

**LIGHTS DEFECT DETECTION SYSTEM**

**User Manual**

**V1.0**

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# Video Capture Application

Video Capture application is used to record video using both front and rear camera. The application will be hosted in localhost on port 8501.

Graphical user interface, application, Teams

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Figure : Video Capture UI in browser

**VIDEO CAPTURE**

A picture containing text, electronics, camera, projector

Description automatically generated

Figure : Video Capture Icon

Video Capture application uses a batch (.bat) file to automatically host the application on localhost. The shortcut to the batch file can be found in Desktop.

**SAVED VIDEOS FOLDER**

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Figure : Saved Folder Icon

Contains the recorded videos and its metadata.

**VIDEO CAPTURE – SRC FOLDER**

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Figure : VideoCapture-src Icon

Video Capture – Src folder contains the source code for Video Capture applications

## Starting and Stopping the Application

Starting Video Capture

1. Double click on the Video Capture Icon (Figure 2).
2. A terminal window (Figure 5) will pop up.
3. After the application is up and running, a browser window will be opened automatically. ***Note:*** *If the browser did not start automatically, open a browser and enter the following URL: http://localhost:8501*

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Figure : Video Capture's Terminal Window

Stopping Video Capture

1. Close the browser window (Figure 1).
2. Close the terminal window (Figure 5).

## UI Components

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d.

c.

b.

a.

Figure : Video Capture UI components

1. **Car Models**

Displays a checklist of existing car models. Tick the car models that are expected to be present in the recording.

1. **Descriptions**

Describe the condition of cars in the video. For example, “MYVI has faulty signal lights”.

1. **Video Length**

Insert the duration of the recorded video in minutes and seconds. For example, set minutes to 60 and seconds to 0 to record for 1 hour. Set minutes to 0 and seconds to 30 to record for 30 seconds.

1. **Begin Recording**

The button to start recording.

## Configurations

Graphical user interface, application, Teams

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Figure : Configurations in Video Capture

1. **Add New Car Model**

To add a new car model to car model list. Enter the name of the new car model and click “Add” button.

Graphical user interface, text, application

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Figure : Add New Car Model configuration

1. **Delete Car Model**

To delete a car model, tick on the car models checkbox. A “Delete Selected Car” button will appear. Click on the button to delete the car model.

Graphical user interface, application

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Figure : Delete Selected Car Model configuration

1. **Video Save Folder**

Path to the folder to save the recorded videos. If the path does not exist, the application will create a folder automatically.

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Figure : Video Save Folder configuration

1. **Front Camera RTSP**

RTSP URL for front camera.

Graphical user interface, application

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Figure : Front Camera RTSP configuration

1. **Front Camera Width**

Video’s width.

Graphical user interface, application, Teams

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Figure : Front Camera Width configuration

1. **Front Camera Height**

Video’s height.

Graphical user interface, application, Word

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Figure : Front Camera Height configuration

1. **Rear Camera RTSP**

RTSP URL for rear camera.

Graphical user interface, application

Description automatically generated

Figure : Rear Camera RTSP configuration

1. **Rear Camera Width**

Video’s width.

Graphical user interface, application

Description automatically generated

Figure : Rear Camera Width configuration

1. **Rear Camera Height**

Video’s height.

Graphical user interface, application, Teams

Description automatically generated

Figure : Rear Camera Height configuration

1. **Frame Rate (FPS)**

Video’s frame rate.

Graphical user interface, application

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Figure : Frame Rate configuration

1. **Video Codec**

Video’s codec. Available codecs for Video Capture application are mp4v, h264, and h265.

Graphical user interface, application

Description automatically generated

Figure : Video Codec configuration

## Configurations Default Value

Table : Video Capture Configurations Default Value

|  |  |
| --- | --- |
| **Configurations** | **Default Value** |
| Video Save Folder |  |
| Front Camera RTSP |  |
| Front Camera Width | 1920 |
| Front Camera Height | 1080 |
| Rear Camera RTSP |  |
| Rear Camera Width | 1920 |
| Rear Camera Height | 1080 |
| Frame Rate (FPS) | 30 |
| Video Codec | mp4v |

# Lights Detector Application

**APPLICATION (.EXE) FILES**

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Figure : Front Lights Detector Icon

Figure : Rear Lights Detector Icon

Lights Detection Application is divided into two applications, “Front Lights Detector” and “Rear Lights Detector”. As the name suggested, “Front Lights Detector” will be using the front camera to detect front lights of the cars while “Rear Lights Detector” will be used for rear lights.

**PERODUA\_CONFIGURATIONS FOLDER**

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Figure : Perodua Configurations folder

All configurations for Light Detection Application are stored in this folder. There are two types of configurations, application configurations and car models configurations which are placed in app\_configs folder and car\_configs folder respectively.

**app\_configs folder**

The configurations file for the application is also separated for front and rear, which can be found in *perodua\_configurations/ipconfig’s* folder.

**car\_configs folder**

The configurations file for the application is also separated for front and rear, which can be found in *perodua\_configurations/app\_configs* folder.

**LOGS FOLDER**

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Figure : Logs folder

Contains log files for Light Detection application for front and rear.

## Starting and Stopping the Application

Starting Lights Detector

1. Double click on the Front Lights Detector Icon (Figure 19).
2. A terminal window (Figure 23) will pop up. ***Note:*** *Lights Detector takes around 30 seconds to load.*
3. A display window will open displaying the camera output. ***Note:*** *For front lights, the display window will appear at the left side. For rear lights, the display window will appear at the right side.*
4. Repeat all the steps for Rear Lights Detector.

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Figure : Lights Detector's terminal window

Stopping Lights Detector

1. Click on the “X” button on the display window or close the terminal window.

## UI Scenarios

A black car parked in a parking lot

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**Scenario 1**

**When no car is detected at the center of the screen:**

Displays the full size of frames captured by camera.

Figure : Lights Detector UI Scenario 1

Graphical user interface

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**Scenario 2**

**When a car is detected at the center of the screen but all lights are turned off:**

Displays zoomed in frames of the car.

The panels for lights detection will appear. The border of all panels is red.

Figure : Lights Detector UI Scenario 2

Graphical user interface, application

Description automatically generated

**Scenario 3**

**When a car is detected at the center of the screen and lights are turned on:**

Displays zoomed in frames of a car detected at the center of the screen.

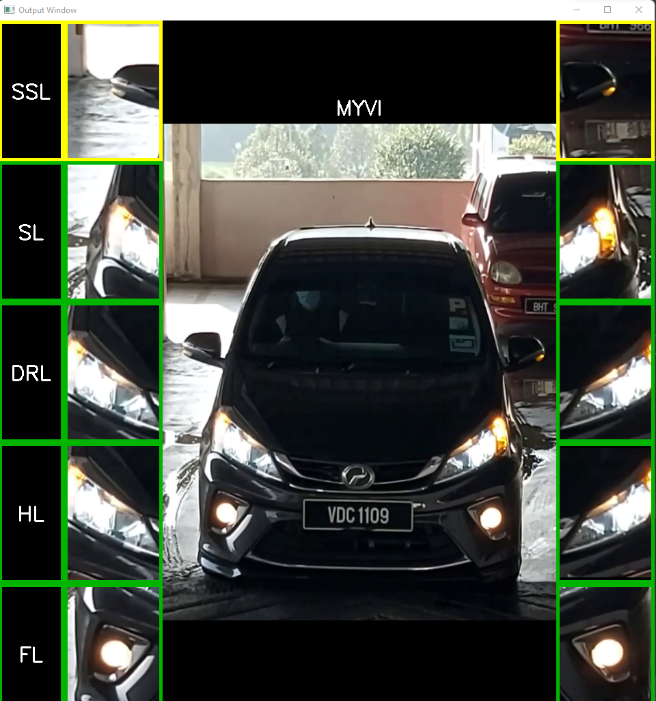
The panels for lights detection will appear. The border of the panels turned green or yellow.

Figure : Lights Detector UI Scenario 3

## UI Components

Figure : Lights Detector UI Components

**Checklist panels** shows the status of both right and left lights in the past 1 minute.



**Car panels** shows the live feed of the car in the center.

**Lights panels** shows live feed of the detected lights and its status.

## Lights Status

Lights status is indicated by the colour of borders in checklist panels and lights panels. The status can be classified into three, which are represented by the colour green, yellow, and red.

**Green**

Light is detected in the current frame.

**Yellow**

Light is not detected in the current frame, but it was detected a few seconds ago.

***Note****: The duration for yellow border to appear before turning red can be adjusted in the configurations file.*

**Red**

Light is not detected.

## Configurations

1. **source**

The RTSP URL of IP camera.

1. **debug**

Debug view. Set to ‘true’ to display debug view.

1. **frame\_duration**

The time interval for the application to start processing.

1. **car\_expired\_duration**

The duration (in seconds) for car detector to be expired. For example, if the current car model is not present at the center of the screen for 5 seconds, the UI will refresh.

1. **lamps\_expired\_duration**

The duration (in seconds) for light detector to be expired. For example, if a left headlight does not light up for 30 seconds, the left headlight box will become red.

1. **summary\_expired\_duration**

The duration (in seconds) for checklist view to be expired. For example, if **both** headlights do not light up for 1 minute, the checklist headlight box will become red.

1. **object\_tracking**

To enable object tracking.

1. **yolo\_weight**

The filename of general YOLO model to detect different car models.

1. **device**

CUDA device to run YOLO. For example, ‘0’ or ‘0, 1, 2, 3’ or ‘cpu’. Leave empty to use default.

1. **dnn**

To enable deep neural network.

Note: Deep neural network takes a lot of computing power. It is not recommended to use dnn for this use case.

1. **imgsz**

Image size to use when running YOLO. Should use the same size used during training, which is [1280, 720].

1. **half**

To enable half-precision inference to speed up computing process.

1. **general\_conf\_thres**

Confidence threshold for car models detection.

1. **specific\_conf\_thres**

Confidence threshold for lights detection

1. **iou\_thres**

Overlapping (Intersection Over Union) threshold.

## Configurations Default Value

Table : Lights Detector default configurations

|  |  |
| --- | --- |
| **Configurations** | **Default Value** |
| source |  |
| debug | false |
| frame\_duration | 1 |
| car\_expired\_duration | 10 |
| lamps\_expired\_duration | 30 |
| summary\_expired\_duration | 60 |
| object\_tracking | false |
| yolo\_weight | cars\_s6\_best\_2022-6-21.pt |
| device |  |
| dnn | false |
| imgsz | [1280, 720] |
| half | true |
| general\_conf\_thres | 0.45 |
| specific\_conf\_thres | 0.1 |
| iou\_thres | 0.15 |

# Updating the System

To update the system, simply replace the current files and folders with the new one. For Video Capture, only VideoCapture-src folder needs to be updated. For Lights Detector, user can choose whether to update only the applications file, only configurations folder, or both.

## Updating Video Capture

1. Get the latest version of VideoCapture-src.
2. Delete the current VideoCapture-src folder (Figure 4) in Desktop.
3. Copy and paste the new version of VideoCapture-src to the Desktop.

## Updating Lights Detector

Updating the Application Files

1. Get the latest version of Front Lights Detector.exe and Rear Lights Detector.exe files.
2. Delete the current Front Lights Detector.exe (Figure 19) and Rear Lights Detector.exe (Figure 20) files.
3. Copy and paste the new version of Front Lights Detector.exe and Rear Lights Detector.exe files.

Updating the Configuration Files

1. Get the latest version of perodua\_configurations folder.
2. Delete the current perodua\_configurations folder (Figure 21).
3. Copy and paste the new version of perodua\_configurations folder.

Updating both Application and Configuration Files

1. Do all the steps for Updating the Application Files and Updating the Configuration Files.

# Troubleshooting

## General Issues

General Issues describes the issues that might happen due to the PC’s settings or Windows system.

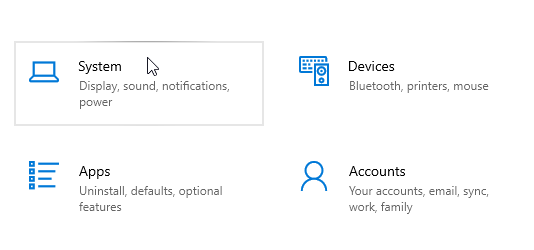
### DELL monitor screen is black / could not connect to the PC

1. Connect the TV via HDMI cable and turn on the TV.
2. Click on windows start button and go to settings.

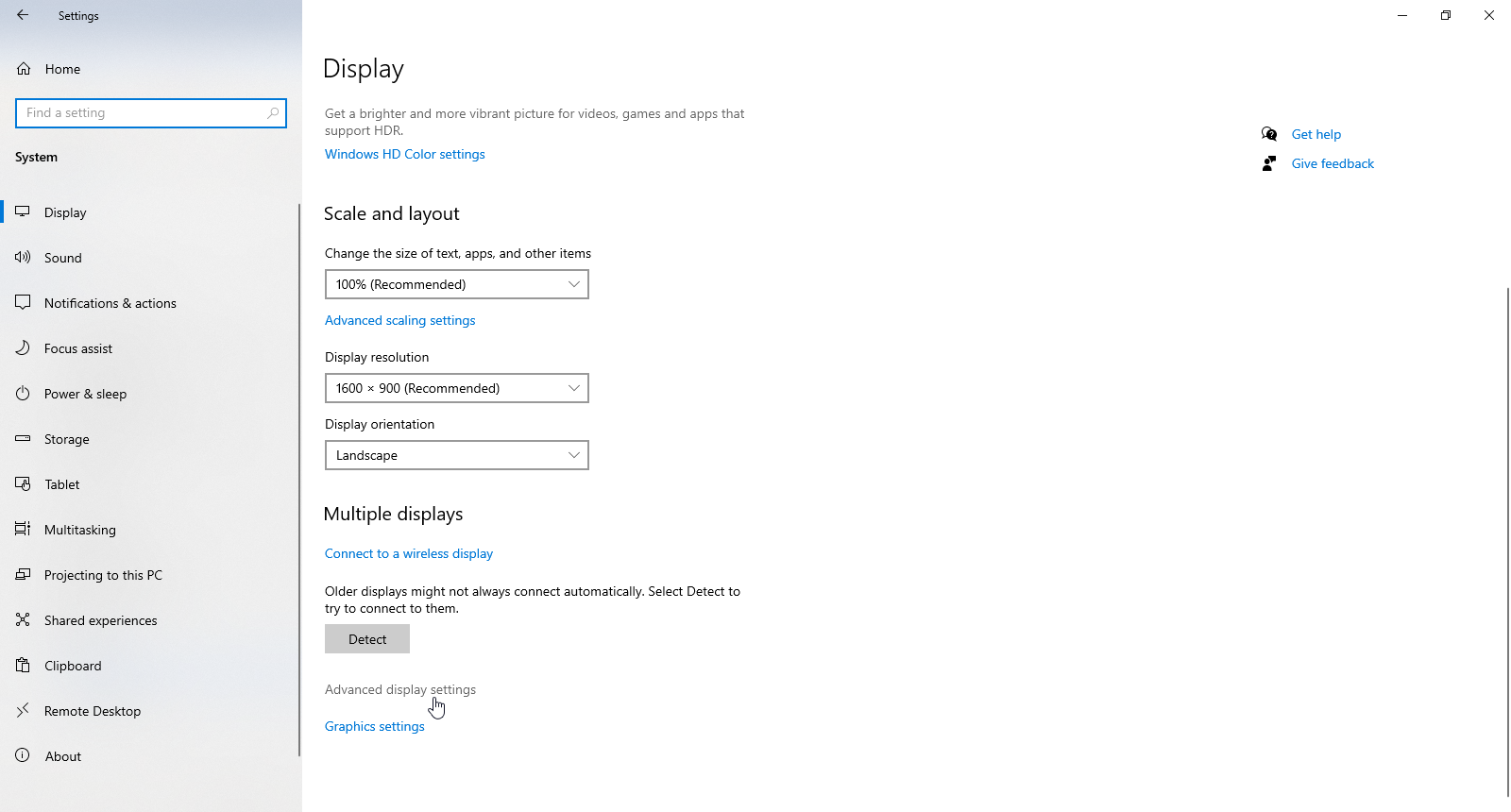
Graphical user interface, application

Description automatically generated

1. Click on “System”.



1. Go to “Display” tab and scroll to the bottom.
2. Click on “Advanced display settings”.



1. Make sure the display is DELL E2016HV.
2. Change the “Refresh rate” to 60Hz.

Graphical user interface, text, application

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### Microsoft Defender SmartScreen pop up

If Microsoft Defender SmartScreen pops up, click on “More Info” and click “Run anyway”

Graphical user interface, application

Description automatically generatedGraphical user interface, application

Description automatically generated

## Video Capture Issues

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Figure : Sample of error message in Video Capture

# Figure 28 shows a sample of error message in Video Capture. The error message will describe the possible cause that triggers the error. To get more details on the error, check the Video Capture terminal windows.

### Camera is not connected

1. Check whether all the camera cables are connected to the PC.
2. Check whether the camera is turned on.
3. Check whether the RTSP URL is correct.

## Lights Detector Issues

Graphical user interface, text, application, Word

Description automatically generated

Figure : Sample of error message in Lights Detector

Figure 29 shows a sample of error popup dialog. The popup dialog will show a general error message of the possible cause of the error. To get more details on the error, check the latest log file in logs folder.

### Camera is not connected

1. Check whether all the camera cables are connected to the PC.
2. Check whether the camera is turned on.
3. Check whether the RTSP URL is correct.

### Configurations file could not be found

1. Make sure the “perodua\_configurations” folder is in “Desktop”.
2. Go in the “perodua\_configurations” folder and make sure “app\_configs” and “car\_configs” folder exist.
3. Make sure “settings\_front.json” and “settings\_rear.json” exist. **Note:** If the settings file does not exist, create a .json file and copy the value in [Section 2.6 Configurations Default Value](#_Configurations_Default_Value).
4. If the above steps did not resolve the issue, check the latest log file in logs folder to get more details.