

HIKVISION

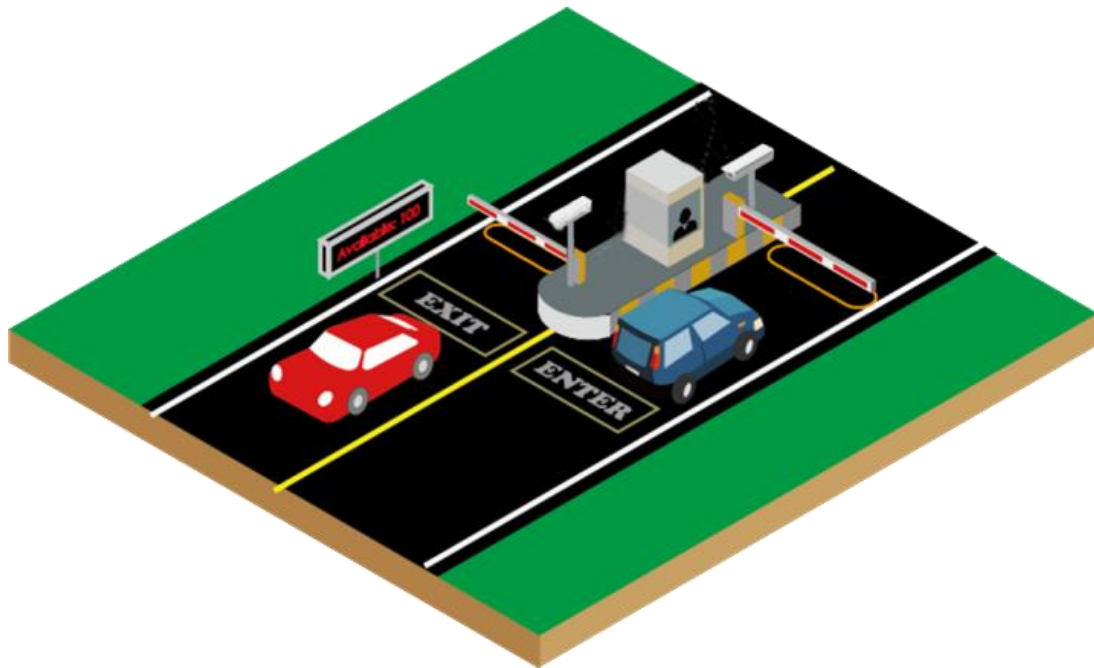


Hikvision LPR Camera
—Installation and Configuration
Manual

1. Installation Instruction

1.1 Installation location

The camera should be installed behind the barrier and facing the vehicle direction as illustrated in picture1.

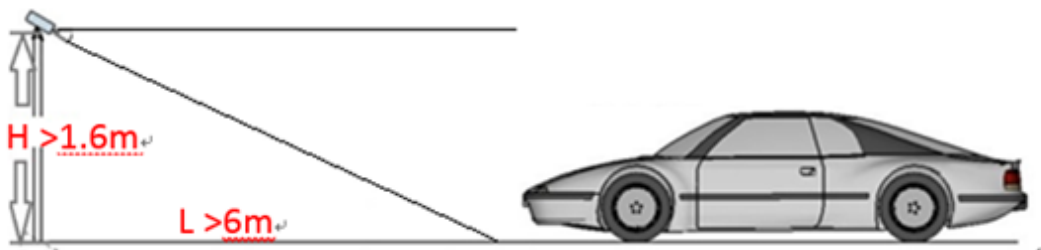


Picture 1: The illustration of camera location

And the distance between camera and barrier cannot be too big, the smaller the better.

1.2 Installation Height

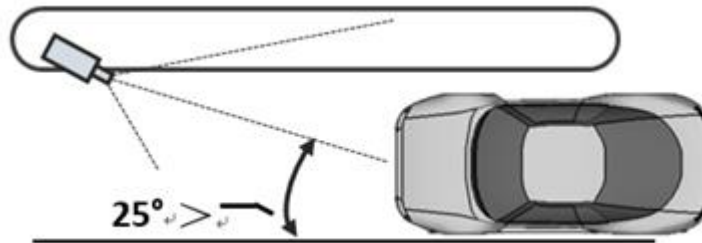
The appropriate installation height of camera is between 1.6m and 2m.



Picture 2: The camera installation height

1.3 Depression Angle

The camera depression angle should be bigger than 25 degree, namely the angle between camera and horizontal line >25 degree.



Picture 3: Depression angle

1.4 The adjustment of camera rotation angle

It is essential to try our best to adjust camera rotation angle to ensure the license plate is parallel to the horizontal line. Additionally, the deviation should be smaller than 5 degree if the vehicle plate is not horizontal under some conditions.



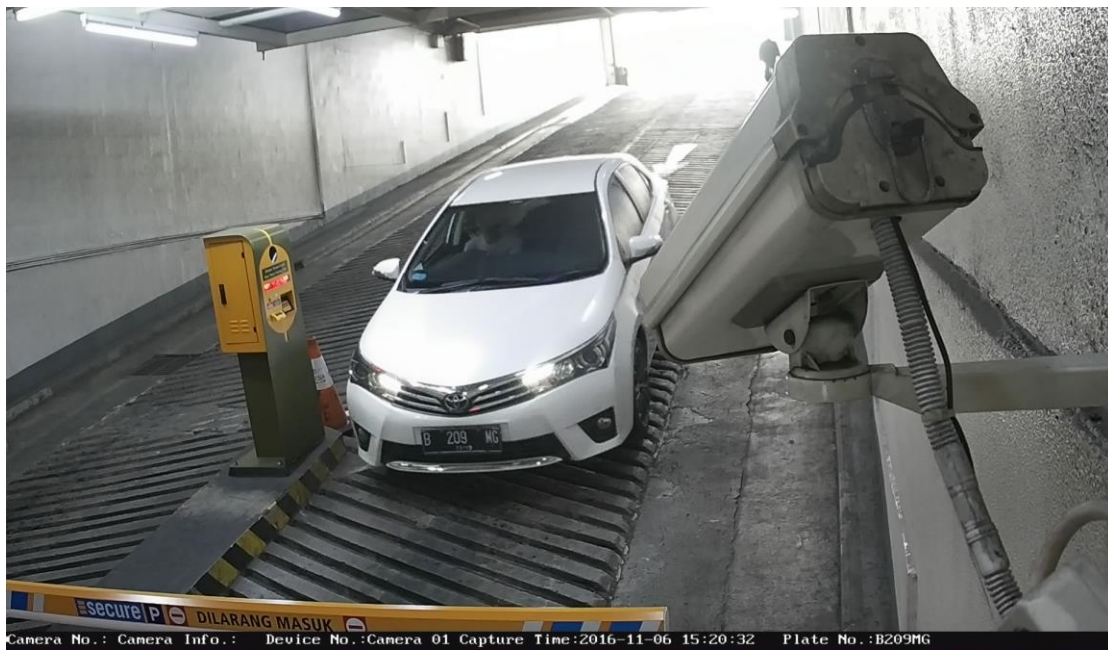
Picture 4: Horizontal position of license plate

This kind of requirement is asked by the software, the smaller the deviation degree is and the better the license plate recognition will be achieved.

1.5 Real Examples



Picture 5: Real example of camera location



Picture 6: Real example of camera angle

The information I mentioned above is under normal conditions. However, the installation position varies due to the restrictions of different conditions. As illustrated in picture 7, the installation height is beyond 2.5m as the slope existing.



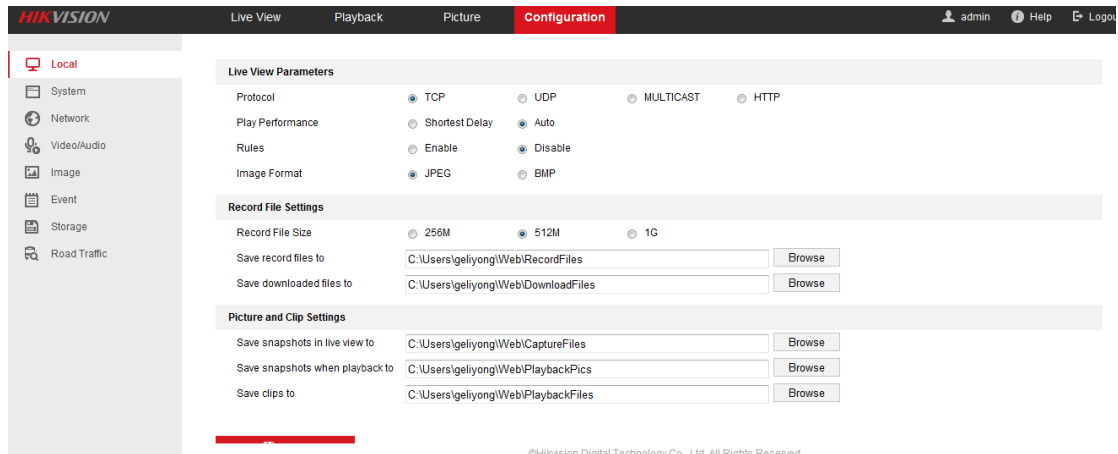
Picture 7: Real example

2. Configuration Instruction

The camera configurations mainly can be divided into three parts:

- The storage path settings
- The selections of the each parameter value
- The drawing of the license plate detection region

2.1 The storage of picture and video

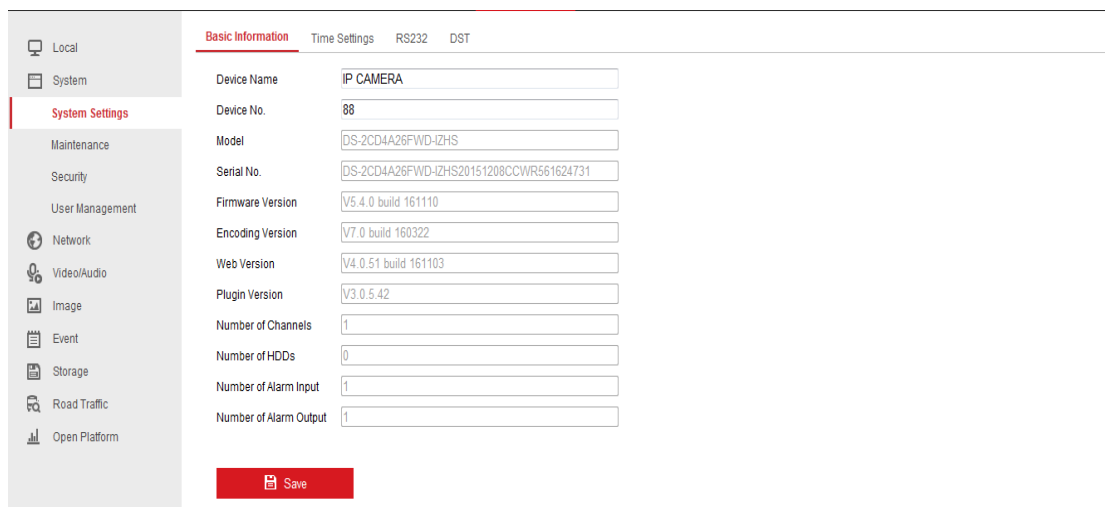


Picture 8: Camera local settings

The manual captured picture and the recording will be saved to your PC directly, and the storage path can be changed as shown in picture 8.

2.2 Check the firmware of the camera

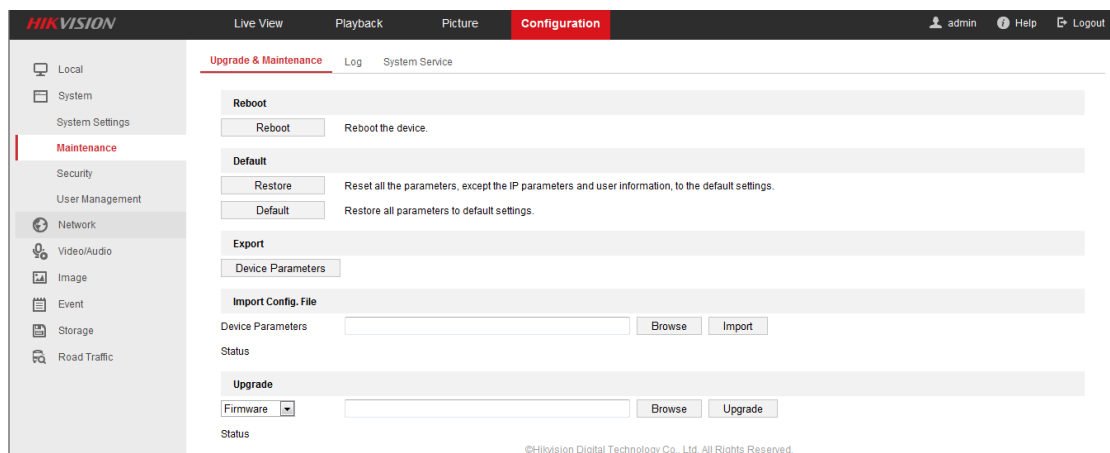
The firmware version can be viewed through system=>system settings=>basic information. It is necessary to check the firmware version to ensure the software is the latest.



Picture 9: Firmware version

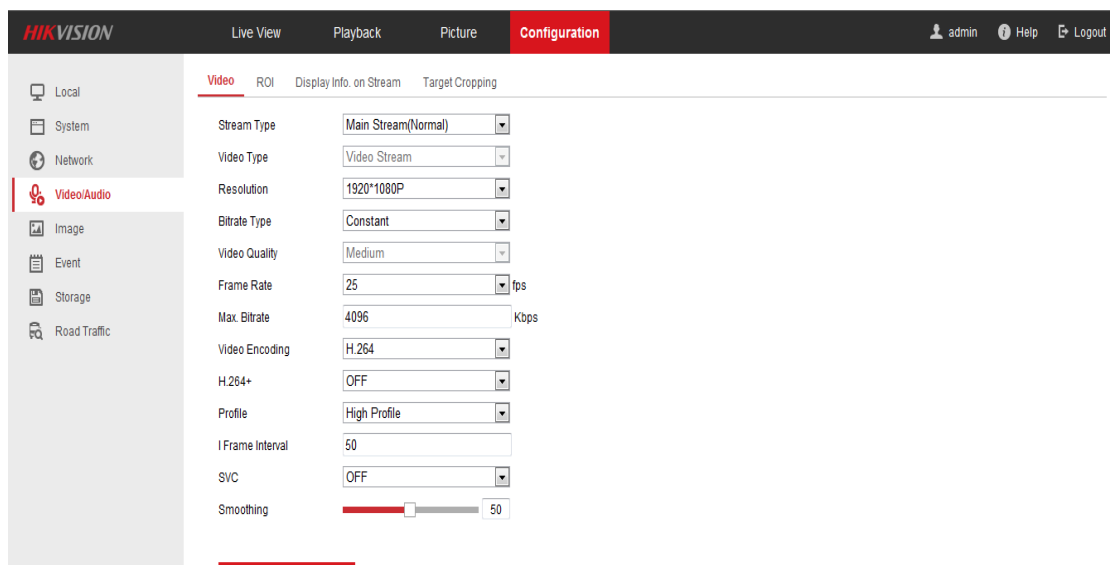
2.3 Software upgrade

The software upgrade can be achieved through system=>maintenance=>upgrade&maintenance and press the second browse button to import the updated file and following press upgrade button, the system will be upgraded automatically. Additionally, the camera will reboot after finishing the upgrade.



Picture 10: Upgrade

2.4 Video configuration



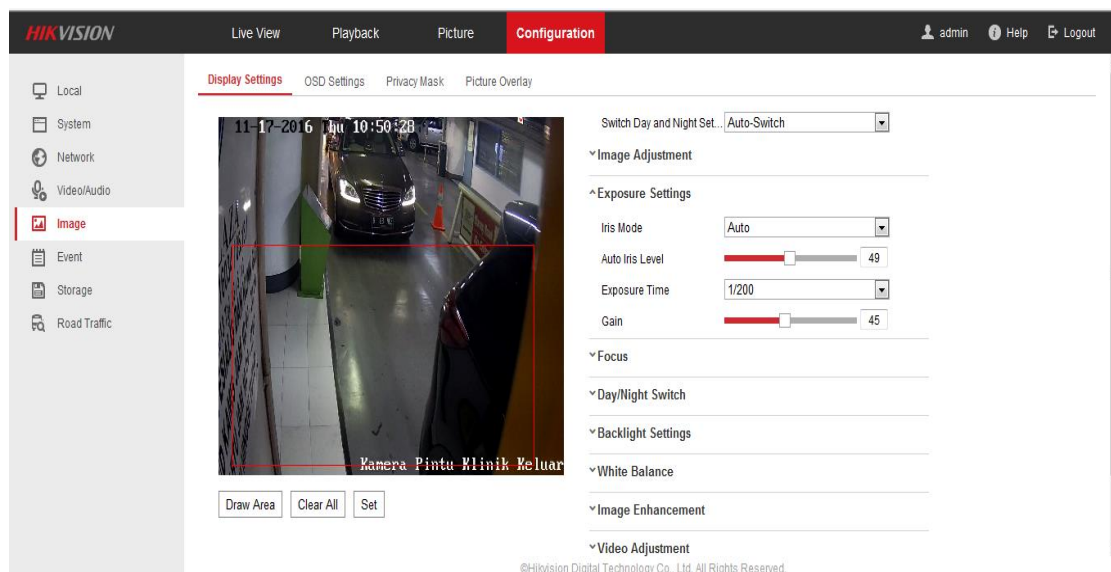
Picture 11: Video

There are two types of bitrate types in total, and they are constant and variable respectively:

- Constant: the video will be taken with the same bitrate to ensure the video quality
- Variable: the video bitrate varies with the change of different internet conditions to ensure the video fluency

In addition, the max bitrate should be the maximum value, or the video will be indistinct.

2.5 Exposure settings



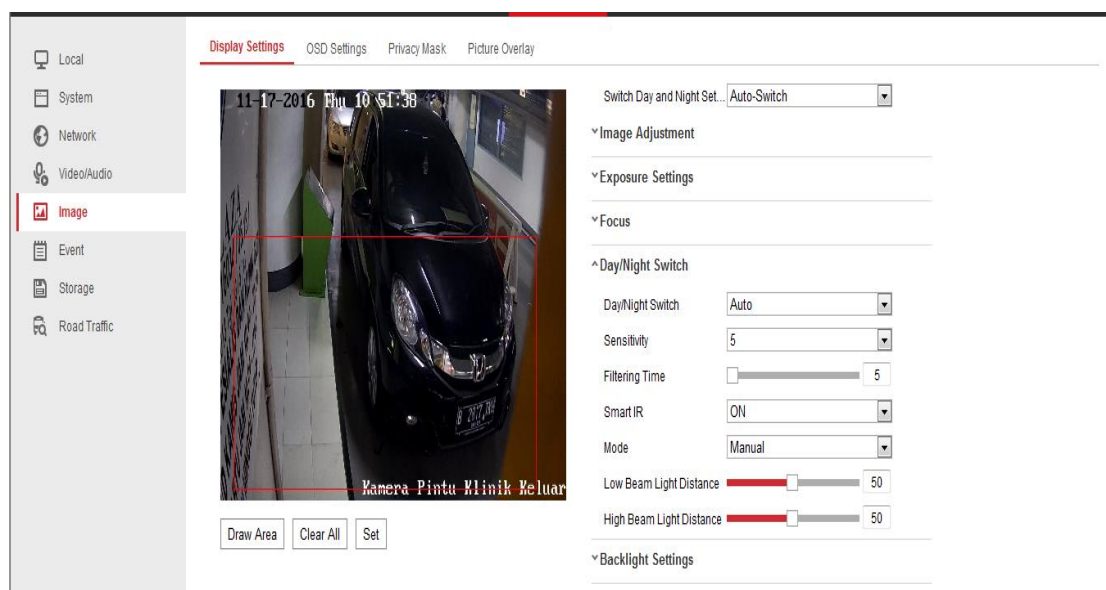
Picture 12: Exposure settings

In general, the exposure time varies from 1/175 to 1/250 according to the environmental brightness and the vehicle speed. The short of exposure time will cause the captured picture dark, on the other side, the long exposure time leading to the indistinct captured picture.

Except for the exposure time, the gain also has effect on the brightness and clarity of the picture. The bigger the gain value is, the brighter the picture is. However, the rise of the gain value will increase the noise in the picture at the same time which is the main factor resulting in the picture unclear.

Therefore, it is important to choose appropriate value of exposure time and gain value.

2.6 Day/Night Switch



Picture 13: Day/Night switch

There are five types of Day/Night switch in this function module:

- Day: the camera will always using the day model
- Night: the camera will always using the night model
- Auto: the camera will change the model automatically according to the changes of the light

- Scheduled-switch: the camera changes the model only according to the customized schedule
- Triggered by alarm input: the model only changed when a triggered signal input

Generally, we will choose the auto model in the universal conditions. Nonetheless, it is essential to change it to night model if the environmental condition is too complex and the light is insufficient as indicated in picture 14.

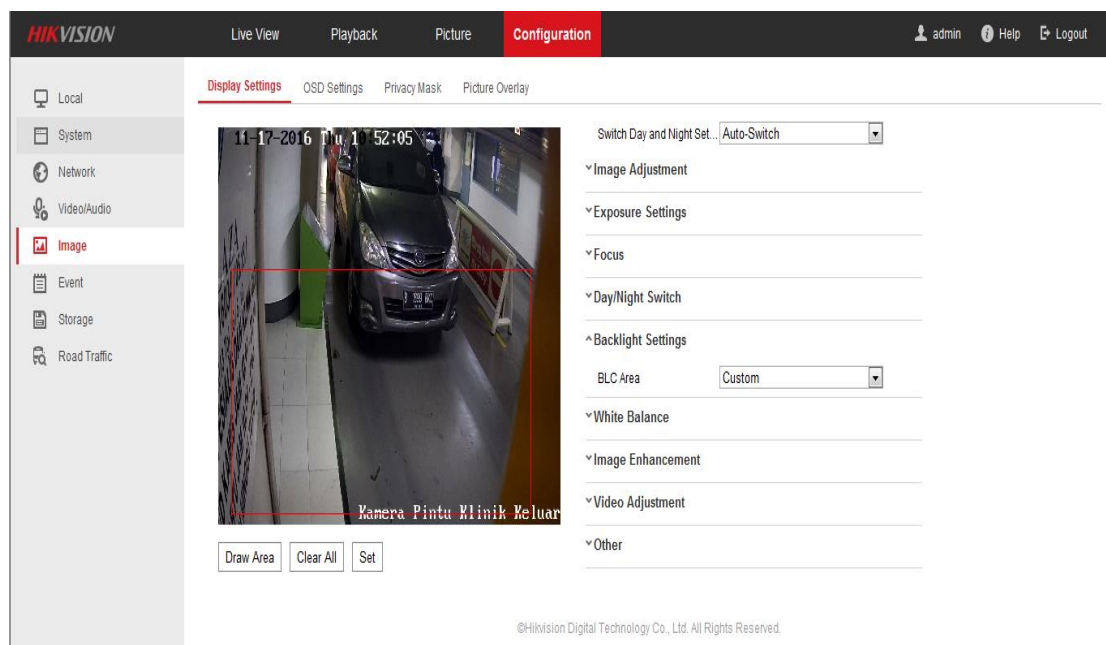


Picture 14: Captured picture

Aiming to obtain a better picture, you can switch on the IR light and you can adjust the model and brightness.

2.7 Backlight settings

To set the backlight: image=> backlight settings=>custom. This function is applied under the condition like that the brightness is inhomogeneous in the camera view and the license plate recognition region is darker than other region. In this condition, the picture captured is dark and increasing the difficulty for the camera to recognize the license plate number.

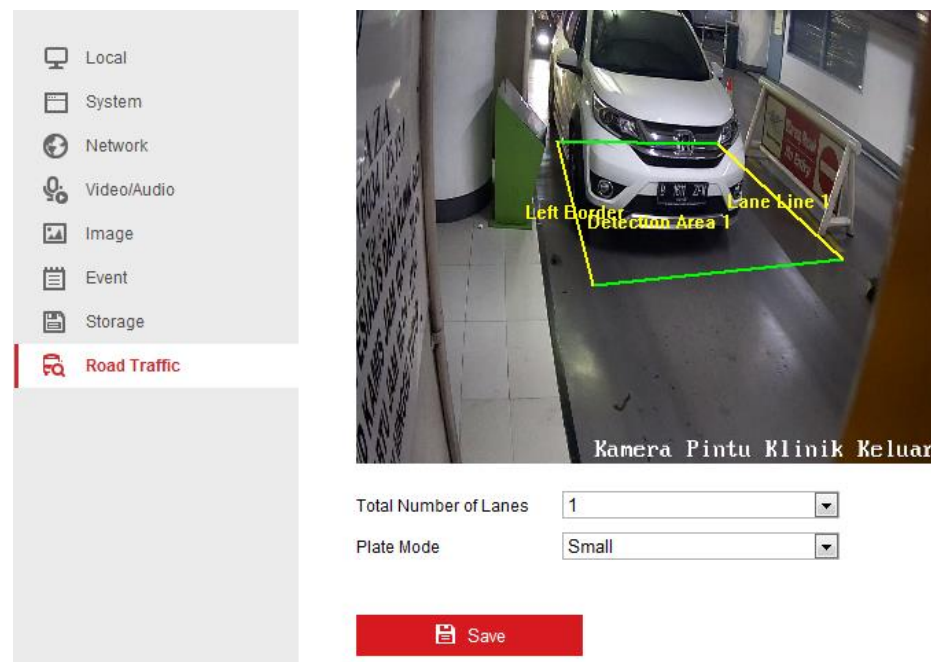


Picture 15: Backlight settings

You can draw the backlight compensation region manually as shown in picture 15. In theory, the backlight compensation region should include the license plate recognition region. After you finished the backlight settings, the picture quality in the compensation region can be guaranteed and the disturbances from outside of the region avoided.

2.8 License plate recognition area setting

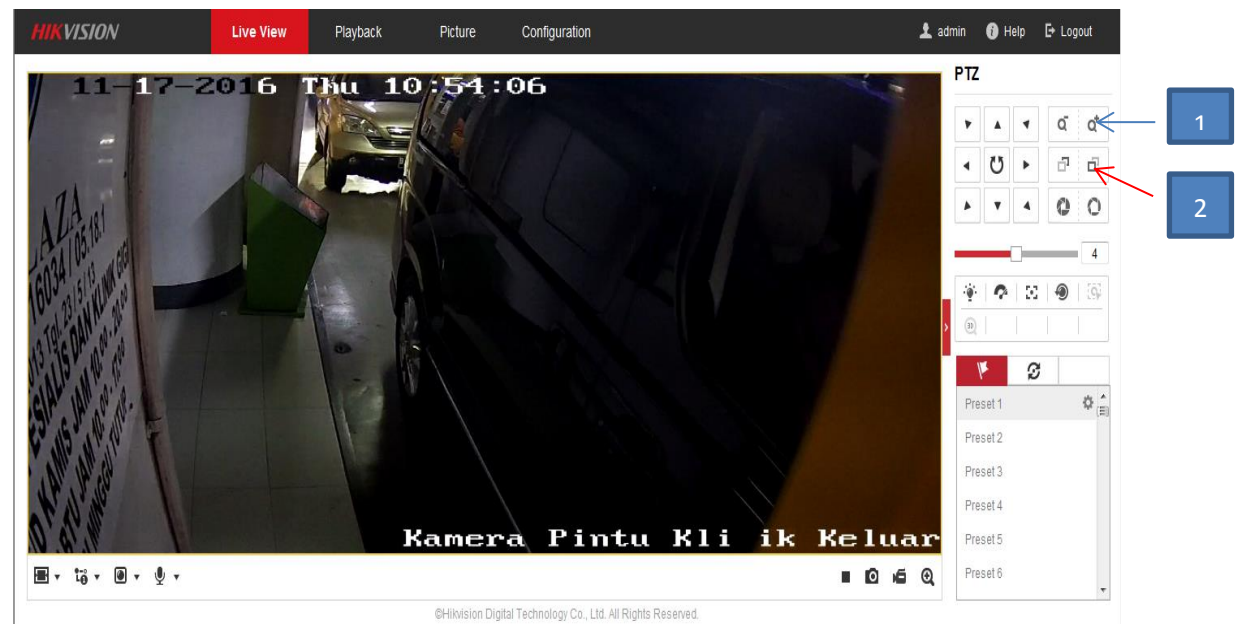
It is available to draw the license plate recognition area in the road traffic module directly. The region width should cover the entire lane and the region length should guarantee the camera can obtain sufficient pictures when the vehicle drives through. In theory, the best length of the region is 2 meters.



Picture 16: LPR region

In overseas, we can choose small plate model if the height of the license plate is smaller than 30 pixel. And large plate mode will be used if the pixel height is over 30. In small plate mode, we should try our best to ensure the pixel height ranges from 25 to 30 in the LPR region.

2.9 Lens settings



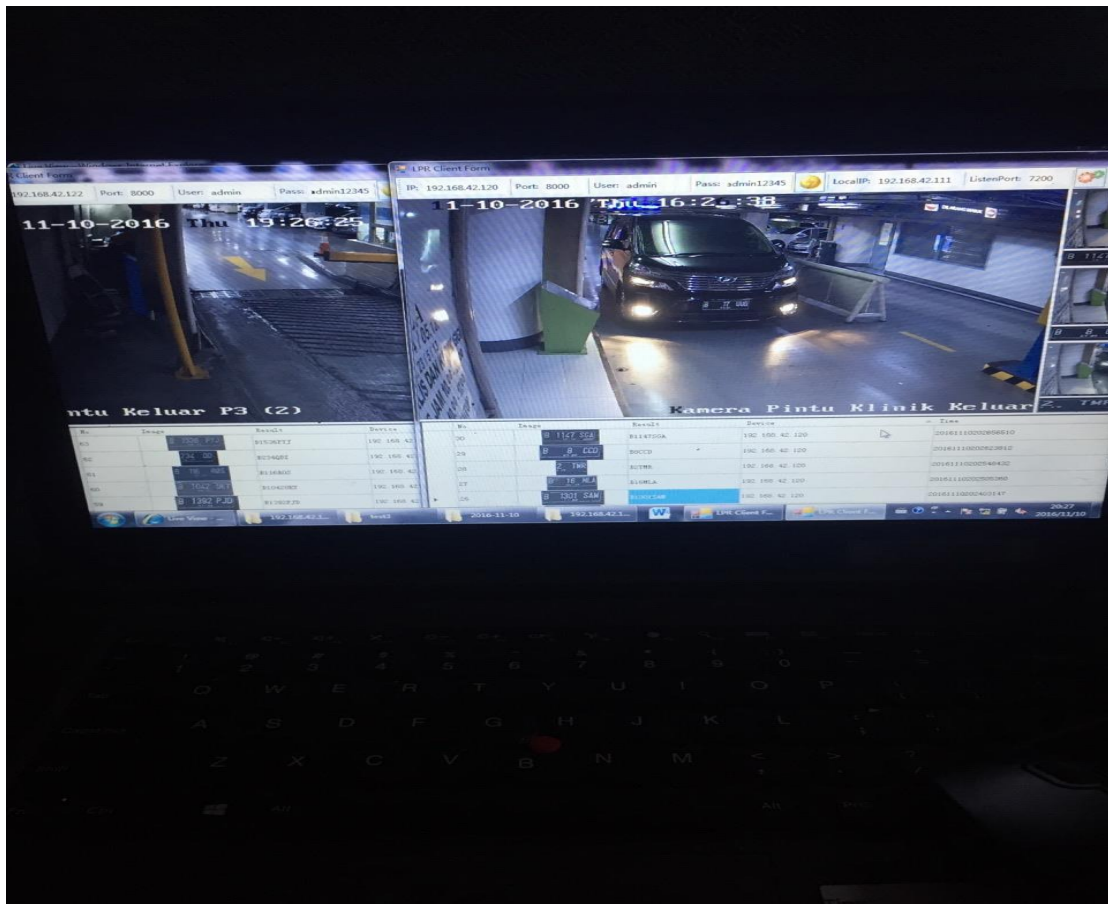
Picture 17: Lens settings

We are able to configure the lens settings through: Live view =>PTZ=> Zoom & Focus as shown in picture 17.

- Zoom function: using to zoom in and zoom out the lens to adjust the image size as indicated the NO.1 in picture 17.
- Focus function: using to adjust the clarity as illustrated the NO.2 in picture 17.

3. The application of the demo software

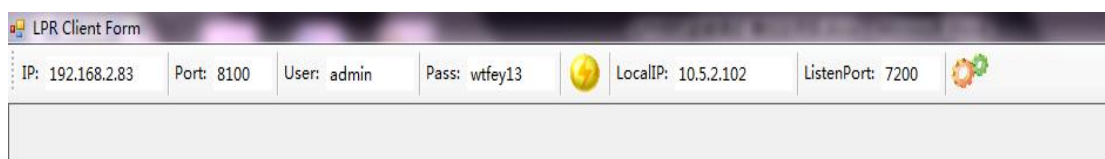
This kind of demo is applied to capture the vehicle and obtain the license plate number, and the results will be shown directly which provides convenience for the operator to check as shown in picture 18. In addition, the results will be saved to local file automatically.



Picture 18: Application of the demon software

It is very easy to use the LPR Client and the processes can be divided into four steps:

- Printing the IP address related the to the camera you want to test
- Changing the port to 8000
- Printing the camera password
- Clicking the connection button



Picture 19: Demo software settings

After accomplishing above steps, the demo software starts to work.

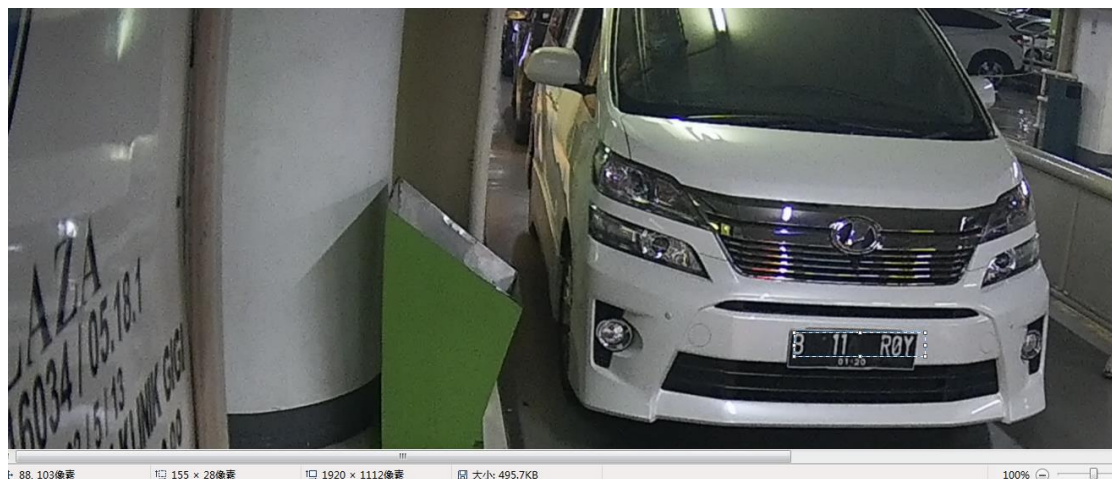
4. The Test Methods

4.1 Test preparation

- Adjust the camera angles
- Adjust the zoom and focus functions
- Set the parameters configurations of the camera, like the exposure time, backlight compensation and so on.
- Draw the LPR region
- Open the demo software (LPR Client)
- Above processes are the preliminary preparation for the test, afterwards, you can start to test the camera.

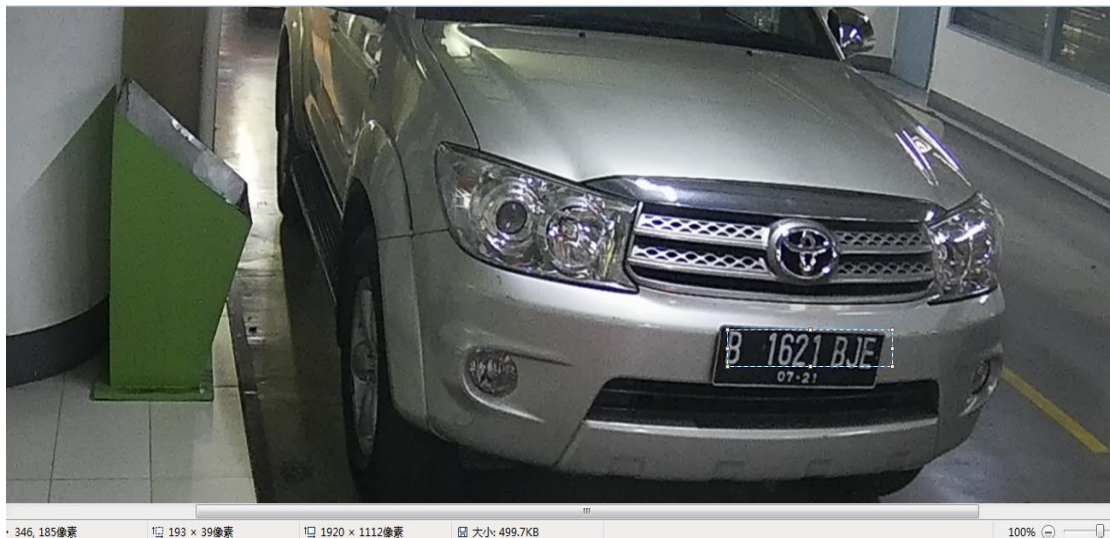
4.2 Test processes

1. Open the captured picture with paint to measure the height of license plate number. And the pixel should ranges from 25 to 30.



Picture 20: Measure the pixel height

If you found the pixel height is far beyond 30 or below 20 which are easy to result in mistaken identification or vehicle missed happening, it is essential to do some adjustments to solve this problem.



Picture 21: Example

As indicated in picture 21, the pixel height is up to 39. To deal with this phenomenon, you can use following two methods:

- Click the zoom out button in PTZ control
- Remove the LPR region to further place

On the contrary, if the pixel height is below 20, you can apply the following two techniques:

- Click the zoom in button in PTZ control
- Remove the LPR region to closer place

In the case of that the two methods introduced above do not work, you can consider to change the camera installation position.

The pixel heights we referred above belong to the captured images. However, we also should ensure the pixel height ranges from 25 to 30 for the moments when the vehicle enters the LPR region and leaves the LPR region, aiming to obtain a better effect. Consequently, it asks for a high requirement to the length of the LPR region.

However, the license plate number still can be captured and correctly recognized though the pixel height does not match with the theoretical value in the real examples.

Due to the restrictions of the local environment, sometimes, it is impossible to keep the pixel value at the desired one. At this moment, you should adjust the camera according to the real conditions to achieve the best result. In general, we prefer to big pixel height rather than small pixel height if we could not guarantee the theoretical value.

2. Check whether the LPR is correct



Picture 22: Example

It is available to check the license plate number from the LPR client directly, or you can open the picture and find the number recognized at the lower right corner of the picture as shown in picture 22.

There are several reasons will cause mistaken identification:

- The license plate is broken or unclear



Picture 23: Example

As shown in picture 23, there is damage on the license plate and it is difficult for the camera to identify the correct number. And this problem is nearly impossible for us to solve for the moment.

- The license plate is dark without sufficient light

Under the dark surrounding, there is no sufficient light shine on the license plate, hence, the LP number is always recognized wrong as illustrated in picture 24.



Picture 24: Example

The picture lightness can be raised by increasing the gain value, but noise also rises with the gain increase. And the picture becomes indistinct with the noise rises, which also bring the difficulty for the camera to recognize LP number. Therefore, it is very important to choose an appropriate gain value under the circumstance without enough light.

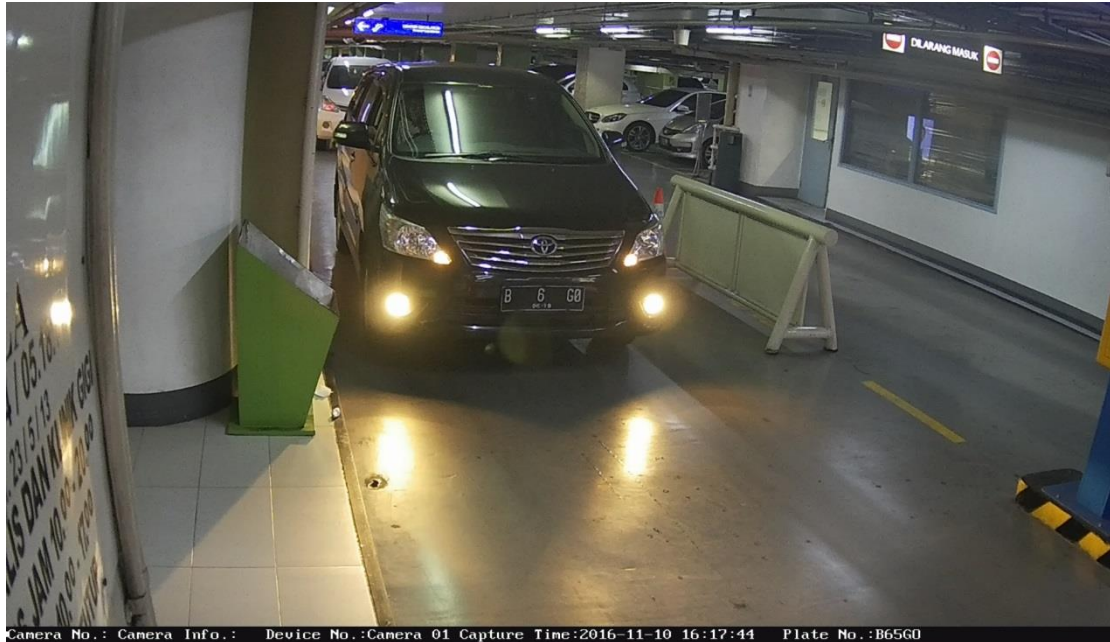
There is no doubt that the best method is to add a supplement light.

As a conclusion, there are three methods to solve or release this problem:

- Add a supplement light
- Choose an appropriate gain value
- Choose the night model
- Switch on the light itself

- The license plate pixel is too big or too small

Both of big pixel and small pixel have the possibility to lead to identification error. And the solutions have mentioned in chapter 4.2.



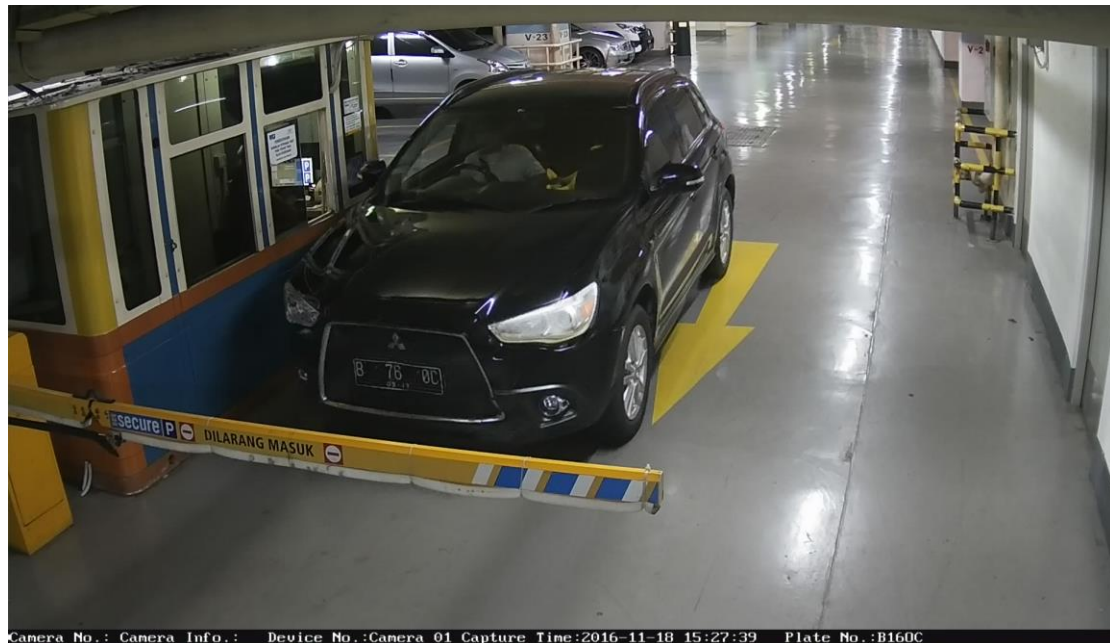
Picture 25: Example

Not only the LP pixel, but also the long distance between two words of LP may result in the recognition error. In picture 25, the distance between B and 6 is up to 50 pixels. However, it is very difficult for us to solve as all of the LP in Indonesia are customized and without standard management.

- The license plate is not horizontal

If the license plate is not horizontal, increasing the difficulty for the program to recognize the LP number. Hence, identification error may happen sometimes like picture 26. We can solve it by changing the

camera angle.



Picture 26: Example

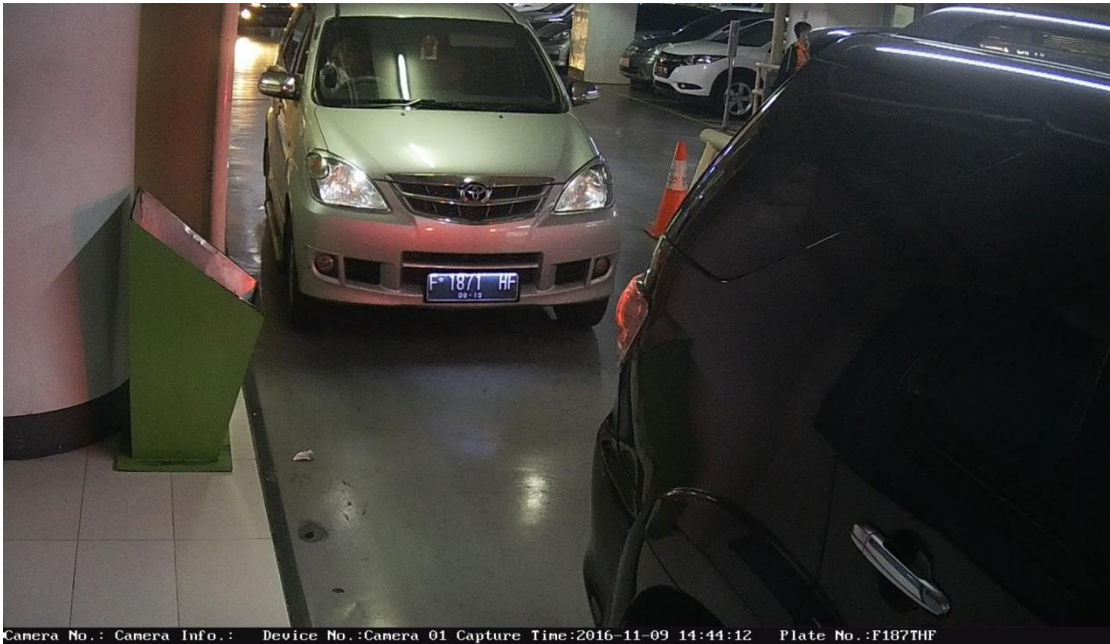
- The LPR program is not effective

If identification error happens frequently under normal conditions, perhaps you need to ask for the improvement of the program. Afterwards, you can send the identification error images back to the research department and wait for the response.

- There are too many disturbances on the license plate

Because the license plate is customized in Indonesia, they can design it according to their own preference and it brings troubles to the LPR camera to recognize the LP number. As indicated in picture 27, the driver installed a row of lights above the license plate which will generate a

layer of light curtain.



Picture 27: Example

And some license plates are made of plastic, and the reflection will be generated when there is light shine on it.



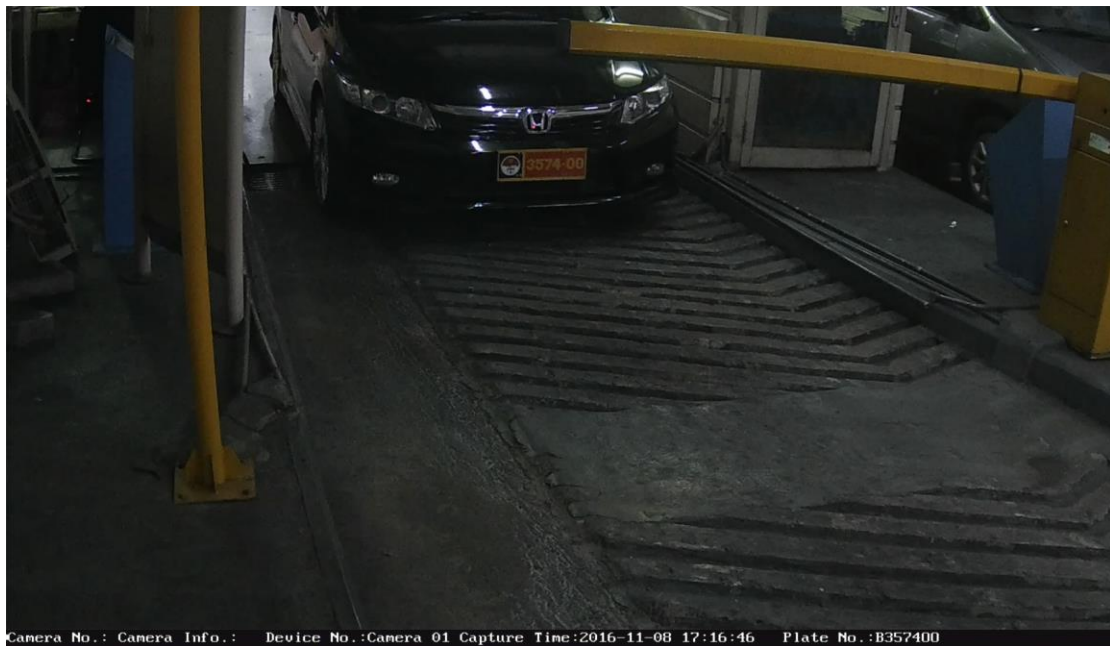
Picture 28: Example

Using strobe light can eliminate these negative effects, yet this application is not allowed.

As a consequence, the only thing you can do is to adjust other parameters to the best values to decrease the event occurrence.

- Special license plate which is differ from the regular one

The military vehicle license plate is very paritcular as it consist of two parts, and they are pattern and number respectively as shown in picture 29.



Picture 29: Example

Fortunately, the LPR is correct at most of the time. If recognition error occurs you cannot do anything except for improve the image clarity.

- The vehicle is shaded by the front vehicle

In the picture 30, the LP is shaded by the front vehicle and the LPR is incorrect. This puzzle can be solved by adjusting the LPR region.



Picture 30: Example

3. Vehicle missed

The reasons causing vehicle missed are similar to the reasons of LP identification error and their solutions are same.

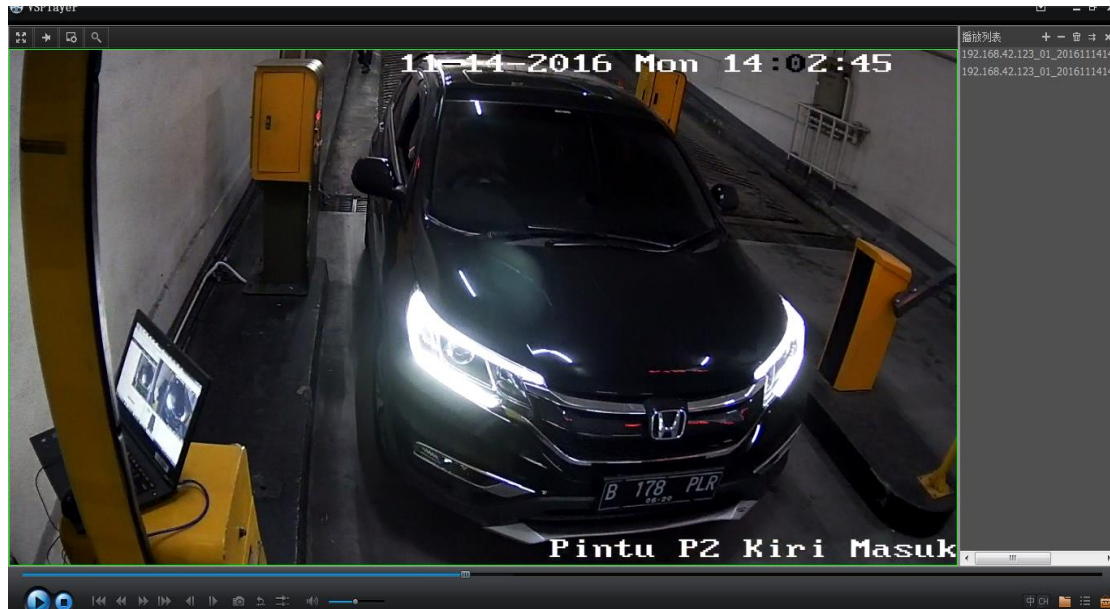
- The pixel is too big or too small
- The program is not effective
- The license plate is dark without sufficient light

Another reason is that:

- Two vehicles are too close

In the case of that two vehicles are too close, the front vehicle will cover

the following one and the camera is unable to capture the picture. And sometimes the vehicle stops before the barrier can we can see the license plate clearly, but it has rushed out the LPR region.



Picture 31: Example

There are two ways to solve it:

- Adjust the LPR region so that the vehicle is still in the region when it stops.
- Using the first method, the image pixel will be very large which may lead to identification error. At this moment, the camera location and angle should be considered.
 - Move the camera back
 - Increase the angle between camera and horizontal line

4.3 Statistics

After finishing the test, the following step is to do the statistics to calculate the accuracy.

In general, we select 130 vehicles as a sample at least. Because if the sample amount is too small, the accuracy we obtained is not reliable.

- Passed vehicle: the total vehicles passed during the certain period
- Captured vehicle: the vehicles captured during the certain period
- Missed vehicle: the vehicle does not captured during the certain period
- Capture rate: using the captured vehicle over passed vehicle and the result is the capture rate
- Incorrect LPR number: the amount of LP identification errors among the captured vehicles
- Correct recognition rate: using the correct LPR number to over the captured vehicle
- Accuracy: capture rate multiply correct recognition rate and the result is the accuracy

Take the form 1 as the example:

Capture rate= 129 (captured vehicle) / 130 (passed vehicle) = 99%

Correct recognition rate= (129-2) / 129 = 99%

Accuracy = 99% (capture rate) / 98% (correct recognition rate) = 97%

IP	Time	Passed vehicle	Captured vehicle	Missed vehicle	Capture rate	Incorrect LPR number	Correct recognition rate	Accuracy
		130	129	1	99%	2	98%	97%

Form 1: The method of accuracy calculation

PS: All of the data taken into calculation should exclude the vehicle which the license plate is damaged or unclear.