LIGHTVISION

CCTV based
AI Parking
with Face recognition

COMMAX
SmartHome & Security

LIGHTVISION

DENIC
support the expert

Problems of Parking Lots in Vietnam market

Parking conditions in Vietnam cause various problems.

Congestion during entry

Use of tickets and RFID cards

Many CCTVs, yet no solution

Problems of Parking Lots in Vietnam market (1/3)

Waiting time increases due to delays in entering and exiting the vehicle.

- High congestion during rush hour
- No fast track for pre-registered people
- Manual vehicle inspection by security causes congestion at parking entrances.
- Difficult to check parking time and amount in advance

Problems of Parking Lots in Vietnam market (2/3)

Using tickets and RFID cards causes considerable time consumption and is not easy to manage either.

- **Current process can take a long time**
- **Easy to forgot or lost**
- **Only one vehicle can be registered per card**
- **Vehicle registration requires in management office**

Problems of Parking Lots in Vietnam market (3/3)

Even with numerous CCTVs, we can't identify whether a car is from our apartment complex or outside.

- **Difficult to monitor CCTV attentively 24/7**
- **It records video But No Tracking Objects**
- **Despite CCTV cameras, car ownership remains unknown.**
- **Difficult to prevent theft**

Current Parking Vs. LightVision AI Parking (1/4)

LV AI Parking provided fast-entry for users

Current Parking System

- High congestion during rush hour
- No fast track for pre-registered people
- Manual vehicle inspection by security causes congestion at parking entrances.
- Difficult to check parking time and amount in advance

LV AI Parking

- Supports quick entry and exit In rush hour
- Fast-track for registered users
- Vehicle inspection automatically
- Check time and cost through app

Current Parking Vs. LightVision AI Parking (2/4)

Ownership can be proven with simple facial recognition. Users can register via the mobile app.

Current Parking System

- Difficult to verify vehicle owner
- Easy to lose or misplace
- Need to go to the administrative office to register

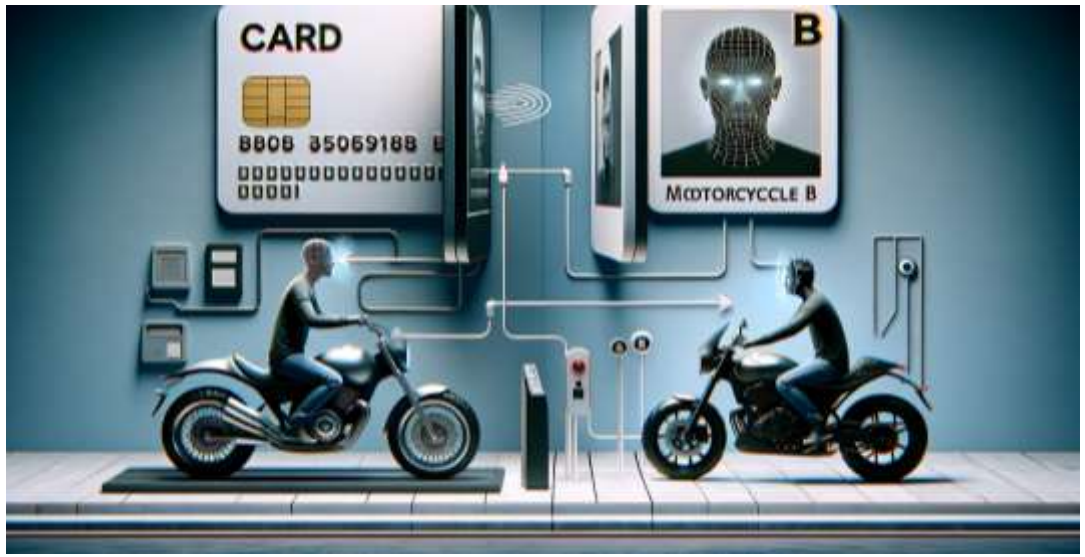
LV AI Parking

- Easy verification through facial recognition
- One owner, two cars, unlimited parking.
- Register yourself using the mobile app

Current Parking Vs. LightVision AI Parking (3/4)

AI Parking is designed to take into account many different complex situations for owners.
It supports multi-person ownership for 1 vehicle and multi-vehicle ownership for one person.

Current Parking System



LV AI Parking

Current Parking Vs. LightVision AI Parking (4/4)

preventing vehicle theft and providing various statistical data.

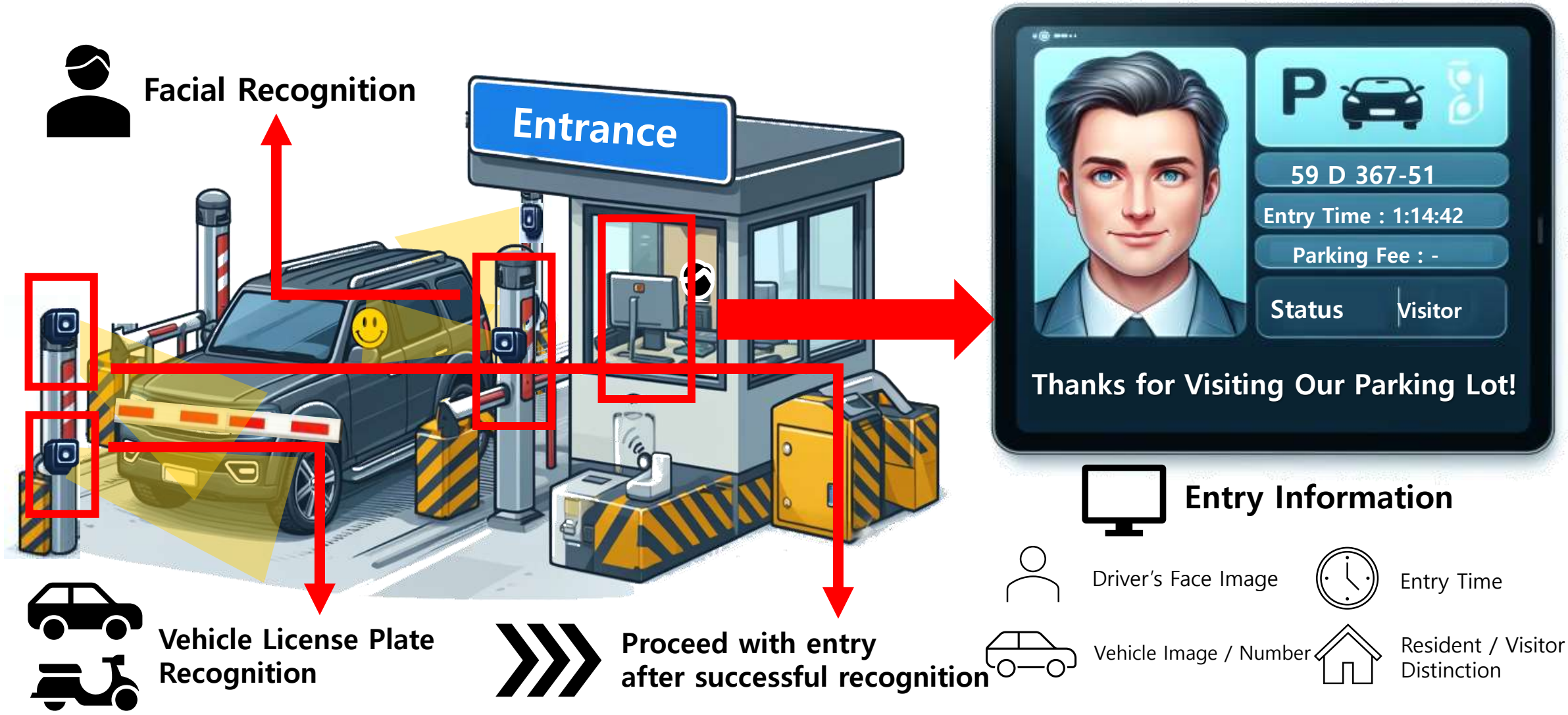
Current Parking System

LV AI Parking

YouTube link

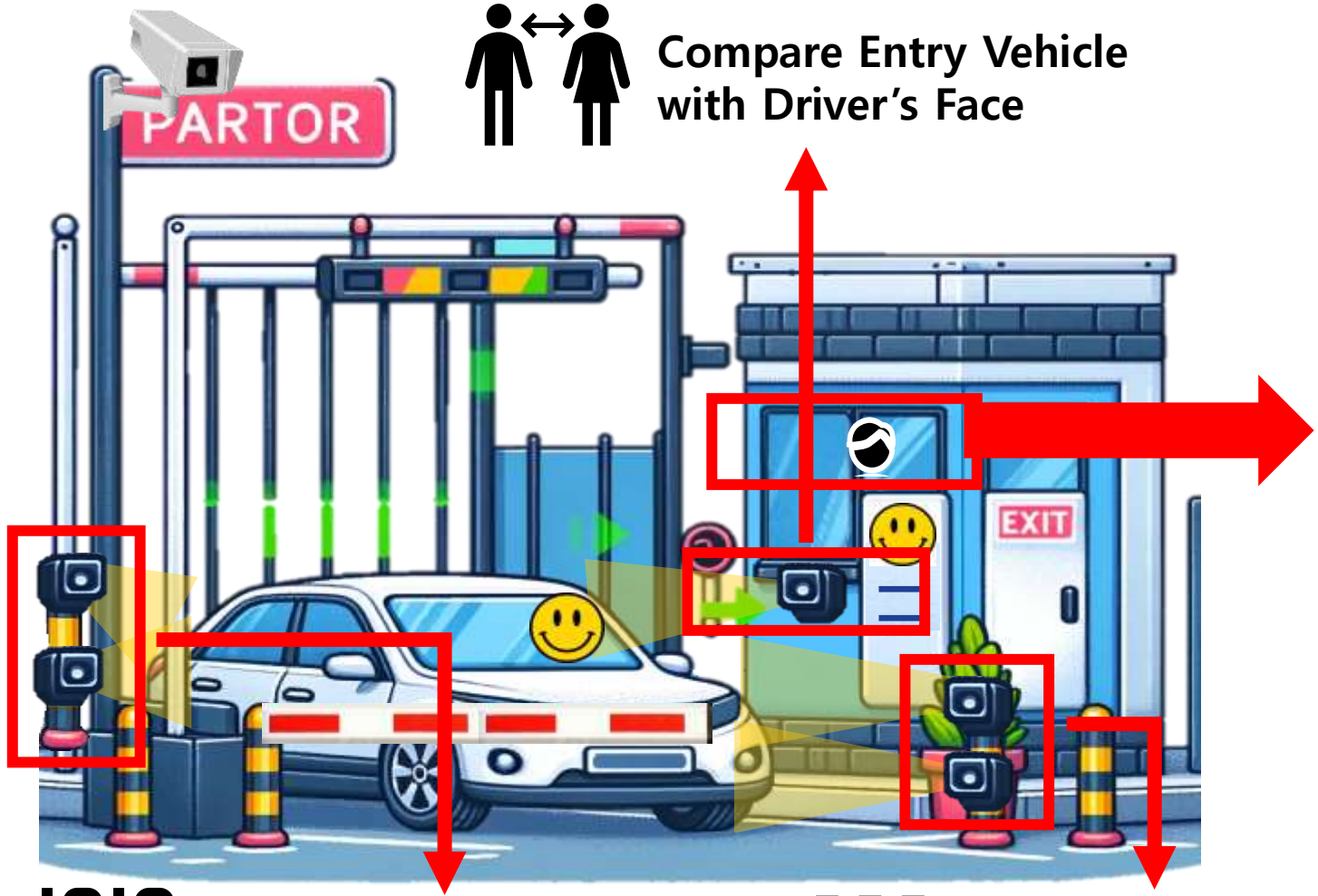
‘Parking Barrier’ Ver. Service Concept Figure (Entry)

When leaving the parking lot, parking related info (parking time, parking fee, etc.) is automatically displayed



‘Parking Barrier’ Ver. Service Concept Figure (Exit)

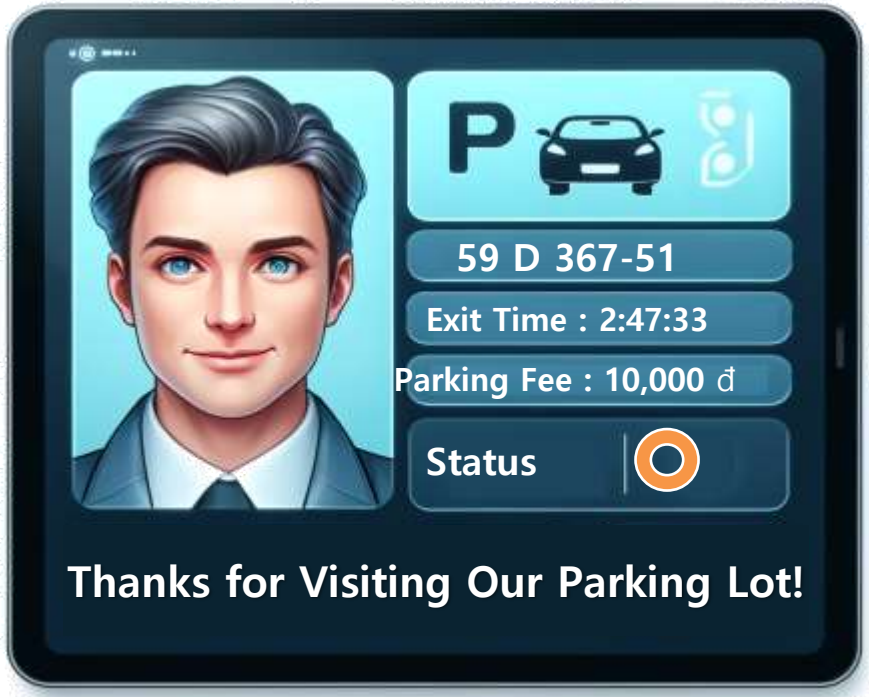
When leaving the parking lot, parking related info (parking time, parking fee, etc.) is automatically displayed



Compare Entry Vehicle with Driver’s Face

Compare Entry Vehicle with License Plate

Proceed with exit after verification

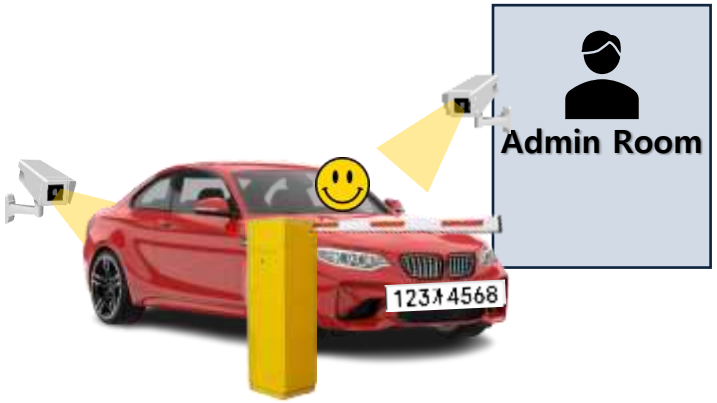


Exit Information

- Driver’s Face Image
- Entry / Exit Time
- Vehicle Image / Number
- Parking Fee
- Status Verification

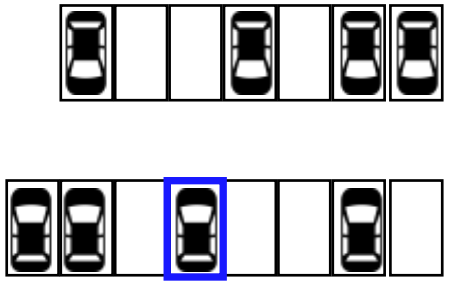
‘Parking Barrier’ Ver. User Scenario

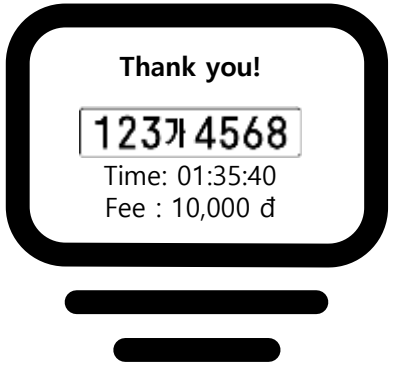
**Convenient for managing parking for motorcycle riders,
as it eliminates the need to provide paper tickets or RF cards, reducing the risk of loss**



Face Recognition by CCTV + Vehicle LPR by CCTV → Data Storage

Entry → Entry Vehicle → Collect Recognition Information → Verifying Input Data →





Barrier Opening → Parking Complete → Exit Vehicle → Display Parking Information → EXIT

‘Parking Barrier’ Ver. System Data Flow

Information is delivered through the following data processing

Data Registration | Data Matching | AI Technology | Data Analysis | Display Output

Fast and Secure Entrance

123가4568

License Plate

Facial Recognition

AI Parking System Data Flow

Data Acquisitor

Raw data

AI Server

Meta data

Service server

Statistical information

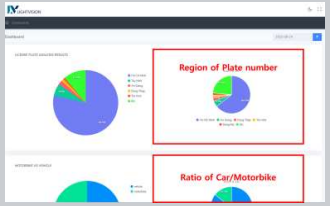
Control Room

Parking information

Time:
01:35:40
Fee :
10,000 đ

User Screen

Outputs



Admin S/W

Parking Fee Info

‘Parking Barrier’ Ver. is comprised of 3 different AI technologies

Make the most of existing CCTV to apply parking management services to indoor and outdoor parking lots

Facial recognition

Registering face & vehicle via App

Visitor Reservation

AI Parking Parking Barrier ver.

Face recognition Algorithm "LV Auth" of AI Parking

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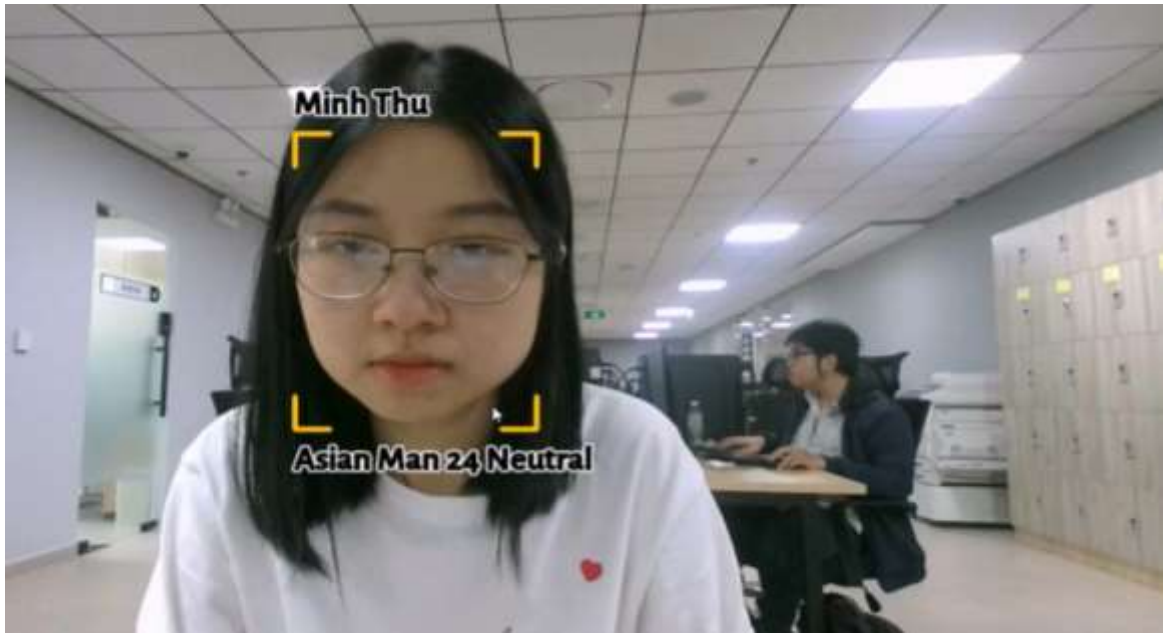
'Facial Recognition' Supports Quick Entry/Exit by Verifying Pre-Registered Residents or Employees



01

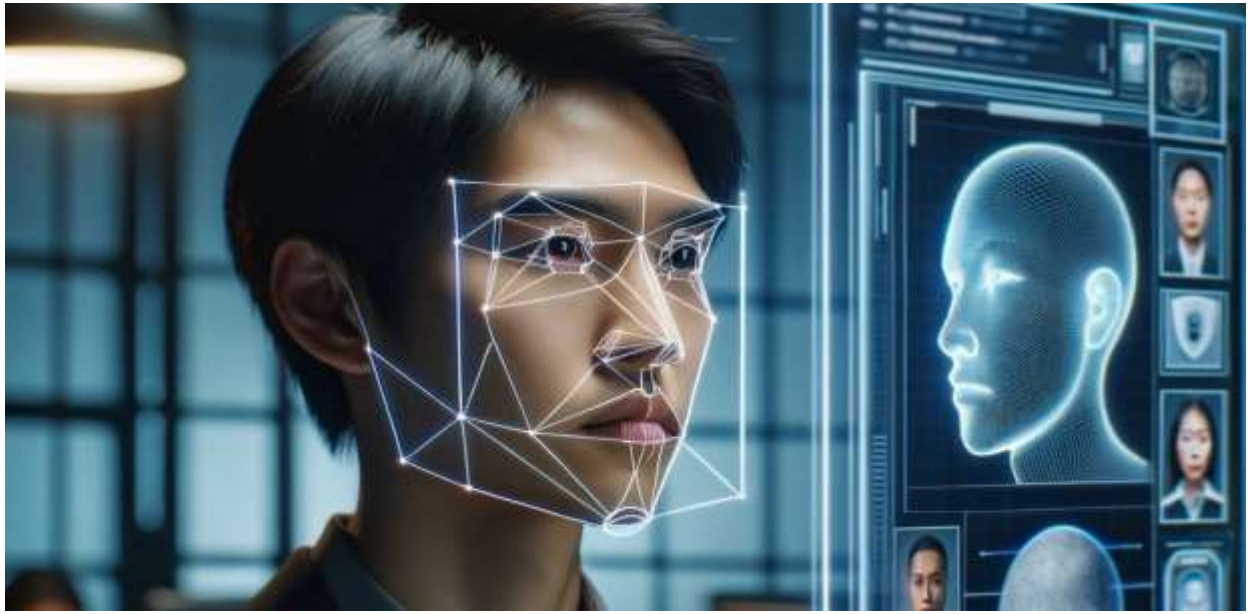
Recognizing multiple faces with Anti-spoofing

02

User analysis gender, age for management

Face recognition Algorithm "LV Auth" of AI Parking

Enhanced accuracy with Vietnamese nationals added to existing facial recognition dataset



03

Scheduled to obtain NIST* FRTE certification**

04

Southeast Asia-enhanced model through AI training.

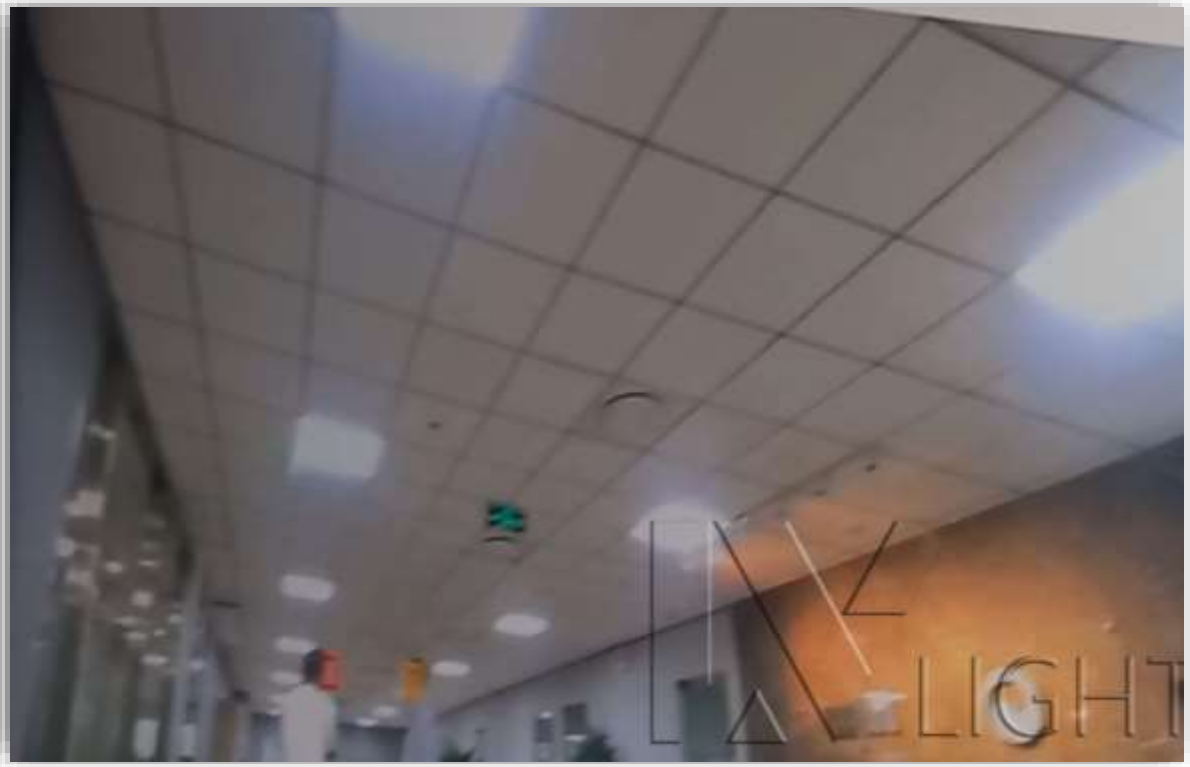
**National Institute of Standards and Technology Face Recognition*
***Technology Evaluation*

Facial recognition Demonstration

'Facial Recognition' Supports Quick Entry/Exit by Verifying Pre-Registered Residents or Employees
It shows accurate recognition rates even in bad conditions.

It is possible to recognize multiple detection in old laptops

YouTube link



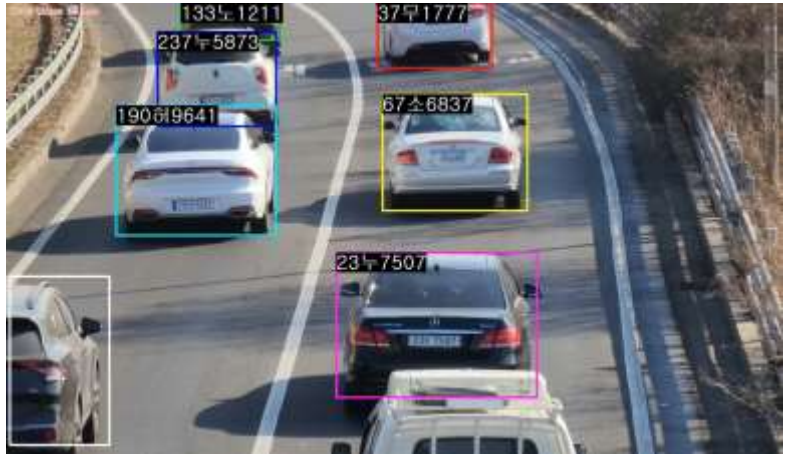
It detects Small pixel recognition + side recognition even from a distance

YouTube link

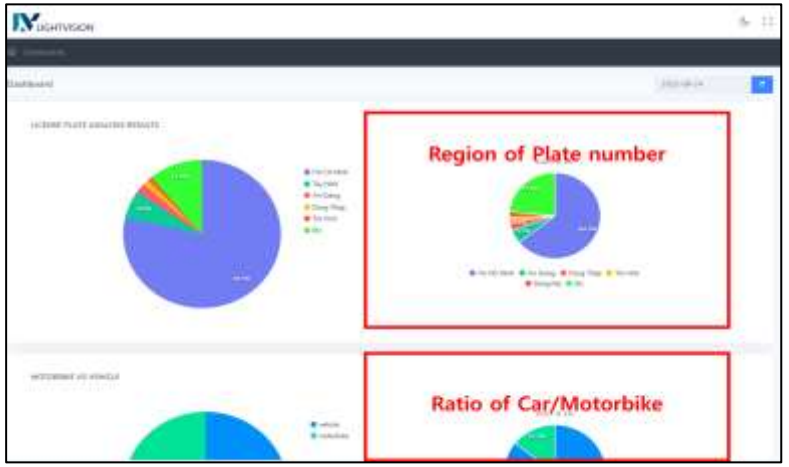
Additional functions of 'AI Parking Barrier' Ver.

In addition, it accurately detects license plates based on an AI model and provides various functions such as statistical data and checking parking time and fee in the app

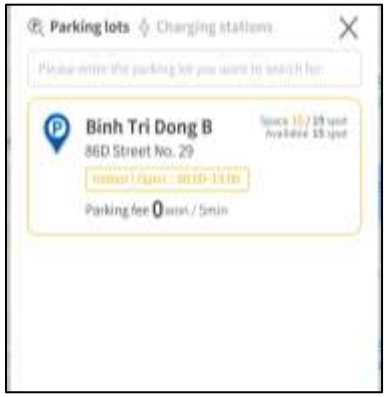
AI-based License Plate Recognition



Providing Statistical Data



Parking Time and Fee Calculation via app



‘Parking Barrier’ Ver. Required H/W

Add an AI server and CCTV for facial recognition to access the new feature, keeping the existing system mostly unchanged.

Parking Barrier

Total 2
Entrance x 1
Exit x 1

CCTV

Total 8
(Entrance)
- Front LPD x 2
- back LPD x 2

(Exit)
- Front LPD x 2
- back LPD x 2

NVR 8ch

+

CCTV+ Display

Total 2
(Entrance)
- Face recognition x 1

(Exit)
- Face recognition x 1

For face recognition

or

AI Server

Total 1
Server room x 1

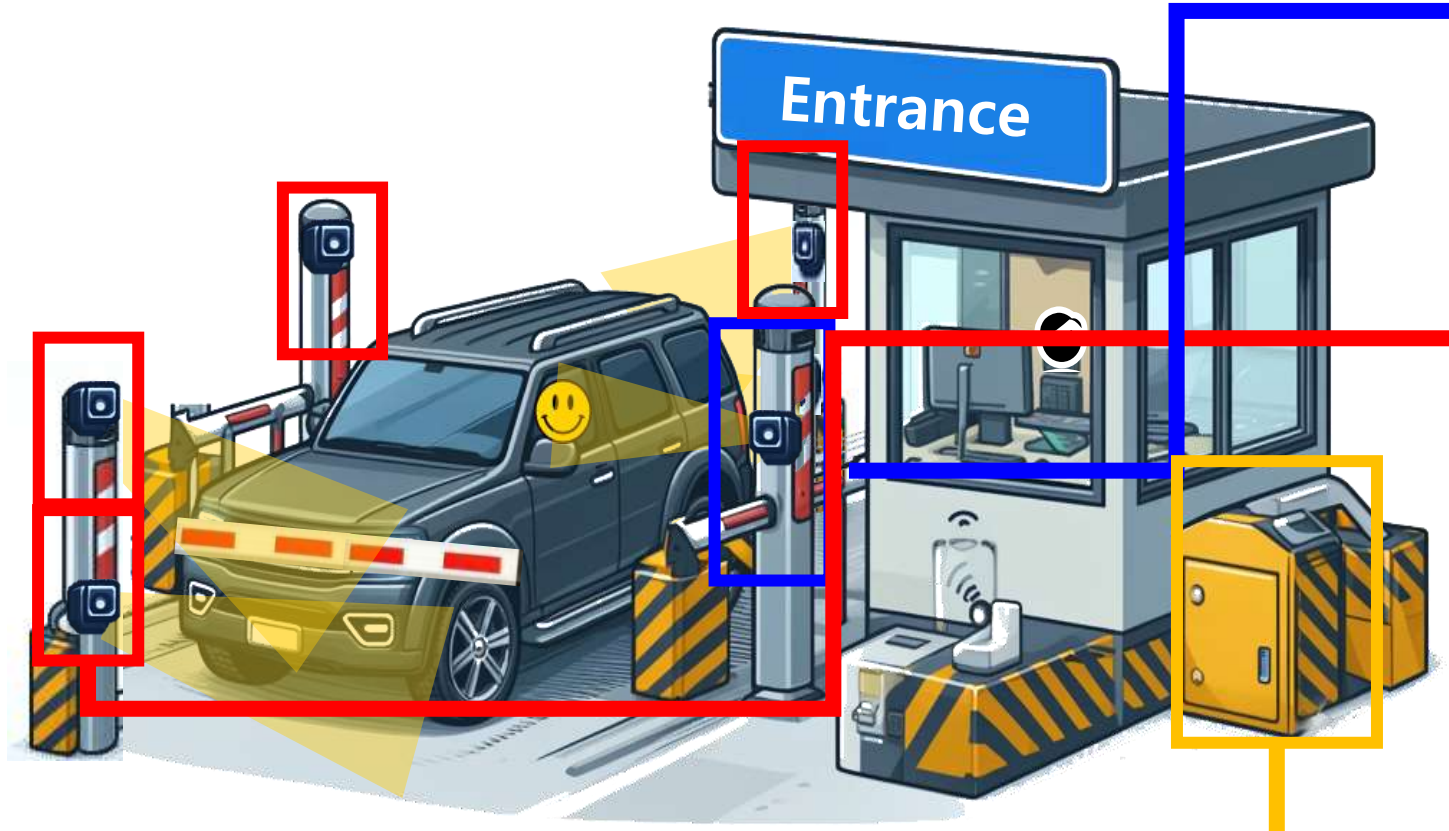
Image processing AI Server

Laptop

Total 1
Control room x 1

CCTV Installation Locations for Barrier ver.

Barrier ver. need CCTV installed only at the entrance
Even if you do not register in advance, you can register in front of the parking lot.



CCTV+ Display

Total 2
(Entrance)
- Face recognition x 1

(Exit)
- Face recognition x 1

CCTV

Total 8
(Entrance)
- Front LPD x 4

(Exit)
- Front LPD x 4

AI Server

Total 1
(Server room)
- AI Server X 1

Four kinds of versions of AI Parking service

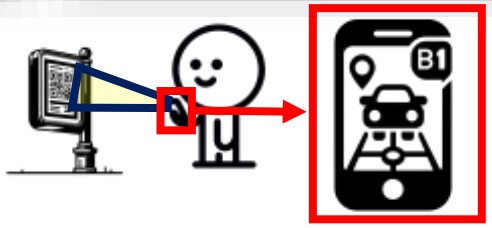
Providing options based on budget and required features

1) Parking Barrier Ver.
(installation CCTV of ONLY entrance and exit)

- Statistical analysis support
- Facial recognition-based entry and exit

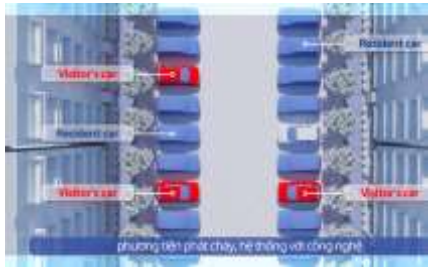
2) Basic Ver.
(installation CCTV of entrance and exit on each floor)

- Find your car location in the parking lot
- Easy arrival and departure through pre-registration of visiting vehicles



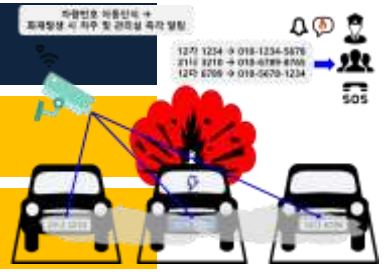
3) Standard Ver.
(installation CCTV at junction on each floor)

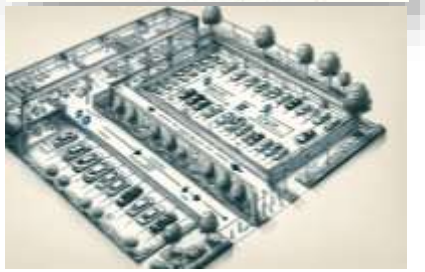
- Illegal parking detection(sending warning messages and managing blacklists for a supervisor)
- Indoor navigation (guidance for empty parking lots on your phone)



4) Premium Ver.
(installation CCTV covering all Indoor/Outdoor parking areas)

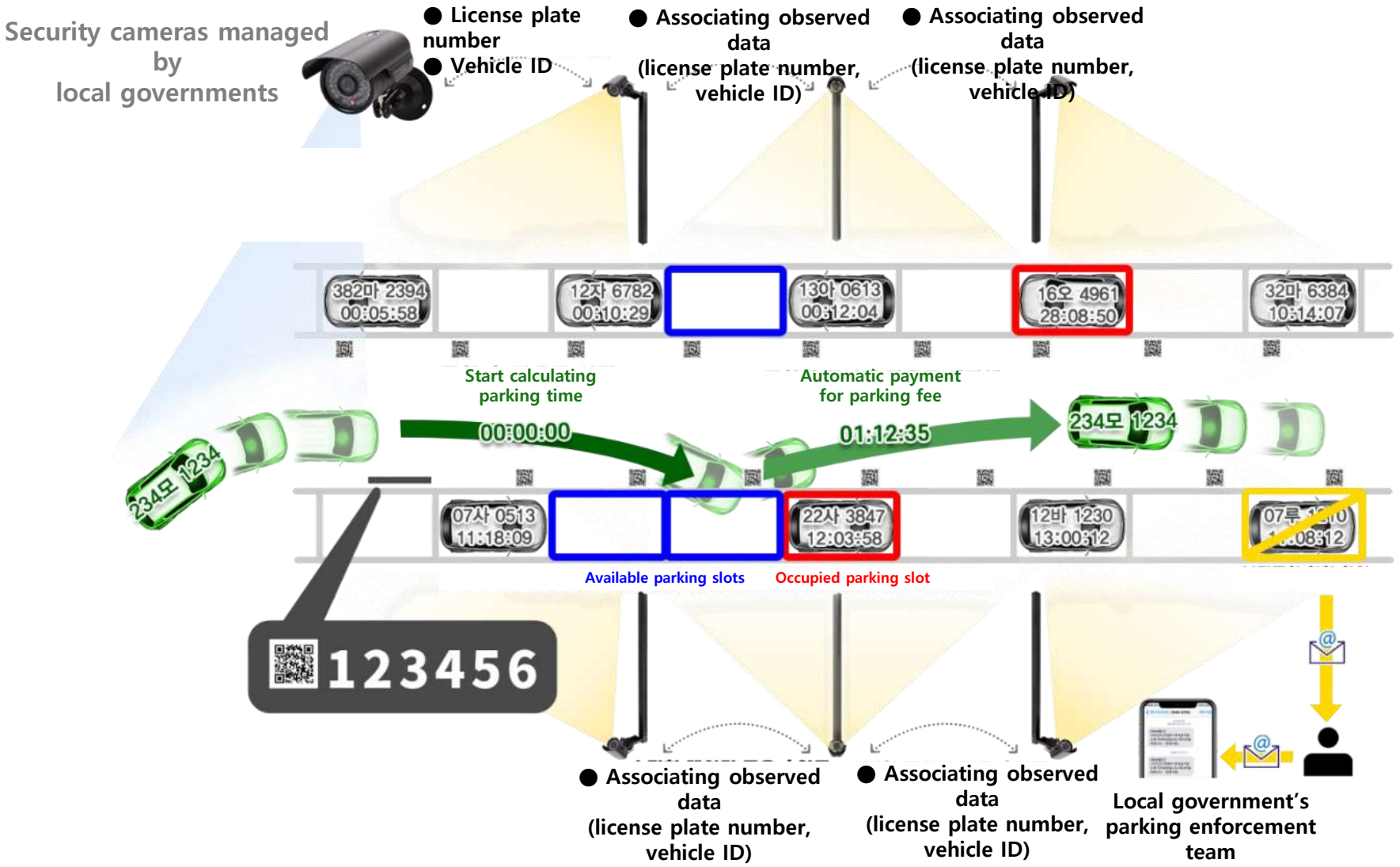
- Early fire detection and alarm system
- Outdoor parking lots management without a parking barrier





AI Parking Premium ver. in smart city

Recognizing incoming and leaving vehicle's license plate number and Assigning unique IDs to vehicles and track them across the cameras



Outdoor parking lot

Users can use our service without altering their habits

- License recognition for incoming vehicles
- Recognition of parked vehicles
- Calculation of parking durations
- Identification of departing vehicles
- **Automatic charging of parking fees**

Premium ver. has 10 additional AI functions than barrier ver.

LIGHTVISION

AI Parking Premium controls even barrier-free parking lots with 10 added technologies.

Parking Barrier

- Registering face & vehicle via App
- Facial recognition
- Visitor Reservation

+

AI Parking Premium ver.

- Detection, recognition and tracking
- Hand over
- Re-identification
- Display empty parking lots
- Detect fire
- Indoor-outdoor integration
- Find my car location
- Water overflow alert
- EV charging locations
- illegal Parking

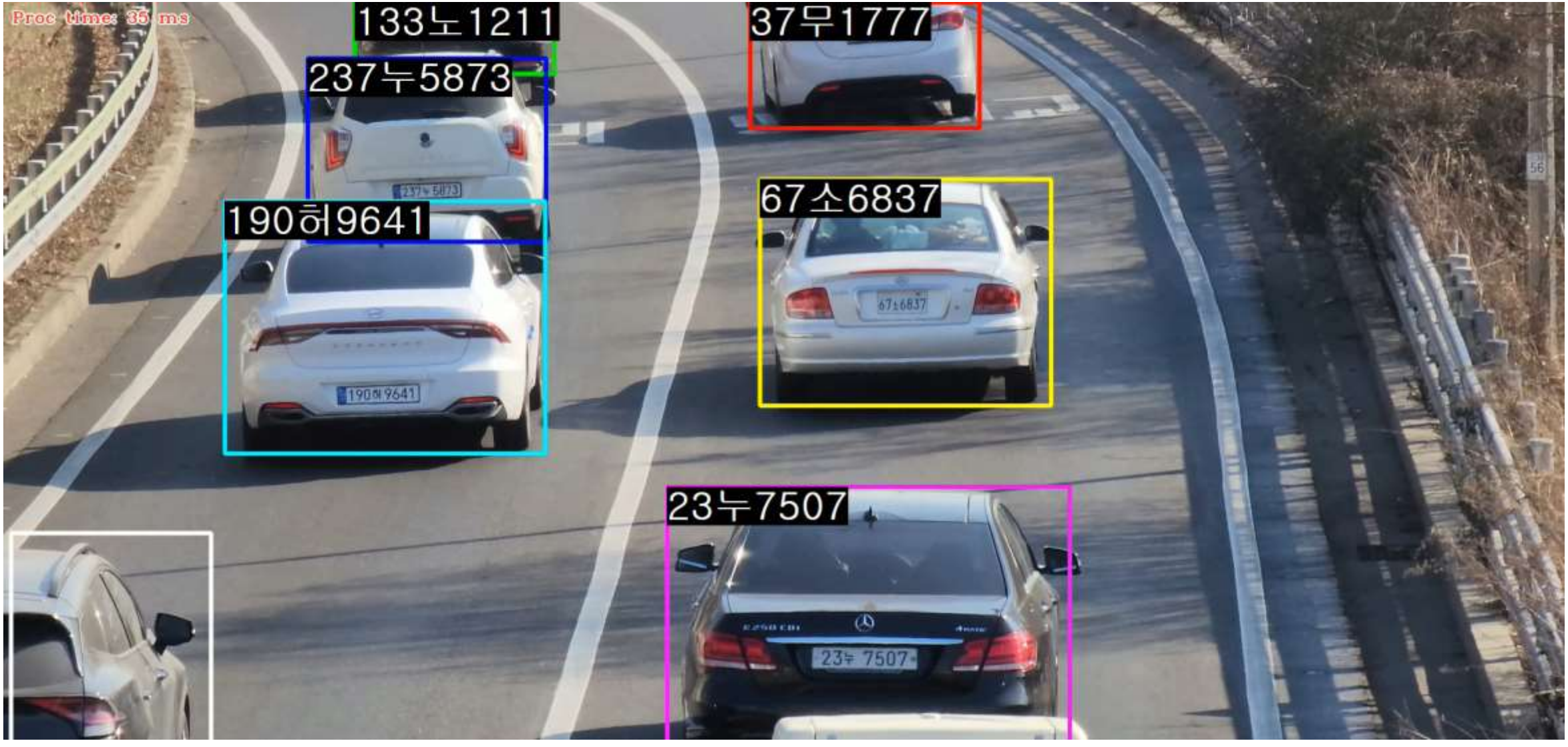
AI Parking Premium ver.

1. Detection, recognition and tracking

Real-time AI Tracking is Possible with a Single Camera on a Laptop Equipped with GTX 1070

(① Recognize License Plate Number, ② Tracking cars with LPN, ③ Labtop GTX 1070)

YouTube link



2. Handover through multiple cameras

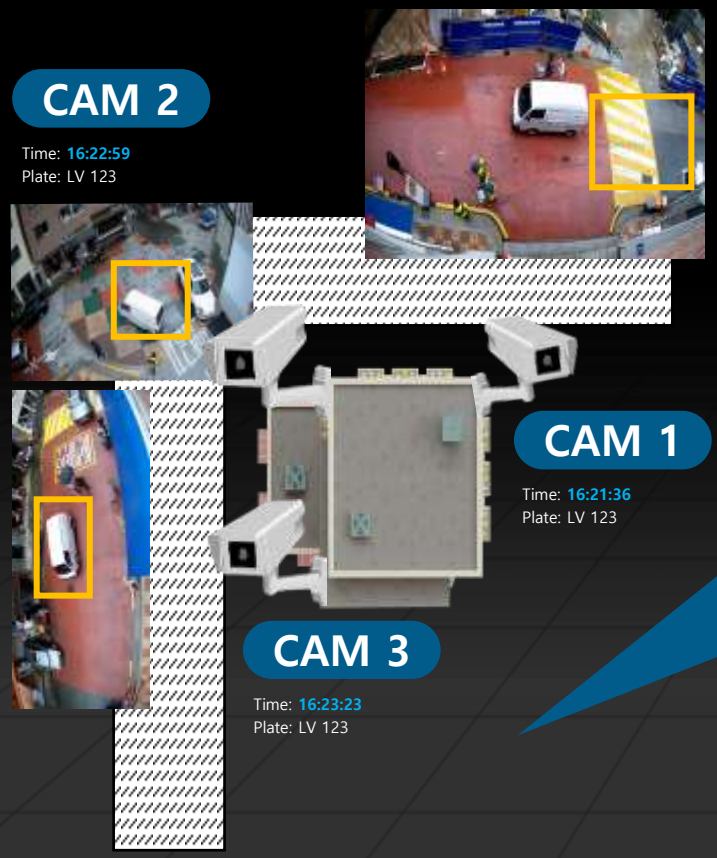
'Handover Functions' for Transmitting Information Between Cameras for Parking Lot Monitoring

YouTube link

3. Re-Identification

① 'Re-ID' Recognizes the Same Type of Vehicle Even When Cameras are Far Apart
② It has a Ability to Distinguish Similar Vehicles Even When They are Close Together

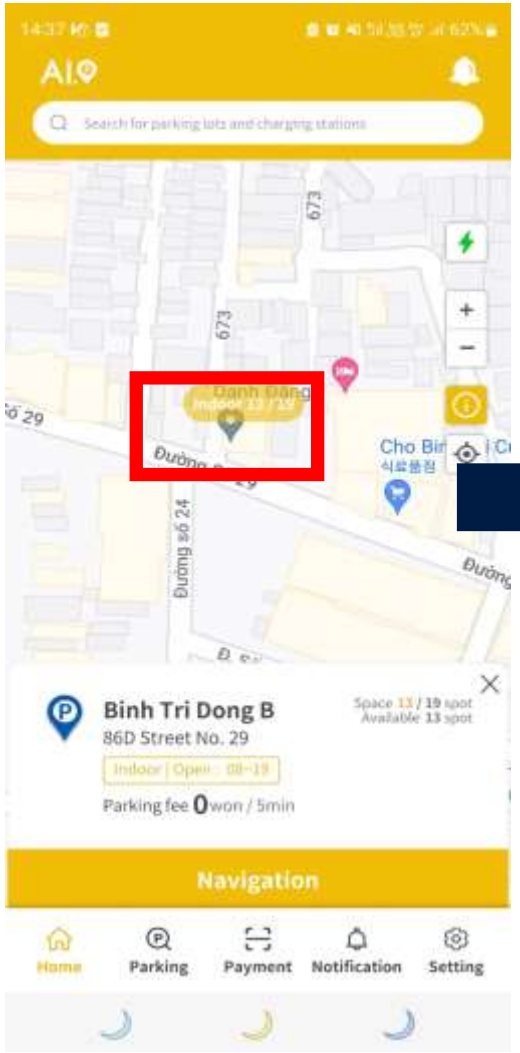
Youtube Link

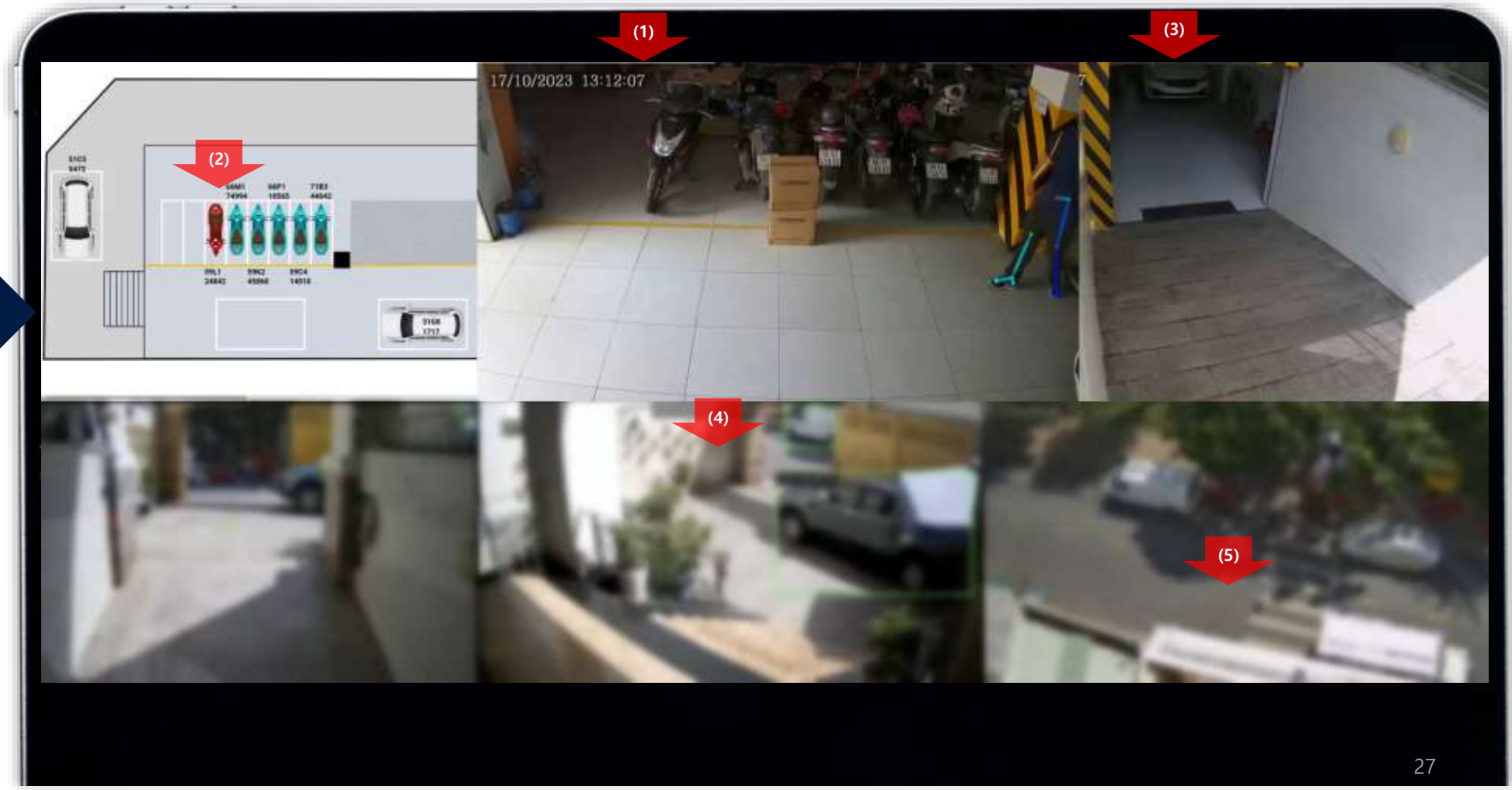


4. Display empty parking lots

AI Parking VINA' detects motorcycle license plates even when parked with the plate obscured on the front.

Youtube link





5. Detect fire

Equipped with AI Fire Detection Function to Identify Fake Lights
After checking the notification, the message is delivered within 15 seconds

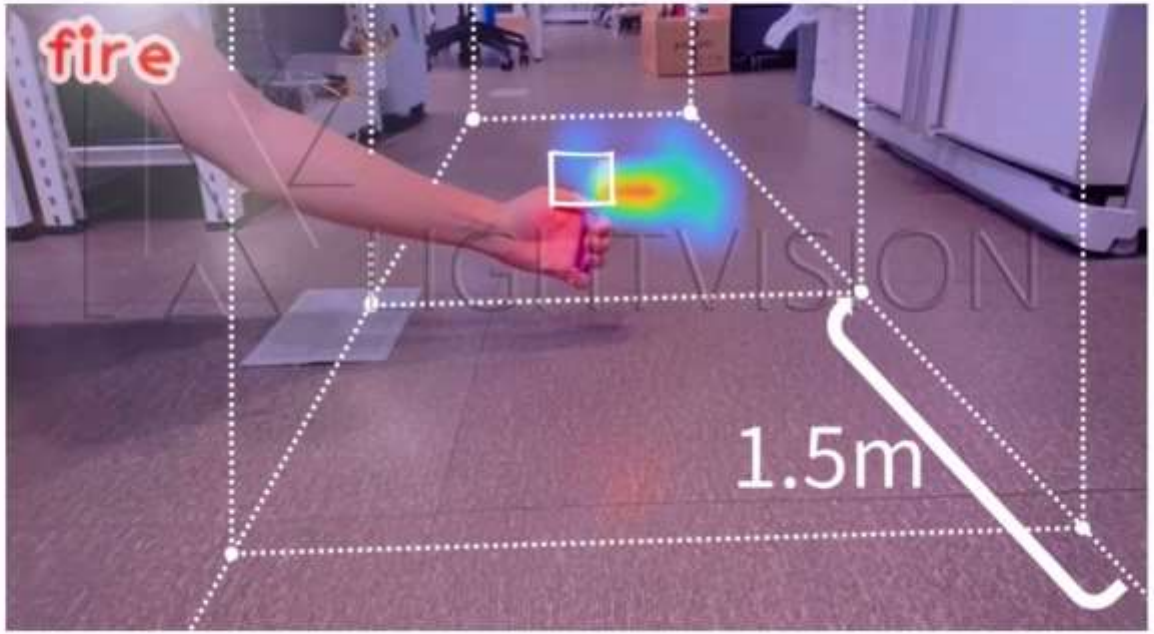
Thông số kích thước phát hiện cháy

Khoảng cách: 1.5m

Kích thước lửa tối thiểu:

7.5 cm,
60 x 60 pixel

Test webcam: 1080p, 30fps HDR CMOS at 1.5m



YouTube
link

Vietnam B2B Industry Sector

Outdoor parking lot control

With CCTV installation alone, there's no need to wander to find vacant spots when visiting factories or plants

Large logistics warehouse vacancy control

With CCTV installation alone, guided vacant space indication in warehouses

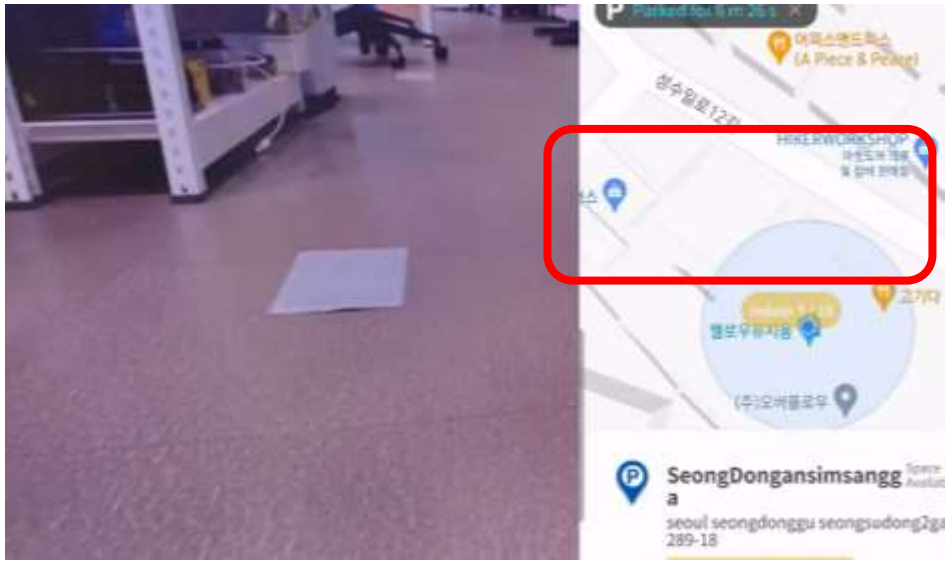
Why you need a premium version?

LV AI models can prevent major damage 24/7 without any gaps
It can prevent major casualties and property damage.

Storage Fire

EV Fire

AI Parking Vina Demonstration



YouTube
link

Service Report of AI Parking premium ver. In Korea

LightVision is providing AI Parking platform with Seoul city more than 3 years
We have reliable AI solution experience

Total number of members

23,450
(849 days since the service launch)

Total number of parking

61,510 cases

Maximum usage of a customer and Revisit rate

- 4,744,950KRW
- Ratio of revisiting customers: 26.7%
- Revisit rate: 72.5%

Utilisation rate of empty parking lot after commuting

Avg.: 29.0%
Max.: 52.7%

Maximum daily usage per parking space

8 cases
(23-06-07)

Average daily revenue per parking space

17,126KRW

Full function demonstration of 'AI Parking VINA'

Human, Car, Motorbike, Helmet wearing Recognition

- Car: license plate recognition, car type (e.g., sedan, SUV, truck, etc.)
- Helmet wearing: motorbike & human
- Statistics of helmet wearing, car & bike ratio, region of vehicles registration

Mapping short-range CCTV with long-range CCTV

Awards and Intellectual property status

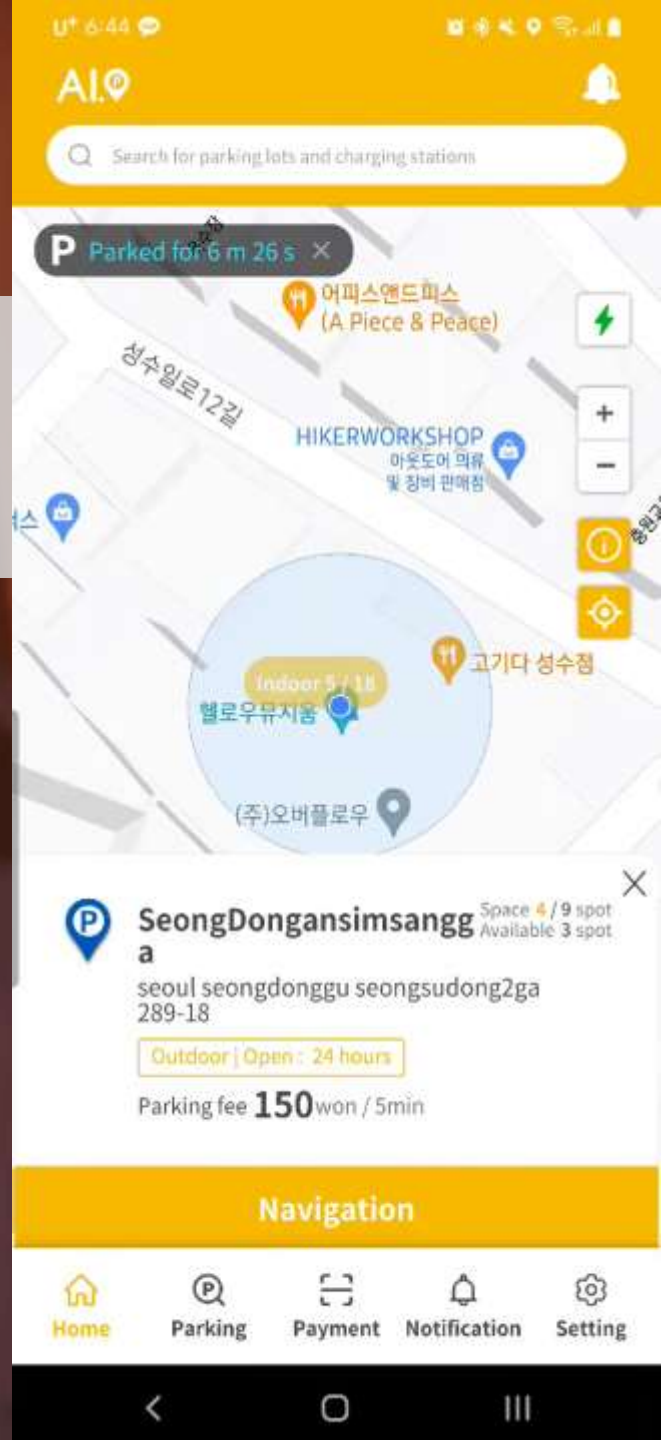
Major company awards certifications

- 2024.2, Awarded 1st place for remote startup by Ministry of SMEs
- 2023.12, commendation from the Minister of Science and ICT for AI industry development.

Key intellectual property rights

- intellectual property rights : 93

AI Parking Service Using CCTV for Facial Recognition Entry and Exit, and Fire detection in any space you need



THANK YOU!