. The availability of historical data at a site can enable performance assessments of the transport facilities and help plan upgrades. It is a distinguishing feature of the

SMART platform, placing it heads and shoulders above the competition.

Old survey data (Excel files) can be simply dragged and dropped on to the dialogue box in the Import tab. The platform automatically extracts necessary metadata such as survey name, description, site address, and start and end dates. If the site location is not provided in exact lat/long coordinates, the platform performs a geosearch based on the site name in the address field to infer an approximate location.

Future feature upgrades will include extraction of survey data from the uploaded Excel (or CSV) files and make it available to the users through the Results tab.

SMART SURVEY

as Gateway to the broader SMART platform

SMART Surveys provides the users with a flavour of the comprehensive abilities of the AI powering the AMAG SMART platform. The classified counts and speeds are but one piece of the puzzle; through the SAFETY, OPERATIONS, PAVEMENTS (upcoming), and INFRASTRUCTURE (upcoming) modules, the

SMART platform provides a one-stop solution to a bouquet of transport applications

SMART Video Analytics Products Use-Cases

Use Cases for across the Transport Enterprise	SAF	OPS	SUR
Accurate ID and tracking of multiple road users	0	0	0
Flow and turning movement by road user class	0	0	о
Treatment evaluations (before/after & with/without)	ο		
Alert-based operations and risk reporting		ο	
Continuous, real-time operations and risk monitoring		0	
Travel demand screen-line calibration support			0
Intersection and corridor modelling support			0
Blackspot evaluation and management	о		
Complex site operational and risk assessments	о	ο	
Speed studies and assessments		ο	о
Incident detection and management		ο	
Risk and operational diagnosis and countermeasure ID	о		
Asset inventory and condition assessment			
Pavement condition typology and assessment			

To book a demonstration of the Enterprise SMART SaaS Platform please go to our website **www.amagroup.io**

Advanced Mobility Analytics Group Pty Ltd (AMAG) aims to be the world leading provider for proactive Transport analytics and management, applying more than 70+ years of cumulative road safety knowledge to develop the only complete Transport management suite of modules from Safety, Operations through to Infra-structure. Using Video Analytics, Artificial Intelligence (AI), Deep Learning, and Advanced Econometrics, AMAG has solved the challenge of predictive analytics for road safety, and during the past decade the founders have proven the methodology and technology through research, refinement, testing, and validation with 23 cities across 8 countries.

AMAG is focused on what we do best, road operational and safety insights through the best analytics solu-tions, developed by the best people. To deliver the best end-to-end SaaS Solution to road safety practitioners, we are partnering with the absolute best technology providers and engineering consultancy service providers across the globe.

Find out more https://amagroup.io

