

SALORIS

We solve social problems
based on convergence technology



2022 COMPANY INTRODUCTION

CONTENTS.

01

SALORIS

3p

Focus field

MISSION & VISION

Main History

Major certifications
registered patent

02

Vehicle number recognition with AI solution for non-face-to-face based smart parking

5p

Problems with the existing parking control system

Solution brief

Solution

Detailed technical overview

Foreign number plate

Advantages and expected effects

03

Integrated enforcement solution for school zones and preventing right turn at intersections 11p

Problem formulation

Integrated System Necessity
Solution

Detailed technical overview

Advantages and expected effects

04

A system for measuring driver drowsiness and preventing drowsiness through biometric recognition 16p

Dealing with an existing drowsy problem
Solution

Expected results

01 SALORIS

Focus area



MISSION & VISION

MISSION & VISION

- A social problem resolving company based on convergence technology.
- Develop image processing technologies and collaborate with exporting companies that possess the world best technologies. (Artificial intelligence technology and ICT technology)

Main History

- 2022** ○ Apr · Project request received (Korean Government) - AI based integrated system solutions for analyzing vehicle information and preventing accidental turns in school zones and intersections.
- 2021** ○ May · Project request received (Korean Government) - AI voucher for unidentifiable vehicle recognition project for non-face-to-face smart parking system.
Mar · Chosen as the project winning company (Korean Government).
- 2020** ○ Oct · Supply of solar IoT equipment (Korea Electric Power Corporation Information)
Mar · SW update task selection.(Daegu Digital Industry Promotion Agency)
Jan · 2019 Initial Start-Up Package completion (Excellent).
Jan · 2019 Regional Business Innovation Capacity Improvement Project completion.
- 2019** ○ Sep · 2019 Early Start-Up package selection. (Gyeongbuk Center for Creative Innovation)
Aug · 2018 Technology Innovation Start-Up Task completion. (Best)
Jun · Start-up company registration
Jan · 2019 Regional Enterprise Innovation Capacity Enhancement Project Selection. (Daegu Creative Innovation Center)
Jan · SALORIS Co., Ltd. Establishment.

Certifications

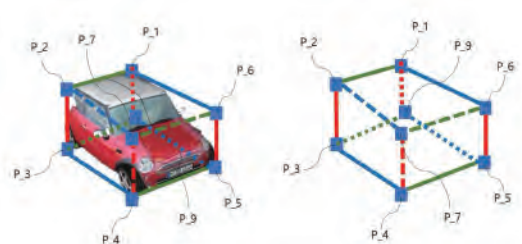


Patent Registrations

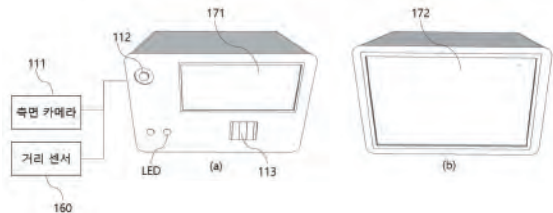
- 10-2062239 | Speed Risk Pre-Alert System Using Heterogeneous Detection Method
- 10-2093858 | Biometric based vehicle controller and vehicle control
- 10-2136068 | Meteorological information acquisition device for solar power generation prediction
- 10-2136006 | Solar power generation prediction device
- 10-2182749 | Multifunctional weather observation device for weather Big Data acquisition
- 10-2251573 | Vehicle side adjacent multi-camera supply device



▲ A multi-camera device mounted on the side of the vehicle and a device that provides information on the situation of the vehicle environment

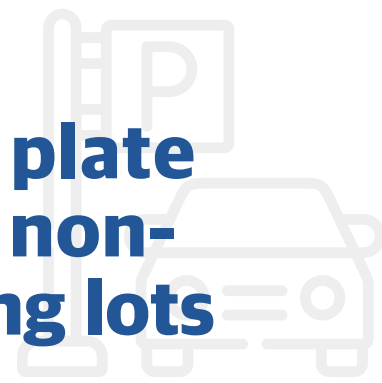


▲ Speed risk pre-alert System using heterogeneous detection method



▲ Vehicle control method using biometrics based vehicle controller

02 AI Solutions for vehicle plate number recognition for non-face-to-face smart parking lots



Problems with the existing parking control system

Loop system problems

- Road and breaker damage due to loop system installation/disposal.



▲ Road damage



▲ Damaged or destroyed crossing gate

- Unrecognizable license plate causes unrecognizable/misleading recognition.



▲ Reflective stickers



▲ Damage license plate



▲ Screen installation

- Despite advanced plate recognition (LPR) technologies and deep learning technologies, about 3 to 5 % of the generated data is unidentifiable, which consumes labor and operational costs such as manually vehicle number registration.

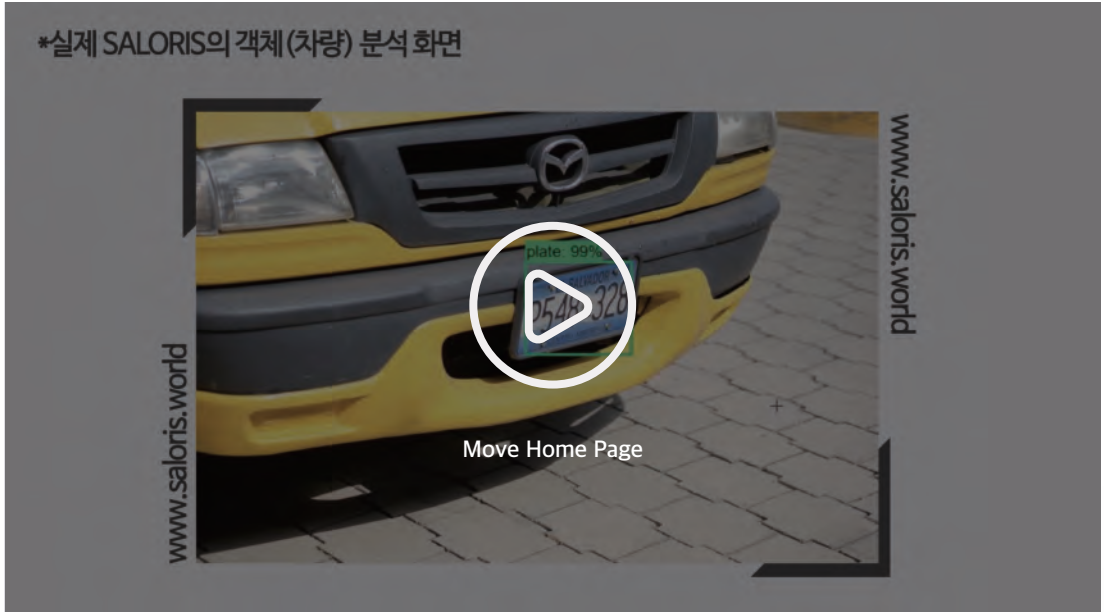


3-5% unrecognized license plate



Manpower, operational costs

Used actual images



Compensation of existing deficiencies with 100% recognition of license plate numbers based on AI solutions

- For the existing LPR system and unrecognized data, 1st and 2nd AI reprocessing and AI-based number detection are performed. 5 % of the remaining unidentified vehicle license plates are re-processed by 100 % unmanned AI modeling.



Original

Vehicle detection

License plate area detection



Shaking correction

Brightness
improvement

License plate
size correction

Vehicle model
recognition

Vehicle manufacturer
recognition

Solution



LPR Processing process



Vehicle recognition



License plate recognition



Number plate crop



License plate content recognition

1st Reprocessing recognition:

Step-by-step application in addition to brightness

Brightness control



Inclination control



2nd Reprocessing recognition:

Step-by-step application in addition to contrast

Contrast control



Erosion



Dilation

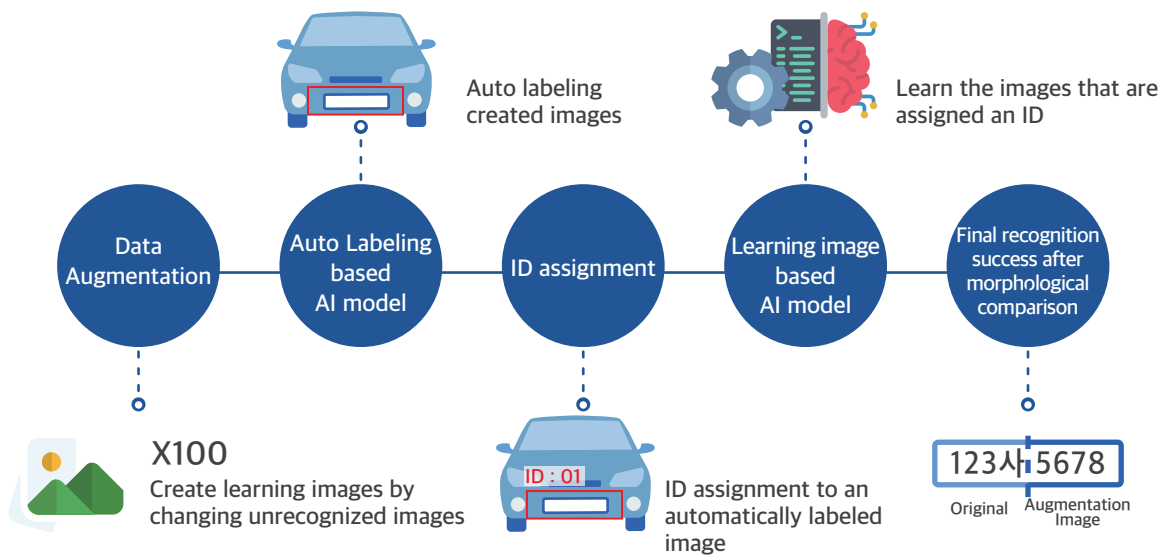


Software specifications

Summary	Content
Platform	Windows, Linux base
Used language	Python, c base
Learning/Test data	Domestic license plates/Latin-American license plates
Algorithms	Deep learning-based object detection algorithm
Performance goals	Target detection from 95 to 99 % after LPR



3rd processing support (unrecognizable)



Software specifications

Summary	Content
Platform	Windows based
Used Language	Python, c based
Learning/Test data	AI-Hub's image of Korean vehicles, 100 types of AI data * 500 sheets = 50,000 sheets
Algorithms	Auto Labeling: CNN-based Object Detection Algorithm Shape recognition: Object detection algorithm based on deep learning (TensorFlow).
Performance objectives	Detection of more than 99% of unrecognized vehicle target

Recognition of primary and secondary reprocessing

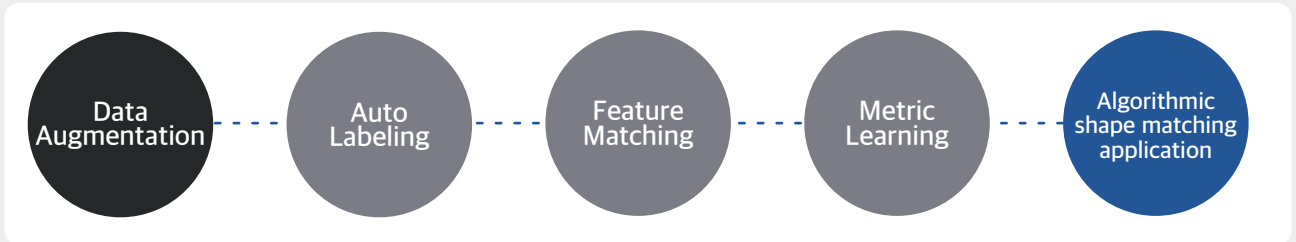
- Number plate recognition after image correction applied.



- Actual image calibration pictures



3rd application of form recognition



Data Augmentation



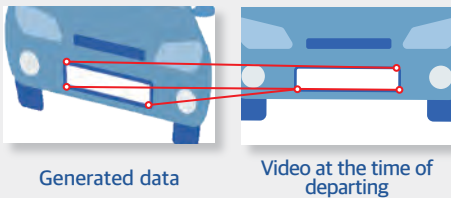
- Data Augmentation for unrecognized data.

Auto Labeling

Create learning data by automatically labeling objects with data created by data augmentation.

Almost the same level of labeling results as manual work.

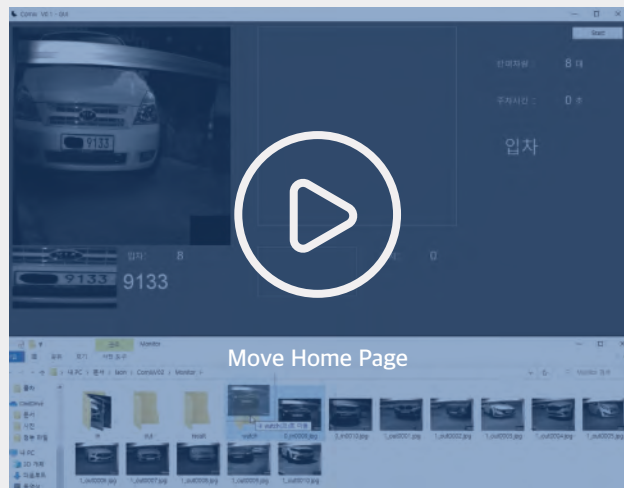
Feature Matching & Metric Learning



- Matching and learning at the time of departure by capturing feature points.

Shape Matching Algorithm

- Demo video

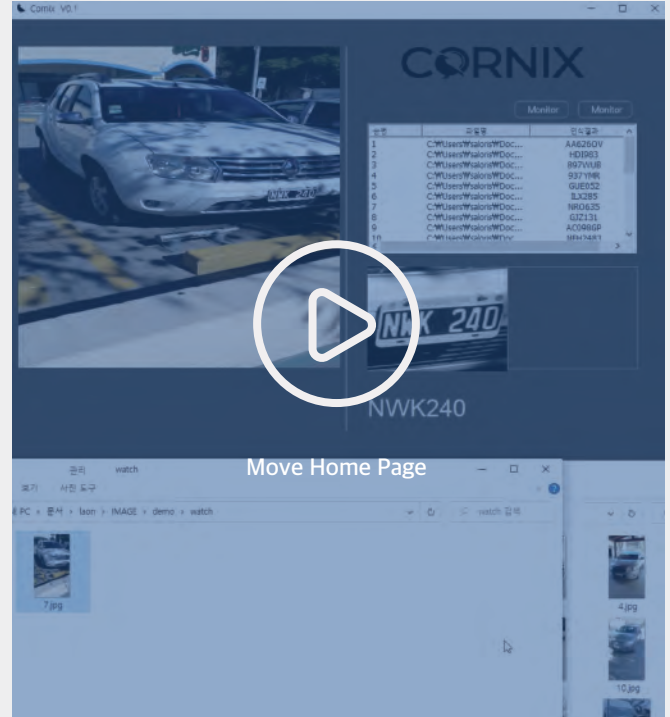
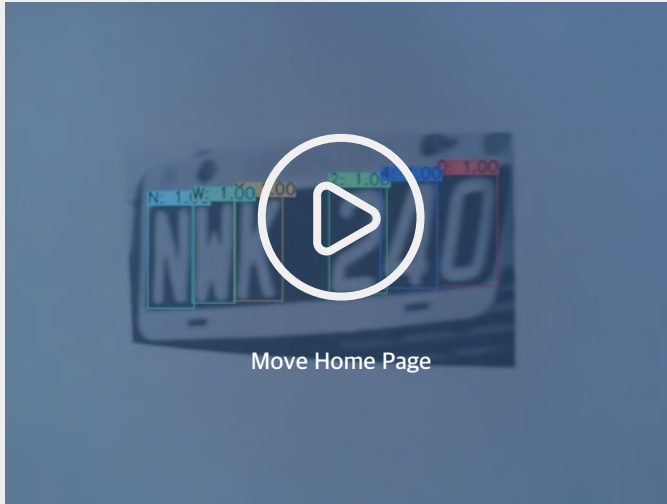


An overseas
number plate

Overseas license plate processing

- Foreign plates can be recognized when re-learning the alphabet numbers to process foreign plates in existing and traditional Korean and numeric learning.

Latin American license plate recognition Demo Video



Expected
effects and
advantages

Solutions benefits

- 1** Inclination correction progress based on deep learning
 - Application of deep learning-based inclination correction of standing image using AI model mounted on solution.
- 2** 100% matching of outbound vehicles using shape recognition
 - Deep learning-based shape recognition is applied to unrecognized vehicles and can match 100% of vehicles at the time of departure.
- 3** Increased recognition rate through image preprocessing
 - The first and second reprocessing processes improve the image of the slowly cooled entrance and increase the perception of the plate number of vehicles.

Expected effects



50% faster
installation time



Increased field satisfaction
due to improved recognition rates



Reduced operational
labor costs during the transition
from manned to unmanned

03 Integrated enforcement solution for school zones and preventing right turn at intersections

Problem formulation

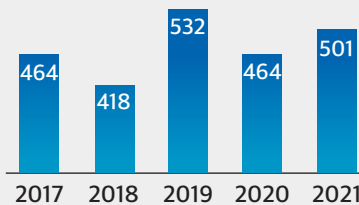
School protection areas and intersections

- Despite the financial support of various related traffic laws, the incidence of traffic accidents for children in school zones did not decrease significantly.



number of school zone traffic accidents

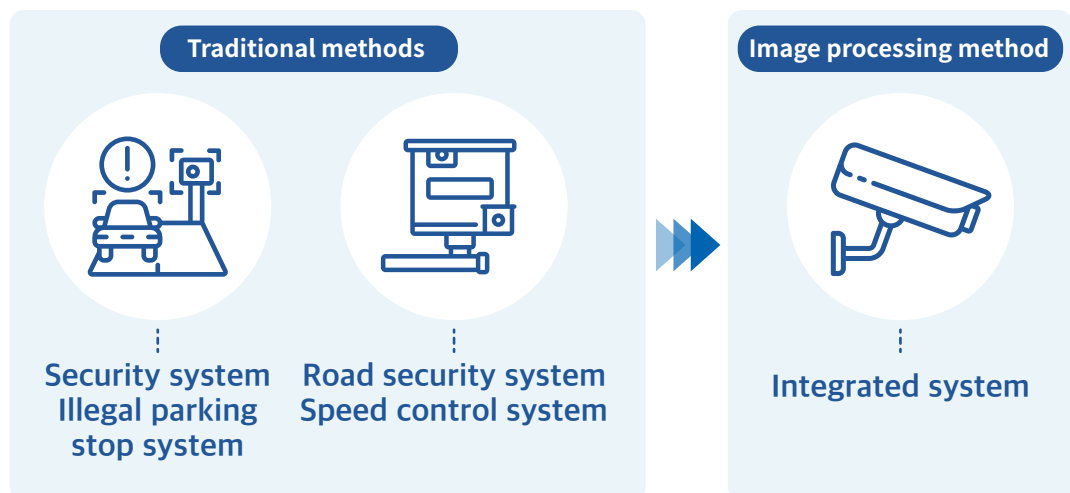
Data : TAAS



Integrated System Necessity

Strengthen traffic control and reduce costs

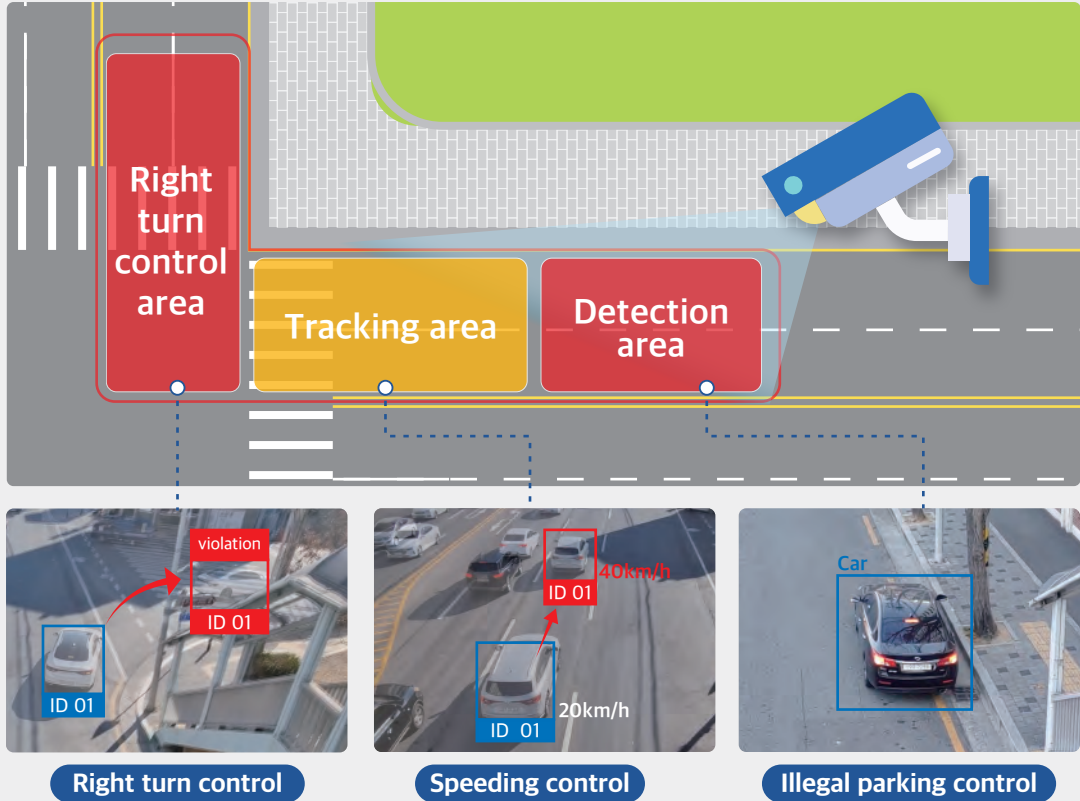
- It is necessary to install additional CCTVs to strengthen the security on right turns at intersections that took effect in July 2022 and to reinforce security on school zones that continue to cause problems.
- It is possible to reduce installation costs compared to the existing method, and it is expected to reduce traffic accidents by promoting high accuracy control due to the introduction of AI.



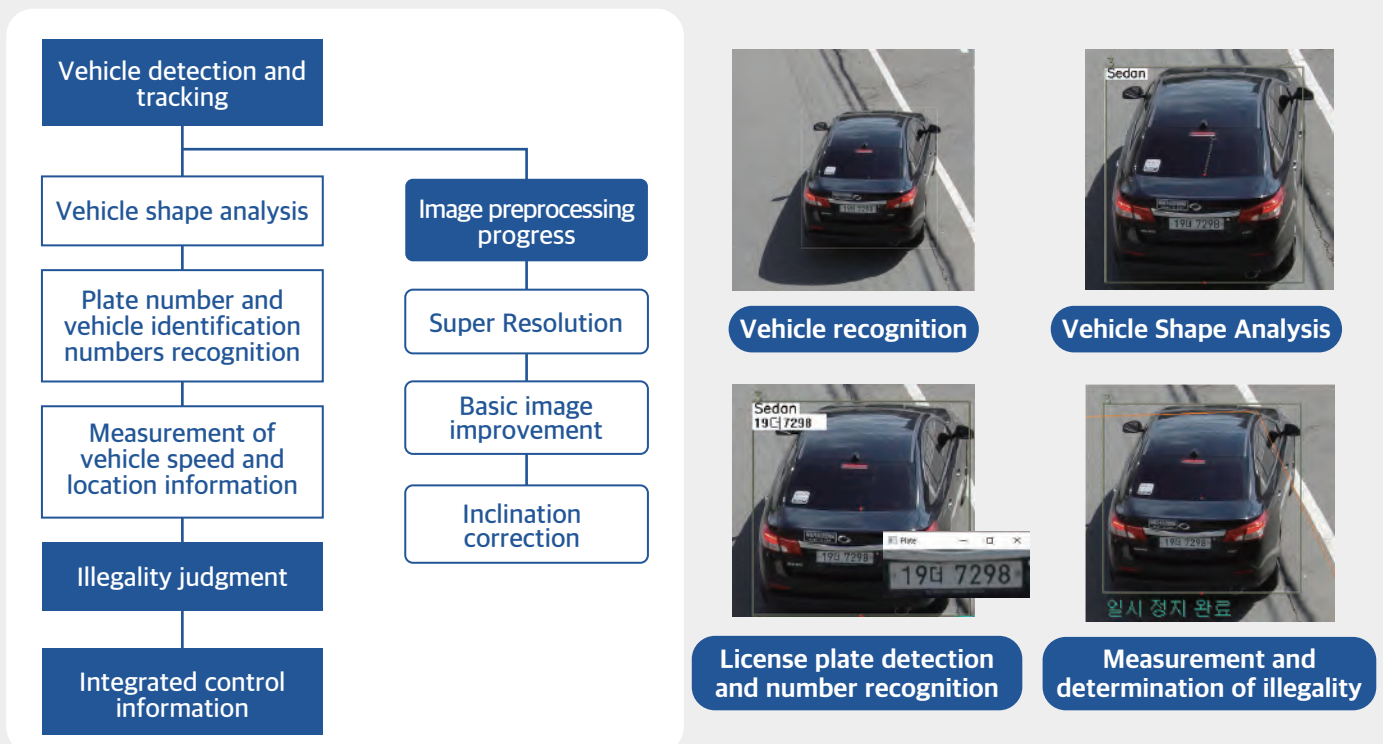
Solution

Integrated vehicle information analysis system based on AI solutions

- An integrated system that performs vehicle classification, illegal parking control, right turn control, and speeding control based on vehicle detection and tracking process.
- One camera can control a large number of offenses.



Solution flowchart



Vehicle detection and tracking

- Identifies and tracks objects when entering a specified detection area in the image.

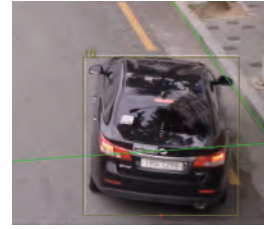


Image identified when entering the area

Vehicle Shape Analysis (Vehicle Type)

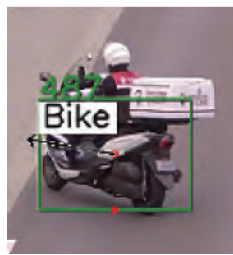
- Enter images cut through vehicle detection into a classification neural network model to categorize them into 5 types of vehicles.



Bus



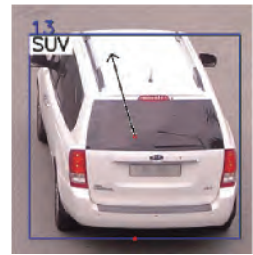
Truck



Motorcycle



Sedan



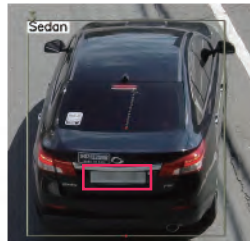
SUV

Plate number and vehicle identification numbers recognition

- Vehicle detection and license plate detection then identify each character from the cut license plate image.



Vehicle detection



License plate detection



License plate crop



Character identification

Performance Verification Completed

- Completion of AI solution metrics and function evaluation.

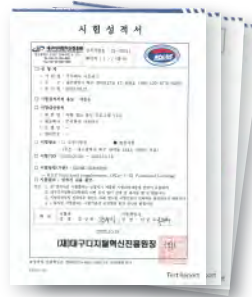
AI model performance metrics



Evaluation index
(closer to 1, more suitable)

Accuracy	0.97
Precision	0.98
Recall	0.98
F-1 Score	0.98
mAP	0.99

Performance evaluation results

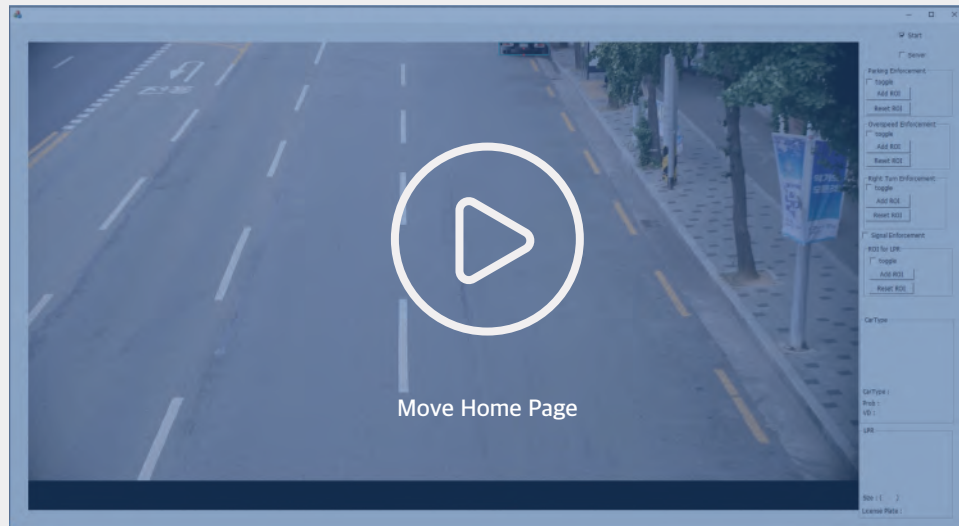


Evaluation index
(closer to 100, more suitable)

Vehicle detection performance	100%
Vehicle classification performance	99%
speed measurement performance	96%

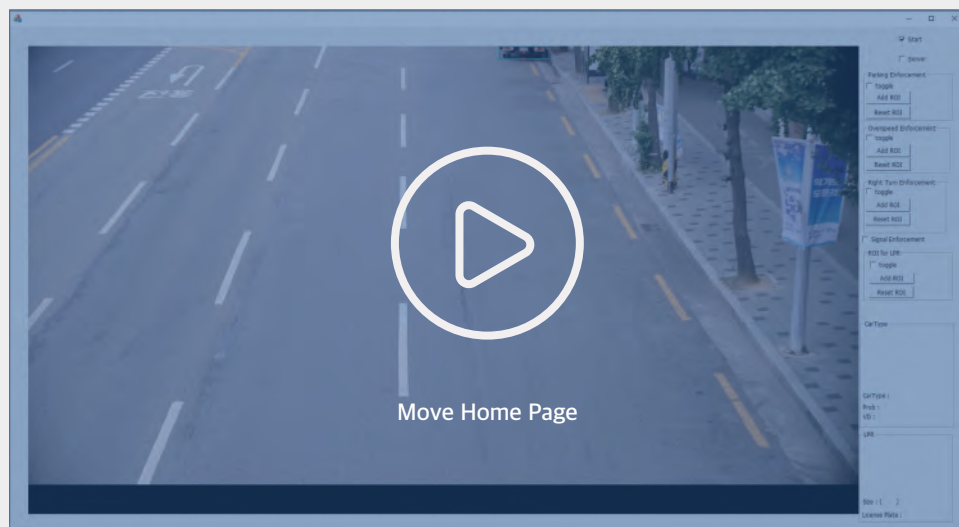
Illegal parking control

- Determining if the vehicle is parked/stopped illegally based on the time the vehicle is stopped in the no-parking zone.
- Stopping the vehicle activates the timer on each vehicle and starts the timer when moving.
- When the timer expires, it is determined to be subject to control and continues to be subject to control even if the vehicle moves in the future.



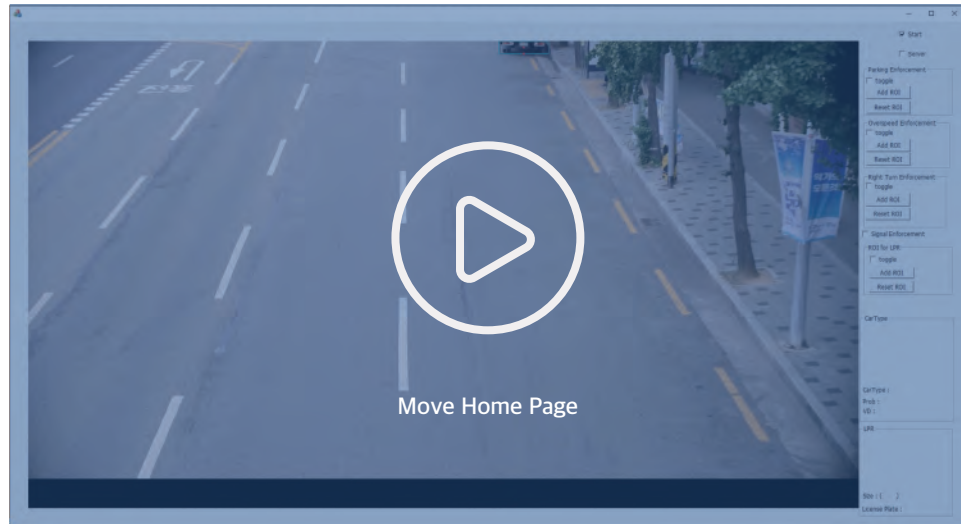
Speeding suppression

- Set the Region of Interest (RoI) to 10 m, record the time passing through each of the two points in the interval, and calculate the speed of the vehicle using the difference in that time.



Right turn control

- Designate the area of the right-turn path and determine a right-turn when passing through all the areas.
- Legitimate when stopping in the right turn area and deemed a violation when passing without stopping.



Advantages and expected effects

Solution Benefits

- Integrated solution simplifies enforcement equipment
 - Current control equipment exists separately for each control function.
 - When applying this solution, integrated enforcement can be carried out with only one enforcement device.

Expectation effectiveness



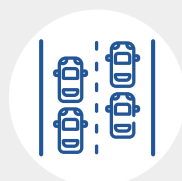
Technical aspects

- Utilize intelligent image analysis data.
- Leverage Digital Twin/Smart Intersections.
- Using the Speed Alert/Selection Control System.



The economic aspect

- Reduce system installation costs.
- Reduce operating and administrative costs.



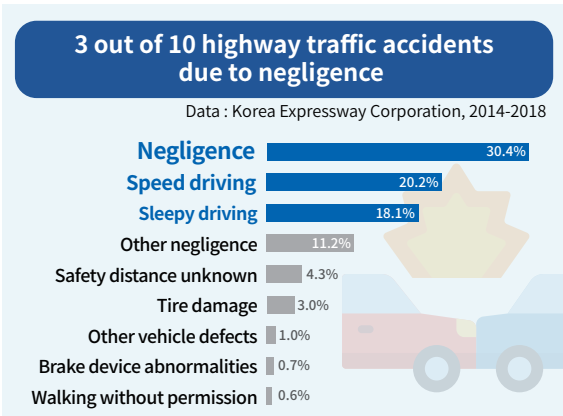
Social aspects

- Increase in traffic safety facilities.
- Easy to prevent and control major traffic accidents such as traffic, lights and speeding crackdowns.

04 Measurement and anti-drowsiness system of driver through biometric recognition

Dealing with an existing drowsy problem

Seriousness of drowsy and negligent driving

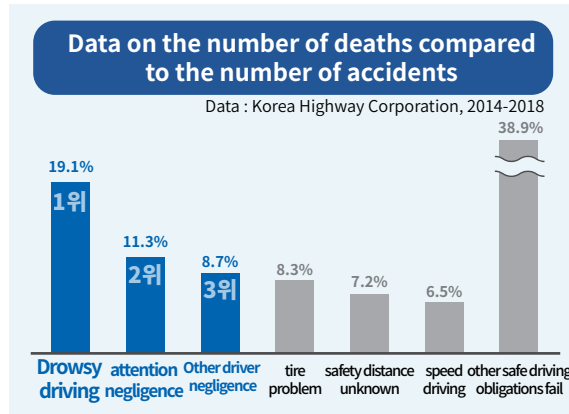


가드레일과 충돌해 트럭 운전자 부상... "졸음 운전 추정"



출처 : https://www.ytn.co.kr/_ln/0103_202201050133366944

- The death rate from drowsy driving is about 1.75 times higher than the death rate from drunk driving.
- There is no adequate technology to prevent drowsiness.



추돌 사고 정체 못 보고 터널에서 또 '랑'...10명 사상

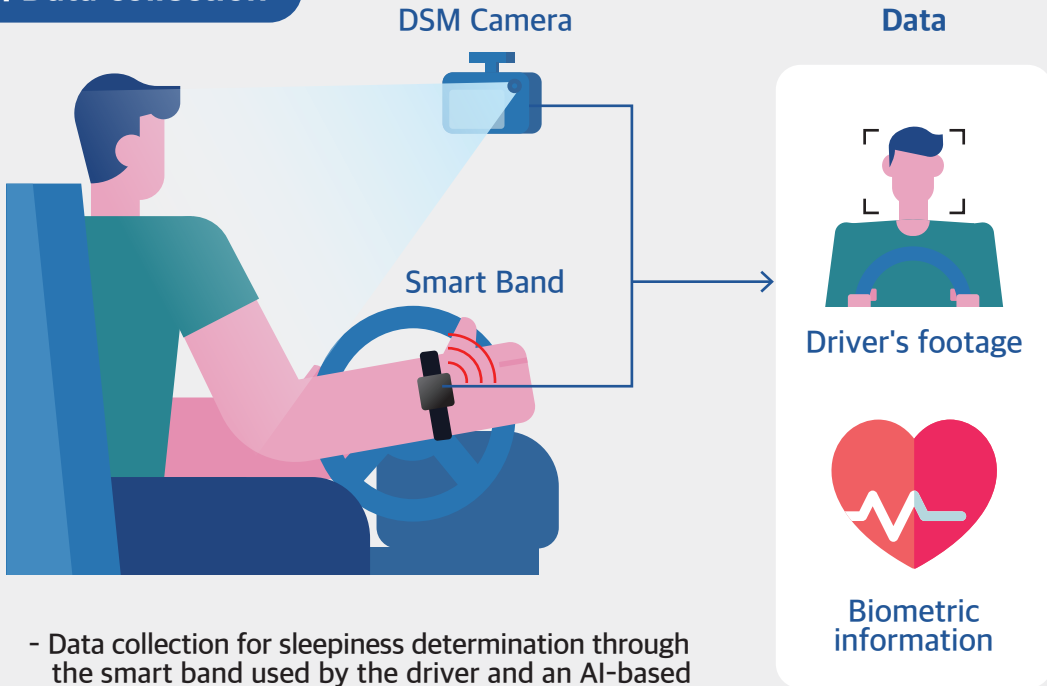


출처 : https://www.ytn.co.kr/_ln/0115_202112101837176457

- 70% of the traffic accident rate is caused by careless driving, and the casualties caused by the accident are very serious.
- system is needed to prevent accidents through the analysis of the driver's condition.

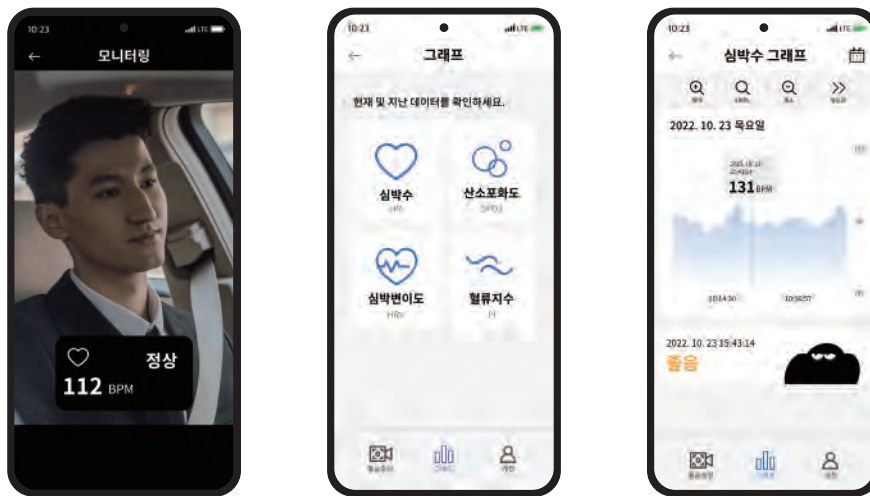
Sleepiness measurement and sleepiness warning with smart band and DSM Camera

1. Data collection



- Data collection for sleepiness determination through the smart band used by the driver and an AI-based camera attached to the vehicle.

2. Application



LTE
DSM Station,
Data Transfer
to DSM Server

- Real-time data monitoring received from DSM cameras and smart bands.
- Allows applications to view real-time biometric data sent from each device.

3. Server and station

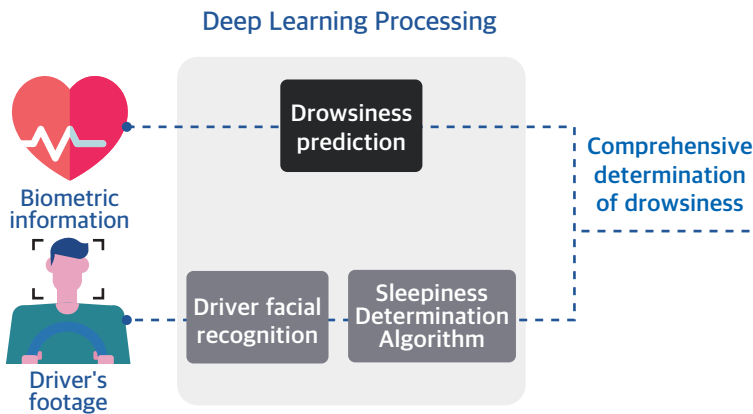
• DSM Server

```

Table: 100 rows | 6 cols
+-----+-----+-----+-----+-----+-----+
| table | _measurement | _field | _value | _time | type |
+-----+-----+-----+-----+-----+-----+
| HR_test | HR | 199 | 2022-06-16T06:11:00.122Z | Heart Rate |
| HR_test | HR | 99 | 2022-06-16T06:11:05.112Z | Heart Rate |
| HR_test | HR | 98 | 2022-06-16T06:11:09.082Z | Heart Rate |
| HR_test | HR | 99 | 2022-06-16T06:11:10.376Z | Heart Rate |
| HR_test | HR | 100 | 2022-06-16T06:11:12.042Z | Heart Rate |
| HR_test | HR | 98 | 2022-06-16T06:11:14.021Z | Heart Rate |
| HR_test | HR | 95 | 2022-06-16T06:11:16.991Z | Heart Rate |
  
```

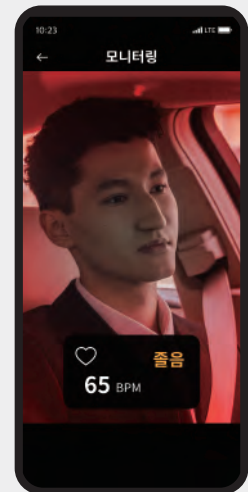
- Application sends data to DSM Server for storage.

• DSM Station



- Data processing and drowsiness determination from DSM Station.

Drowsiness notification



- If determined to be drowsy, sound/vibration anti-drowsiness notification via app.

Solution benefits

Advantages



Biological data-based sleep prevention eliminates the need for additional adjustments

- Analyzing changes in biometric data to detect drowsiness, eliminating the need for installation or tuning in the vehicle.



Vehicle-agnostic compatibility and convenience

- It can be used at a low price without distinguishing between different vehicles.
- It can be notified through smart bands and apps without the need for a separate device.

We solve social problems
based on convergence technology



SALORIS

Saloris Co., Ltd. T. 070-8776-8287 F. 0505-055-8287 E. maker@saloris.world
409, IT Convergence Industry Building, 80, Daehak-ro, Buk-gu, Daegu, Republic of Korea