



# WISTRON Driver Monitoring System

WISTRON Intelligent

Revision 1.6



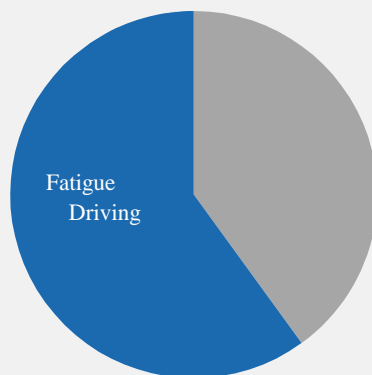
BACKGROUND

# Over 60% Traffic Accidents in China are Fatigue Related Each Year

Fatigue-Related Accidents

60%

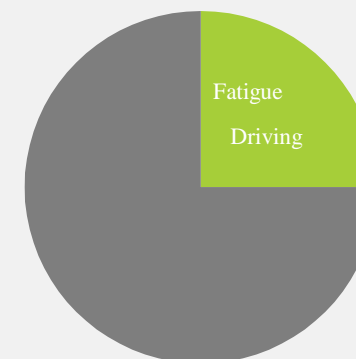
Over 60% traffic accidents in China are fatigue-related



20%

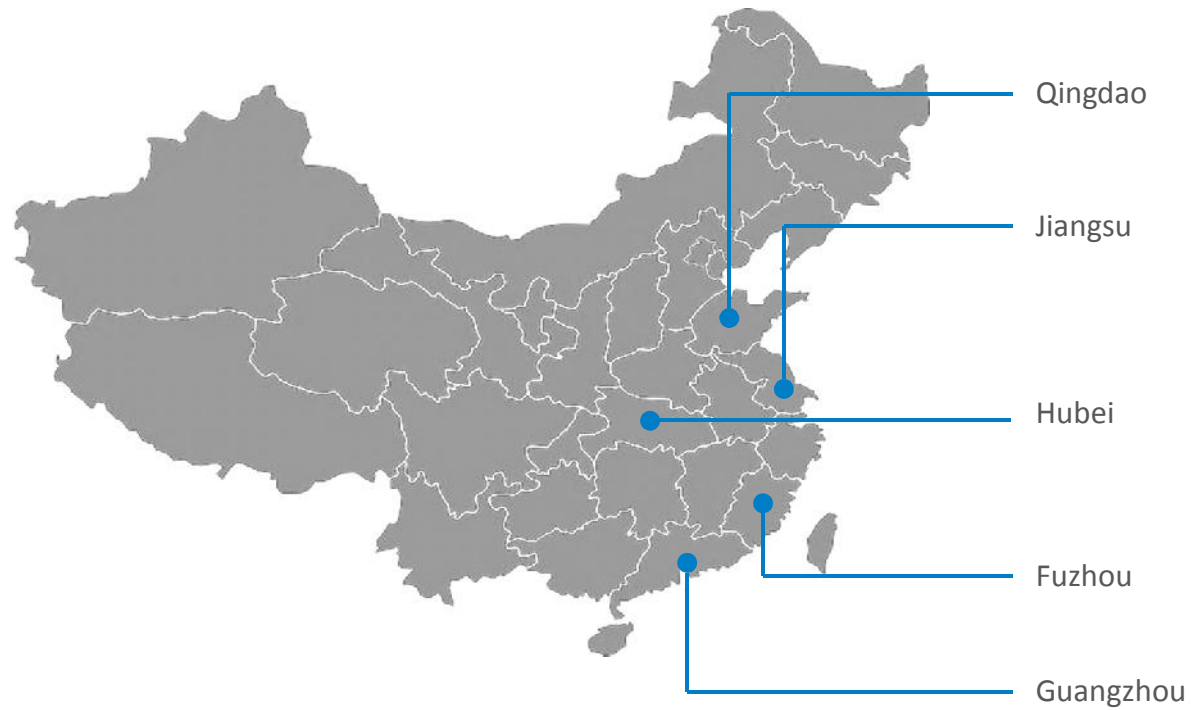
Every one in five road fatalities in China are fatigue-related

Fatigue-Related Fatalities



Source: *Big Data on Traffic Accidents* Released by Transportation Safety Board of PRC in 2017

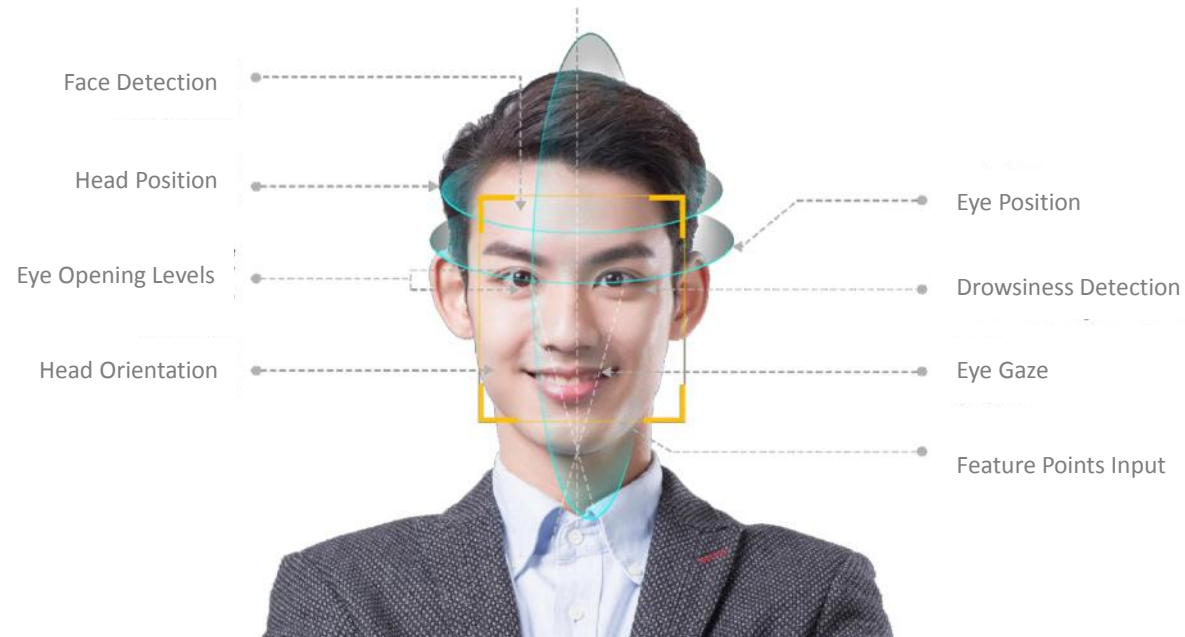
# DMS are Mandated by Many Provinces in China to Promote Driving Safety



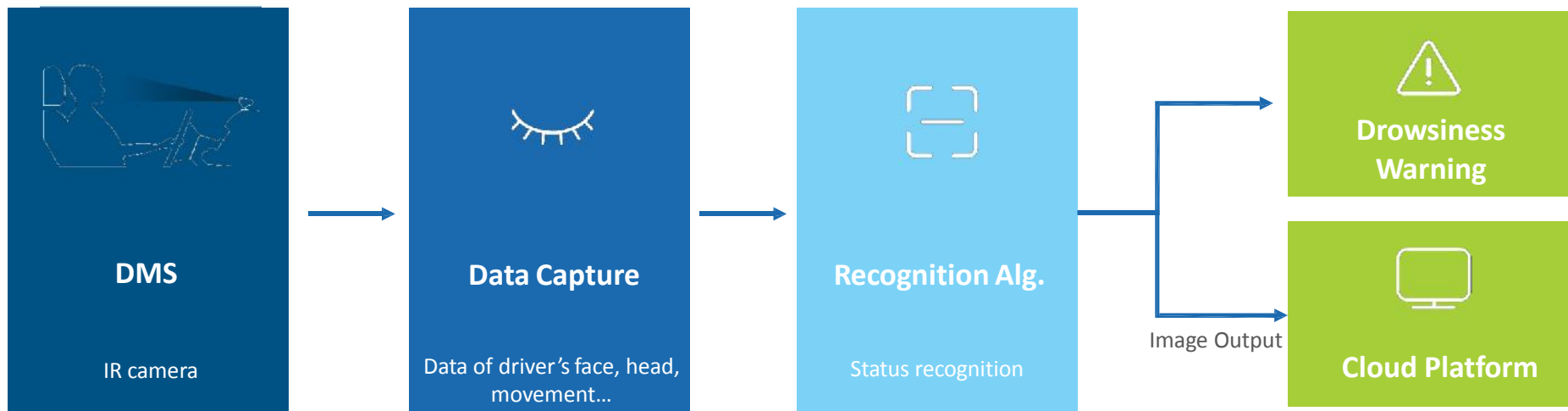
WISTRON SOLUTIONS

# WISTRON Driver Monitoring System

WISTRON Driver Monitoring System can warn drivers of their drowsiness on the basis of changes in head, face and eyelid movements captured by a camera. While issuing real-time warnings, the system will also wirelessly deliver related images and videos to management platform for remote monitoring and fleet management analysis.



# Function Diagram



# Core Technologies



## Face Detection and Tracking

- Face Recognition
- Face Verification



## 3D Face Modeling

- Head Gesture Recognition



## Facial Feature Point Recognition

- Eye Location and State Detection
- Mouth Location and State Detection



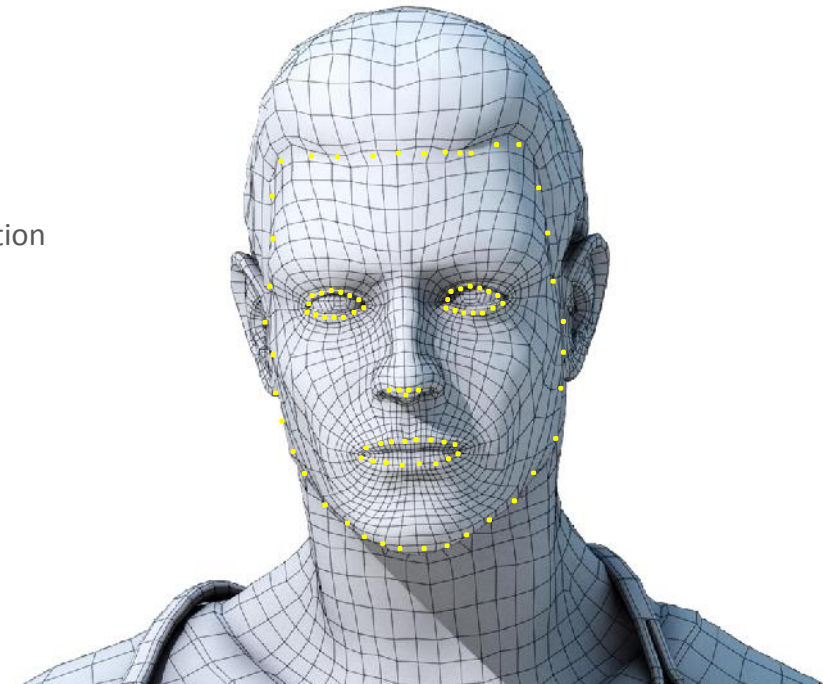
## Industry-Leading Algorithm

- Combine traditional algorithm with deep learning



## Sample Data

- Massive samples
- Automatic labelling with manual calibration



# Key Features: Dangerous State and Behavior Warnings

## Head Down

If drivers keep their heads down for a certain period of time, the system will issue drowsiness warning.

## Eye Closure

If drivers close their eyes for a certain period of time, the system will issue drowsiness warning.

## Eyesight Deviation

When the driver's eyes are off the road for a certain period of time, the system will issue warnings.

## Yawning

The system could monitor the driver's facial expressions, and when yawning emerges, it will issue warnings.

## Smoking

When drivers are found to talk over the phone during their driving, the system will issue warnings.

## Phone Calls

When drivers are found to smoke during their driving, the system will issue warnings.

## Shelter

When the system detects the camera is sheltered, it will issue warnings.

## Departure

When the driver's face is not present in the field of view during driving, the system will issue warnings.

# System Features: Driver Identification

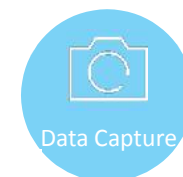
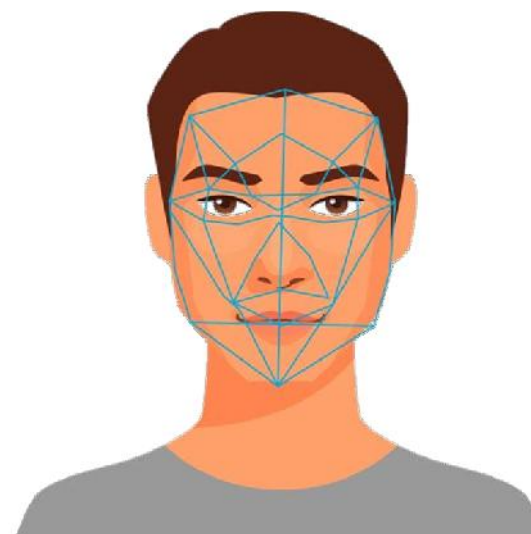
The system also features driver identification. Driver identity information can be logged into management platform, and then bound to some DMS device. One device could be bound to multiple drivers.



Face Detection



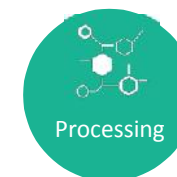
Driver Identification



Data Capture



Upload



Processing



Comparison



Output

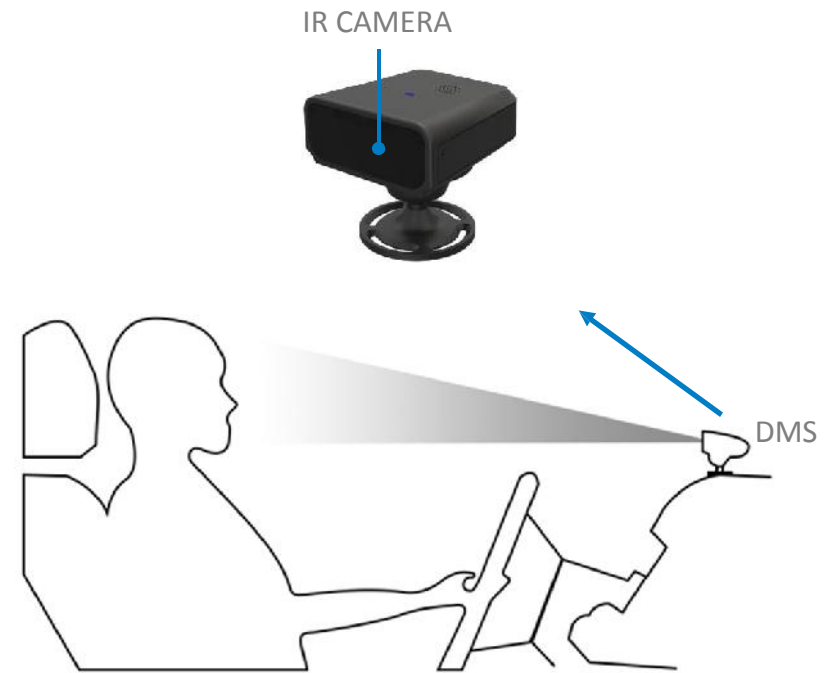
# High-Quality IR Camera, Robust in Various Challenging Lighting Conditions

## Adaptive to Low-light and Challenging Lighting Conditions

The system comes with a high-quality IR camera that could be adaptive to various challenging lighting conditions.

## Eyeglasses / Sunglasses Filter

The system also works for drivers with eyeglasses or sunglasses.



# Solution Advantages



## Highly Accurate Recognition

- Massive sample data
- The most advanced recognition algorithm
- Combine traditional algorithm with deep learning



## Rapid Response

- Efficient engineer implementations (instruction set optimization, multithread optimization, proper algorithm scheduling...)



## Adaptive to Various Lighting Conditions

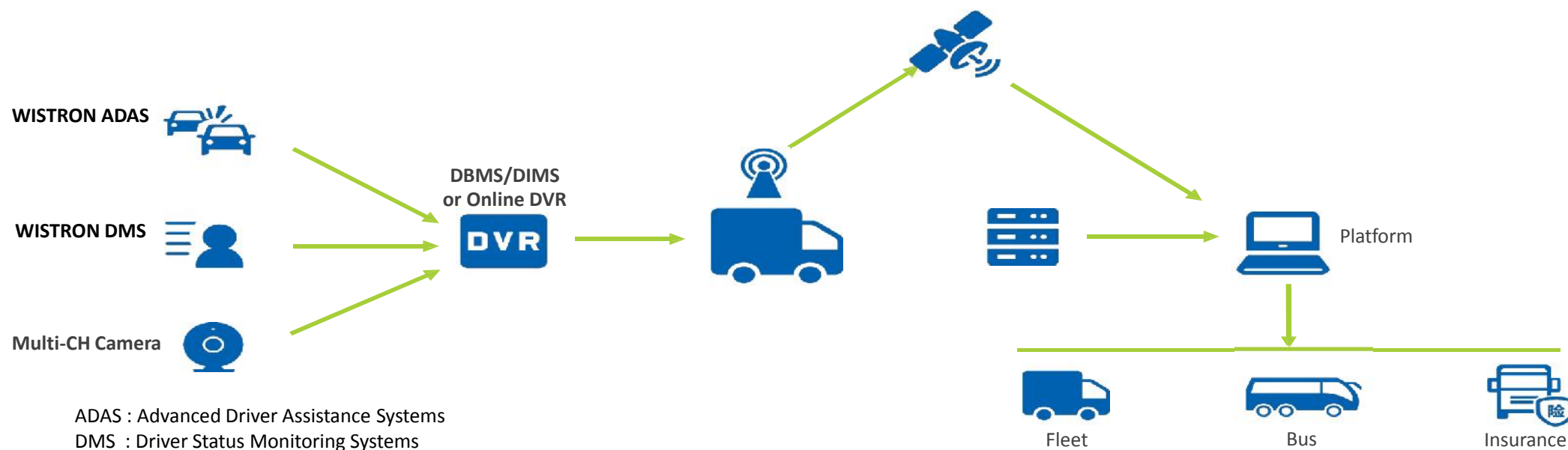
- Adaptive to various lighting conditions
- Eyeglasses / Sunglasses status detection
- Drowsiness features detection and recognition in complex conditions



## System Integration

- Integration with ADAS
- Integration with DVR system

# System Integration of All-Round Driving Safety



## DMS : Advanced Driver Assistance Systems

- Fatigue & Distraction status capture and Warning
- Driver identification
- 3G / 4G

## ADAS: Driver Status Monitoring Systems

- Collision avoidance warning, including Back And Forward Collision Warning
- Vehicle recording
- 3G/4G

## DBMS/DIMS or Online DVR

- Telematics device to record and save data text, image, video and can send to server to show on a software platform

# CLOUD MANAGEMENT PLATFORM

# Cloud Management Platform

The DMS camera can work in pair with management platform that capable of fleet management, driver information management, alert management, alert images and videos, and reports and forms management, etc.

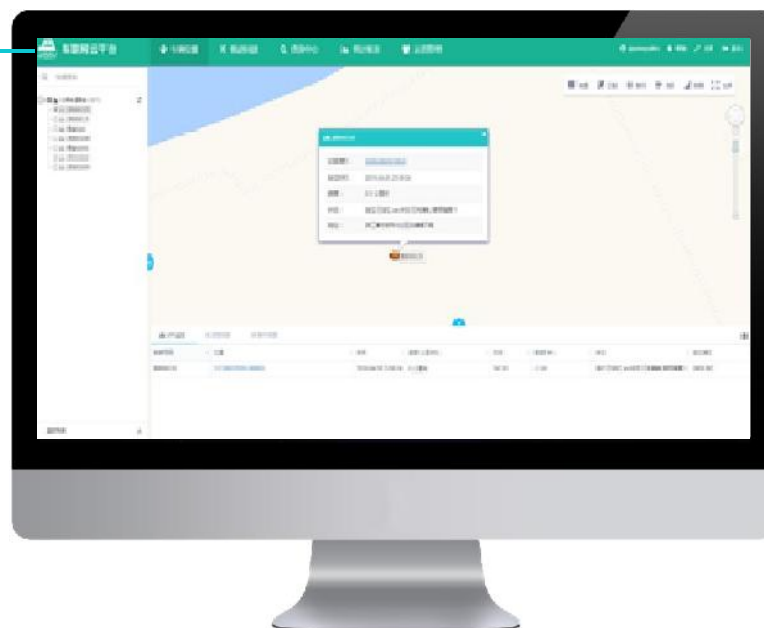
## Features

### Safety

- Realtime risk warning
- Visualized vehicle monitoring
- Realtime manual intervention
- Automatic evidence capture
- Driving behavior analysis
- Driving risk evaluation

### Management

- Realtime task monitoring
- Business intelligent analysis and  
Management reports
- Vehicle and driver management



3<sup>rd</sup> FMS

The platform could be integrated with 3<sup>rd</sup> FMS

# Realtime Vehicle and Driver Monitoring for Driving Safety



Realtime Risk Warning



Realtime Monitoring



Realtime Manual Intervention



Automatic Evidence Capture

The screenshot displays the DMS72014 software interface. At the top, a teal header shows 'DMS72014 Organization: Quantum(0/1)'. Below this is a green 'Warning Content' section with a close button. The warning details are as follows:

Plate Number: DMS72014	Reason: PHONING
Time: 2019-04-26 23:25:47	Speed: 63.00 KM/H
Location: Getting fail	

Below the text, there are two evidence capture options: 'Alarm video' and 'Alarm picture'. The 'Alarm picture' option is selected, showing a grayscale image of a driver talking on a mobile phone. The image includes a timestamp '2019/04/26 23:25:47', speed '63Km/h', and the event name 'phoning'. To the right, a map view shows the location with a purple pin. A pop-up window over the map provides the following event details:

Event:	PHONING
Occur Time:	2019-04-26 23:25:47
Speed :	63.00Km/h
Coordinate:	106.933144,-6.383162

# Realtime Vehicle and Driver Monitoring for Driving Safety



Realtime Risk Warning



Realtime Monitoring



Realtime Manual Intervention



Automatic Evidence Capture

Media Resources

Warning Detail

Alarm handle

DT-0800 CAT 777E

Vehicle plate: DT-0800 CAT 777E

Reason: SMOKING

Time: 2019-06-11 21:48:16

Speed: 60 KM/H

Location: unknown

Driver Name:

Telephone:

Driver License Number:

CLOSED\_EYE 2019-06-11 21:48:16

CLOSED\_EYE 2019-06-11 21:48:16

CLOSED\_EYE 2019-06-11 21:48:16

DT-0800 CAT 777E

Event: SMOKING

Occur Time: 2019-06-11 21:48:16

Coordinate: 115.910660, -1.913867

Alarm video

Alarm picture

1公里

高德地圖 © 2019 AutoNavi - GS(2018)1709号

# Realtime Vehicle and Driver Monitoring for Driving Safety



Realtime Risk Warning



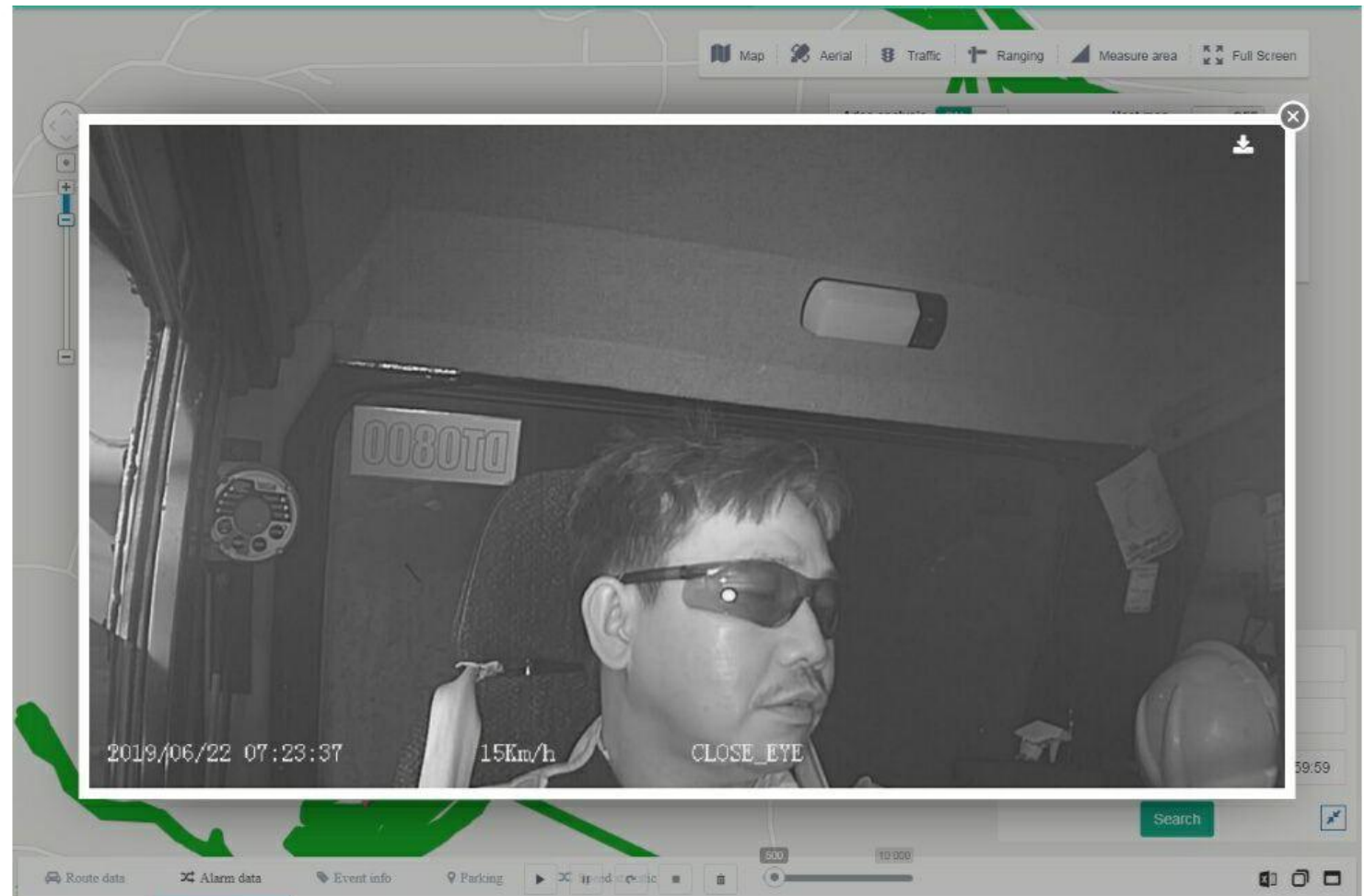
Realtime Monitoring



Realtime Manual  
Intervention



Automatic Evidence  
Capture



# Realtime Vehicle and Driver Monitoring for Driving Safety



Realtime Risk Warning



Realtime Monitoring



Realtime Manual Intervention



Automatic Evidence Capture

Warning Content

Plate Number: DT-0800 CAT 777E  
Reason: YAWNING  
Time: 2019-07-04 10:09:25  
Speed: 14.00 KM/H  
Location: Getting fail

Driver





Driver Name: Driver  
Telephone:  
Driver License Number:

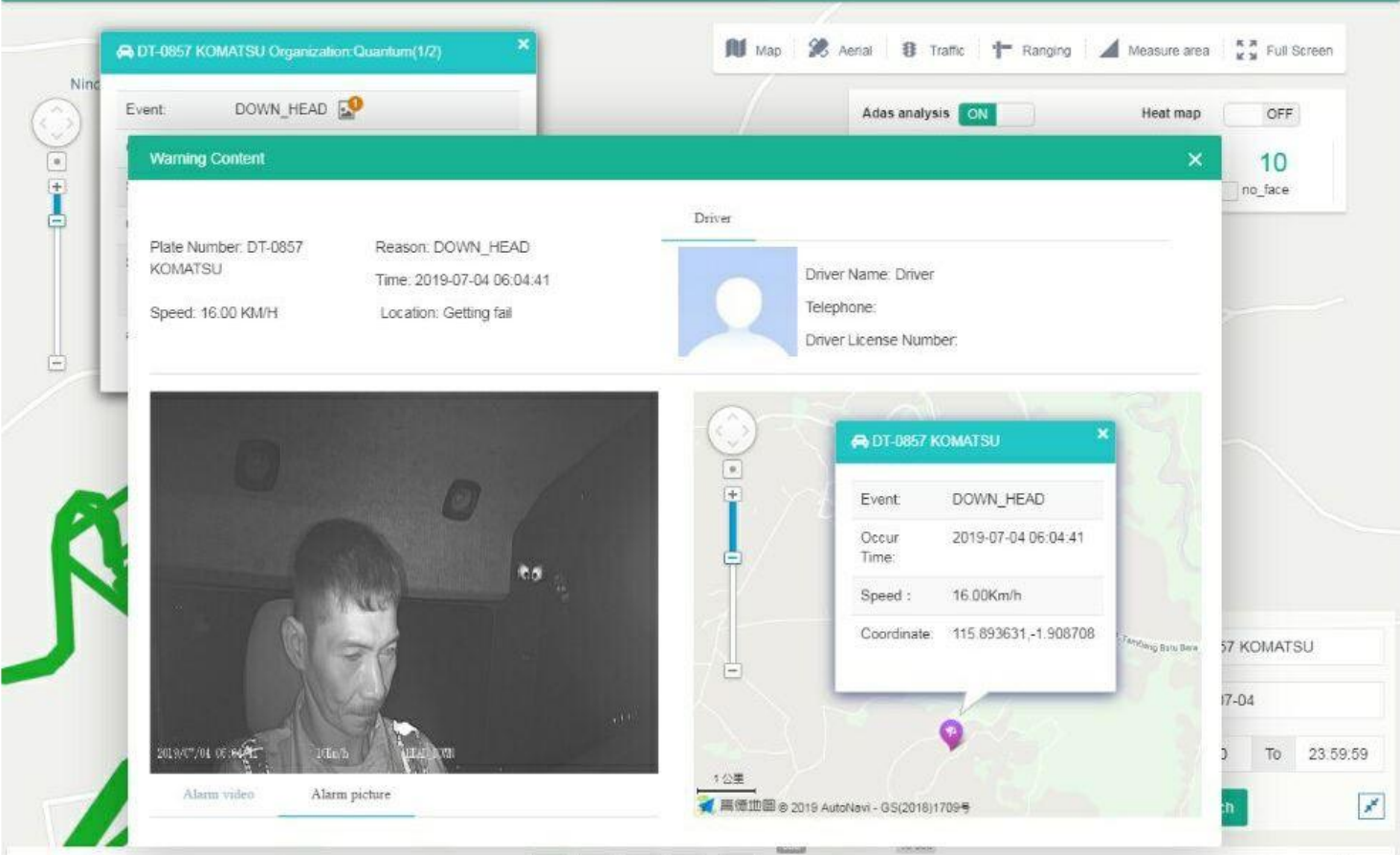
Event: YAWNING  
Occur Time: 2019-07-04 10:09:25  
Speed: 14.00Km/h  
Coordinate: 115.907967,-1.915718

DT-0800 CAT 777E

Alarm video Alarm picture

# Realtime Vehicle and Driver Monitoring for Driving Safety

-  Realtime Risk Warning
-  Realtime Monitoring
-  Realtime Manual Intervention
-  Automatic Evidence Capture



DT-0857 KOMATSU Organization: Quantum(1/2)

Event: DOWN\_HEAD

Warning Content

Plate Number: DT-0857 KOMATSU	Reason: DOWN_HEAD
Speed: 16.00 KM/H	Time: 2019-07-04 06:04:41
	Location: Getting fail

Driver

Driver Name: Driver

Telephone:

Driver License Number:

Event: DOWN\_HEAD

Occur Time: 2019-07-04 06:04:41

Speed: 16.00Km/h

Coordinate: 115.893631,-1.908708

Alarm video

Alarm picture

# Realtime Vehicle and Driver Monitoring for Driving Safety



Realtime Risk Warning



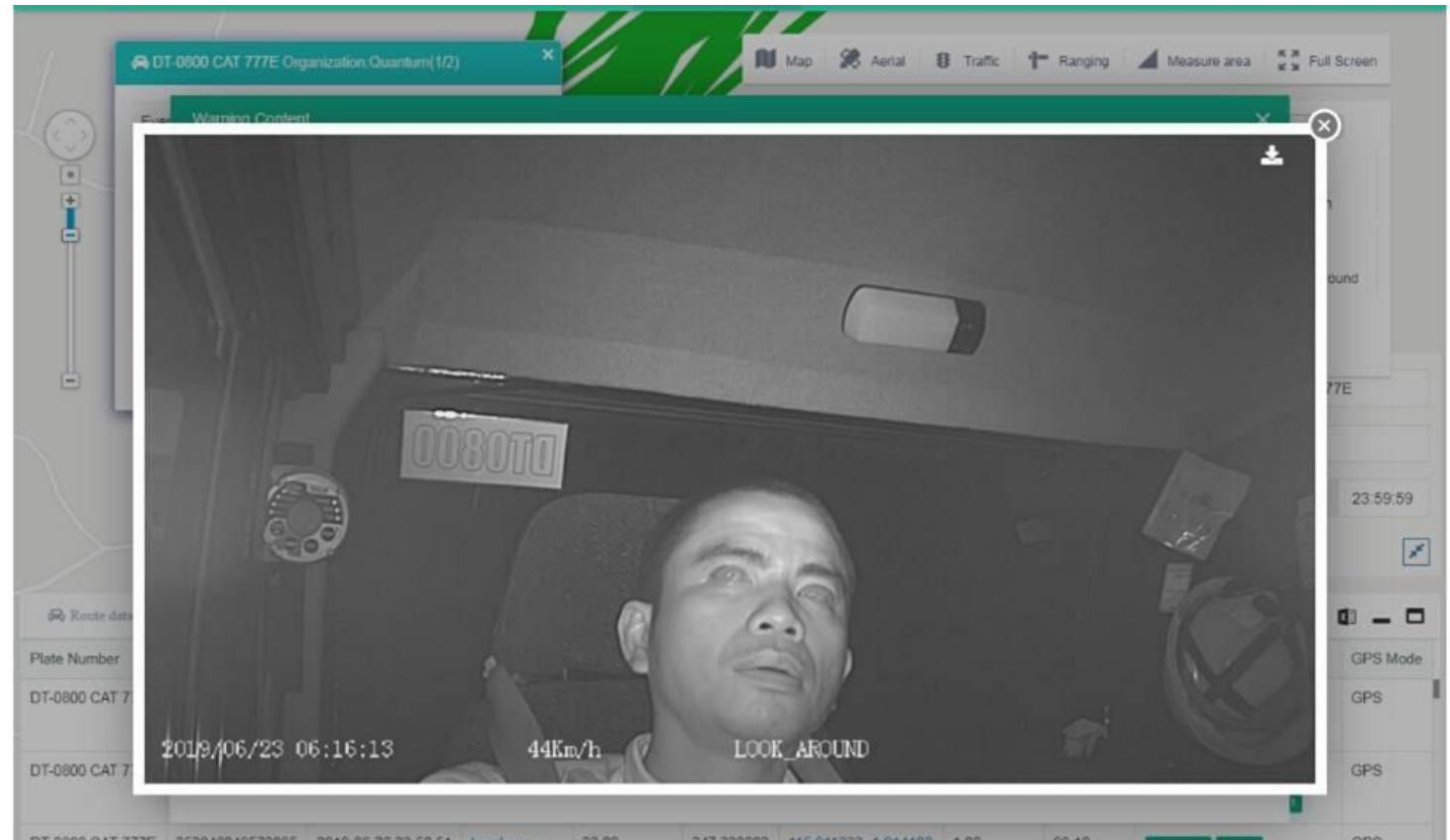
Realtime Monitoring







Realtime Manual  
Intervention

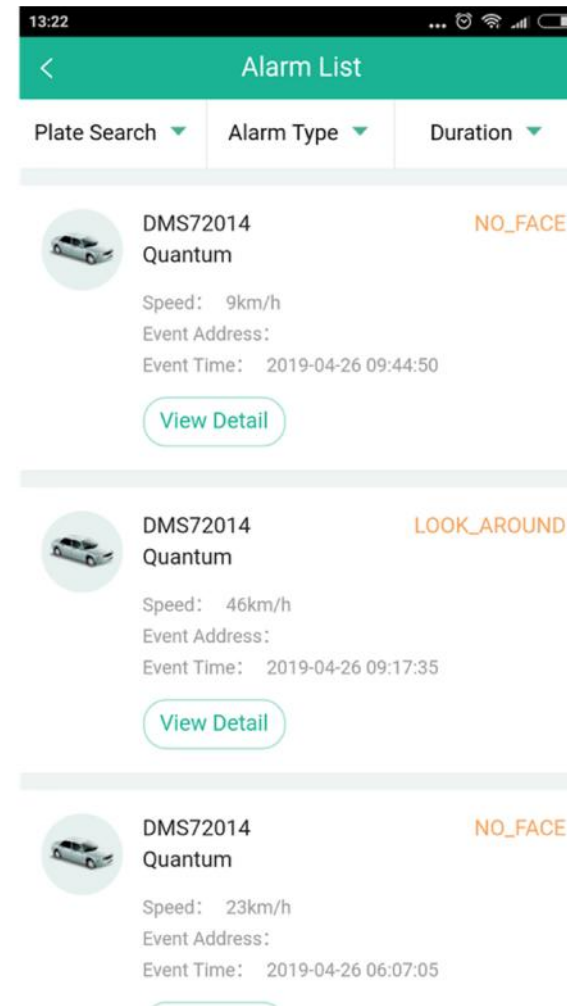
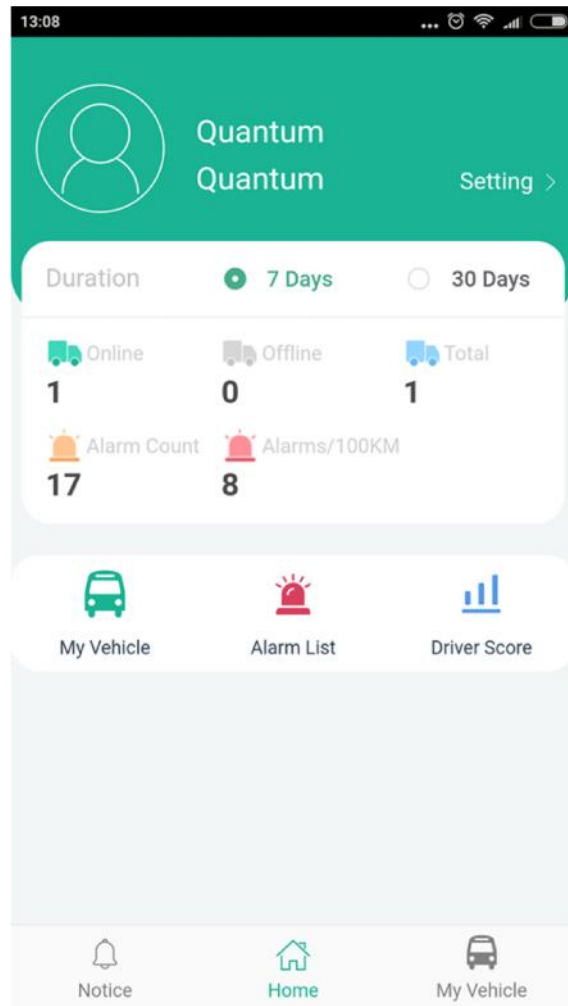


Automatic Evidence  
Capture







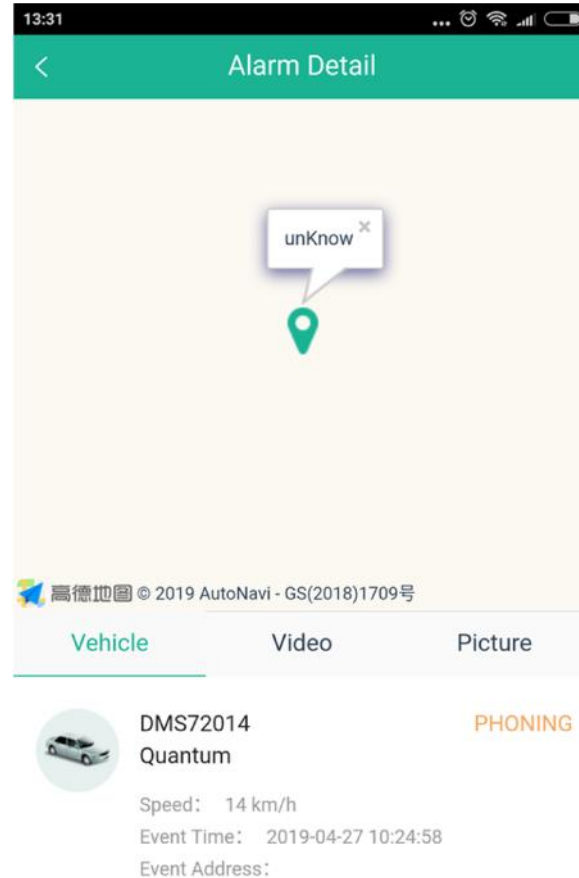
# Mobile App Realtime Vehicle and Driver Monitoring for Driving Safety

-  Realtime Risk Warning
-  Realtime Monitoring
-  Realtime Manual Intervention
-  Automatic Evidence Capture



# Mobile App Realtime Vehicle and Driver Monitoring for Driving Safety

-  Realtime Risk Warning
-  Realtime Monitoring
-  Realtime Manual Intervention
-  Automatic Evidence Capture



# Mobile App Realtime Vehicle and Driver Monitoring for Driving Safety



Realtime Risk Warning



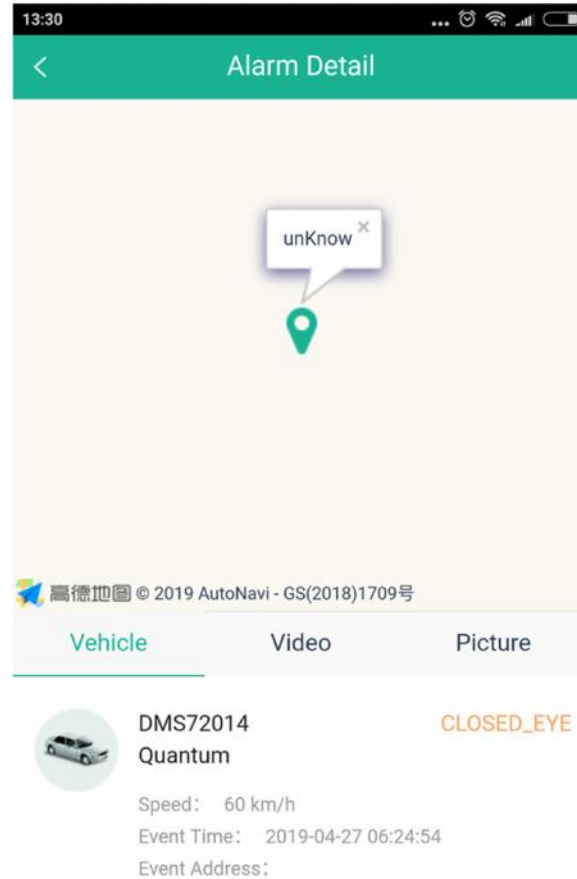
Realtime Monitoring



Realtime Manual Intervention



Automatic Evidence Capture



# Driving Data Capture for Delicacy Management of Fleets



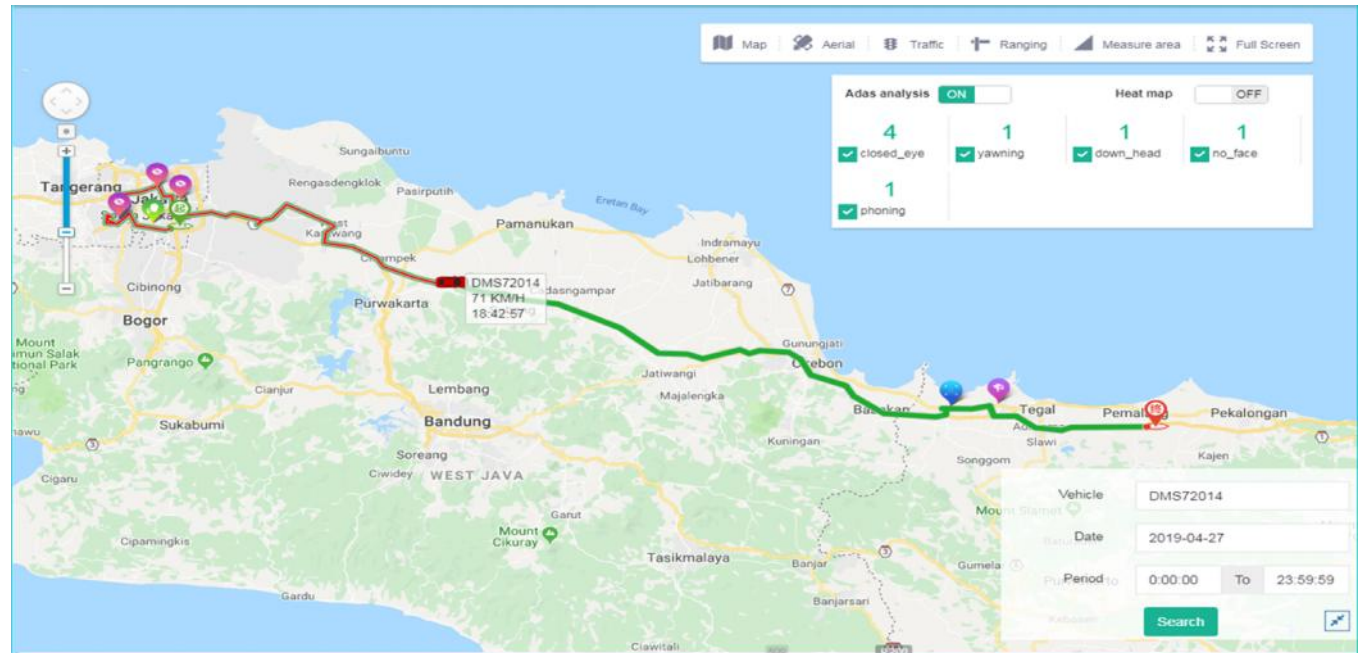
Data Capture of Abundant Accurate Driving Scenarios



Data Capture of Driver Status



Driving Behavior Analysis and Risk Evaluation



Drowsy Driving

Speed Limit

Single Trip Duration

Behavior Analysis

Distracted Driving

Road Type

Driver Info

Warning Trend

Driver Identification

Single Trip Mileage

Warning Inquiry

Score Trend



Warning Data Analysis



Driving Score Trend

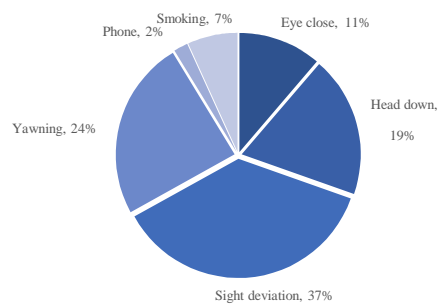


Risk Evaluation and Improvement Suggestions

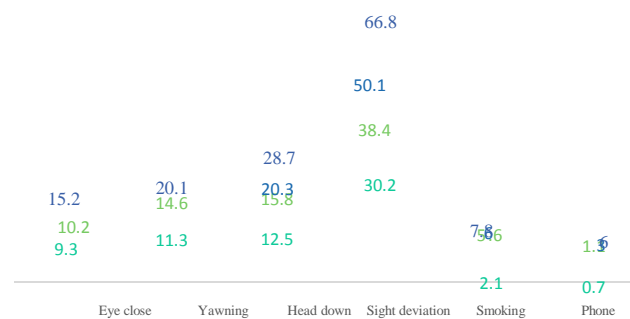
## Driving Risk Report (EXTRATION)

Fleet Name : XXXXXX  
 Vehicle Plate : XXXXXX  
 Report Date : 2018.4.28  
 Data Duration : 2018.3.20-2018.4.20

### WARNING TYPES



### WARNING TREND (per 100km)



### RISK EVALUATION AND SUGGESTIONS

Warnings : Sight deviation and head down warnings occurred frequently on this vehicle (plate: XXXXX) from Mar.20<sup>th</sup> to Apr. 20<sup>th</sup>.

Risk Rating: Based on overall warning and driving data analysis, the driving risk is rated as MEDIUM

Suggestions: Frequent sight deviation and head down indicates that the driver can be easily distracted during driving. The fleet manager should inform the driver of its risk. Driving do's and don'ts trainings may be required.

# Solution Benefits

# Solution Benefits



**Reduce Traffic Accidents**



**Reduce Accident Costs**



**Reduce Fleet  
Management Costs**



**Improve Management  
Efficiency**

# Specifications

# Form Factor



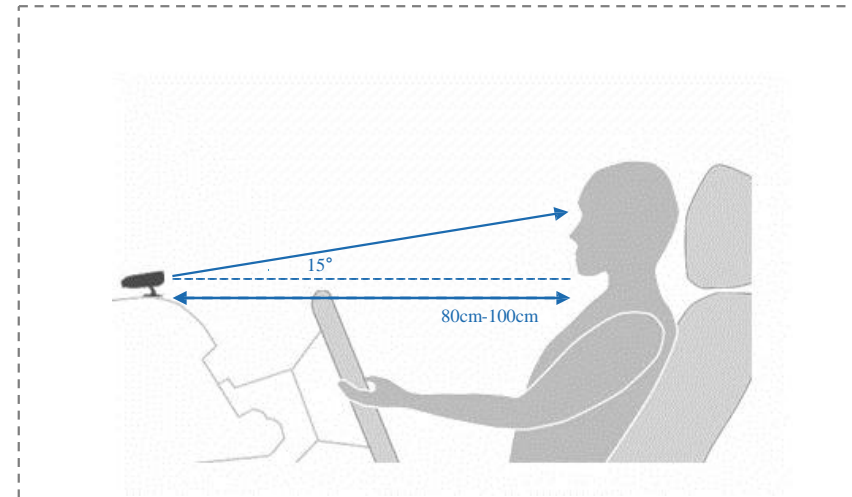
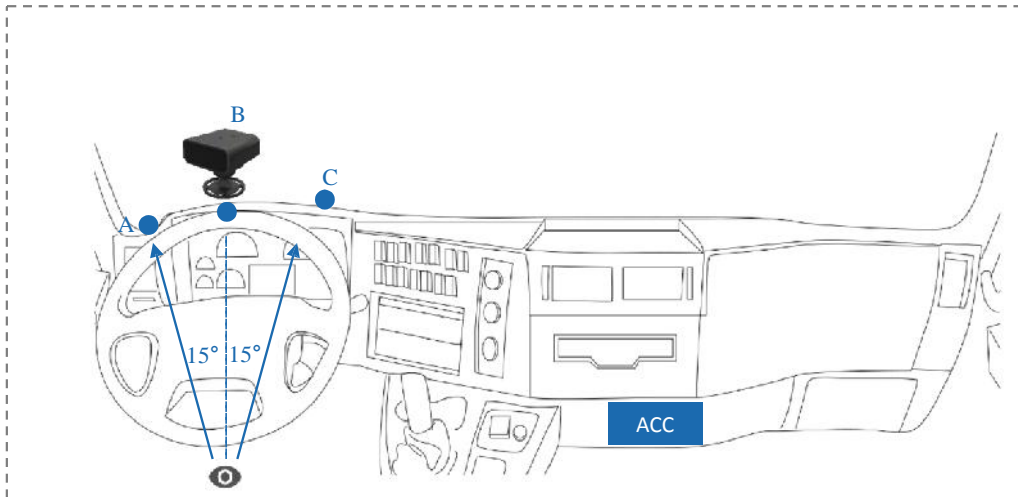
# Specifications

Dimension	105mm * 91mm * 92mm
Weight	415g
Interface	Micro SIM, TF card , USB, CAN
Wireless	WCDMA/GPRS、WIFI、BT(4.0)
Sensor	magnetometer, accelerometer, gyroscope
Rated Power	12V/0.5A
Input Power	9~36V +/-10%
Operating Temp.	-30°C ~ 70°C
Storage Temp.	-30°C ~ 85°C
Detection Range	80cm-100cm (the distance of camera to drivers' face)



# Installation

The camera is supposed to be located right in front of the driver seat on the instrument panel (Point B), or other locations within 15° (Point A to Point C ) from the center.





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