Eyedea Traffic Analyzer 3.2.1

User Guide

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1 Introduction

The software Eyedea Traffic Analyzer is a desktop application which is used to recognize license plates and vehicles from video or image files, web camera or IP camera stream.

This software enables you to play the source video from file or stream and analyze it frame-by-frame. For each frame, the license plates are automatically detected, their contents are read using optical character recognition (OCR) and the vehicle owning the license plate is analyzed in make and model recognition (MMR). The results in a text form are saved to a file.

The analytical core of the system is based on advanced recognition algorithms, which are created using the statistical methods of automatic learning on large training sets. It is necessary to assess the quality of the detection and recognition features based on the statistical evaluation of the larger number of samples.

This manual is written for the operating system Microsoft Windows 10, 64b, in English, in the default settings. Some of the described procedures and legends of the control elements of the operating system can differ for other operating systems.

2 Hardware requirements

2.1 Minimal requirements

- Processor: Intel® Core™ i5, 2 cores (4 logical processors)
- RAM: 4 GB
- Hard disk: 256 GB (optional SSD)
- Operating system: Microsoft Windows 10 or 11, 64b

2.2 Recommended requirements

- Processor: Intel® Core™ i7, 4 cores (8 logical processors)
- RAM: 16 GB
- Hard disk: 512 GB, SSD
- GPU (optional): NVIDIA® GeForce® GTX 1050 Ti, 4GB GDDR5
- Operating system: Microsoft Windows 10 or 11, 64b

3 Version history

Eyedea Traffic Analyzer 3.2.1

Released: 2025/02/27

List of major changes:

- Fixed video time calculation
- Updated LPM and MMR modules

Eyedea Traffic Analyzer 3.2.0

Released: 2024/10/18

List of major changes:

- Added American LPM module 553
- Simplified MMR settings
- Fixed saving results from IP camera stream

Eyedea Traffic Analyzer 3.1.3

Released: 2024/10/07

List of major changes:

- Updated LPM module
- Updated Sentinel license protection system

Eyedea Traffic Analyzer 3.1.2

Released: 2024/07/15

List of major changes:

- Updated LPM module

Eyedea Traffic Analyzer 3.1.1

Released: 2024/06/24

List of major changes:

- Added option to select saved image format
- Updated LPM and MMR modules

Eyedea Traffic Analyzer 3.1.0

Released: 2024/04/12

List of major changes:

- Allowed to save settings to a file
- Added option to write results to CSV file without recognized license plate text
- Updated LPM and MMR modules

Eyedea Traffic Analyzer 3.0.2

Released: 2023/07/04

List of major changes:

- Fixed results sorting under high load
- Updated LPM and MMR modules
- Updated Sentinel license protection system

Eyedea Traffic Analyzer 3.0.1

Released: 2023/05/26

List of major changes:

- Distinguished various MMR tags
- Enabled automatic reconnection to the IP camera stream

Eyedea Traffic Analyzer 3.0.0

Released: 2023/04/19

List of major changes:

- New product branding as "Eyedea Traffic Analyzer"
- New analytics core
- Added integrated Playlist with a list of errors
- Distinguished occluded license plates
- Czech localization

AnprGUI 2.3.2

Released: 2023/03/24

List of major changes:

- Prevented application from crashing on startup due to invalid settings
- Updated Sentinel license protection system

AnprGUI 2.3.1

Released: 2022/07/15

List of major changes:

- Updated LPM and MMR modules
- Extended Settings options

AnprGUI 2.3.0

Released: 2022/05/05

List of major changes:

- Updated LPM and MMR modules
- Extended list of supported video and image formats
- Reorganized and extended Settings
- Added option to customize output file columns
- Added lock for Region of interest
- Improved tracking management
- Improved error handling

AnprGUI 2.2.1

Released: 2021/07/12

List of major changes:

- Updated MMR module
- Updated Sentinel license protection system

AnprGUI 2.2.0

Released: 2020/09/11

List of major changes:

- Enabled image processing
- Improved video processing

AnprGUI 2.1.1

Released: 2020/03/06

List of major changes:

- Fixed checking the number of lines in the CSV output file
- Speeded-up video files preprocessing

AnprGUI 2.1.0

Released: 2020/02/25

List of major changes:

- Support for GPU computation
- Option to automatically save the frame with the highest OCR score per track

AnprGUI 2.0.0

Released: 2020/02/03

4 Installation and uninstallation

4.1 Installation of the application

Installation of the application starts using the file **EyedeaTrafficAnalyzerSetup64.exe** in the installation package. The following window is displayed after the start, it informs about initiation of an installation process.
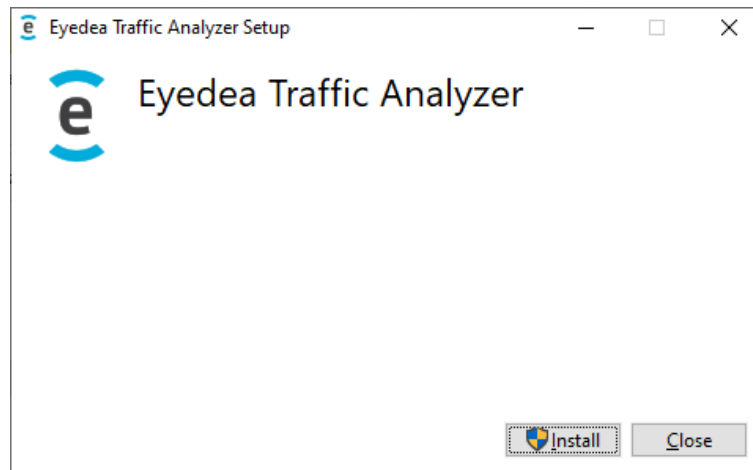
After pressing the **Install** button, the installation of important libraries for running Eyedea Traffic Analyzer takes place, then the following window appears.
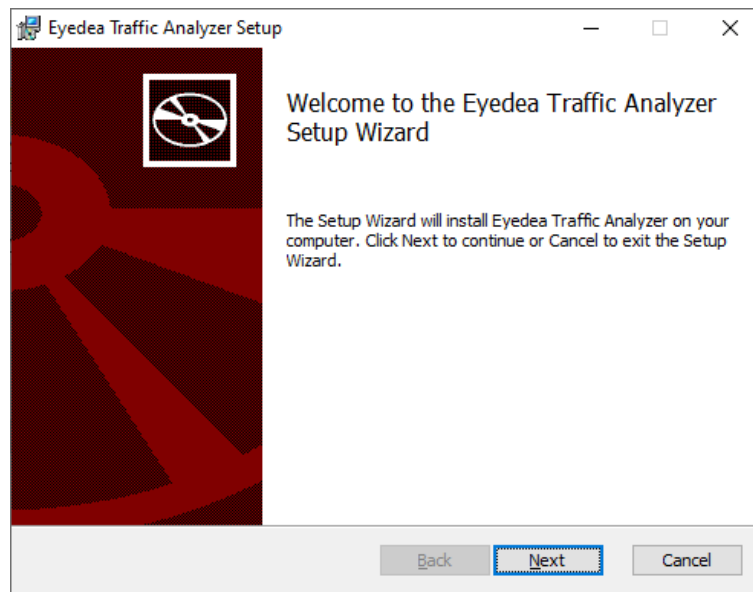
Clicking the Next button, the License Agreement is displayed.
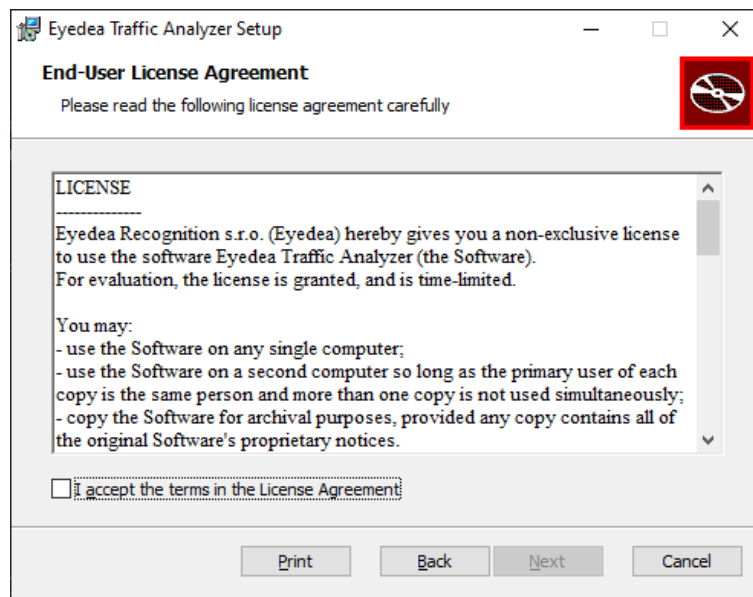
After reading of the License Agreement and confirmation using the choice I accept the terms in the license agreement it is possible to continue to the next step using the Next button.
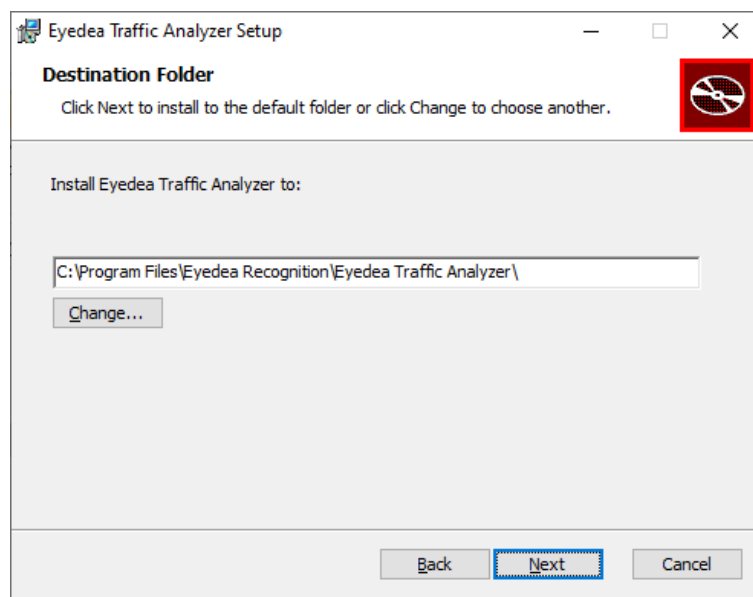
In this window, it is possible to change the folder alternatively, where the program is installed, and using the Next button to continue to the last page before the installation.
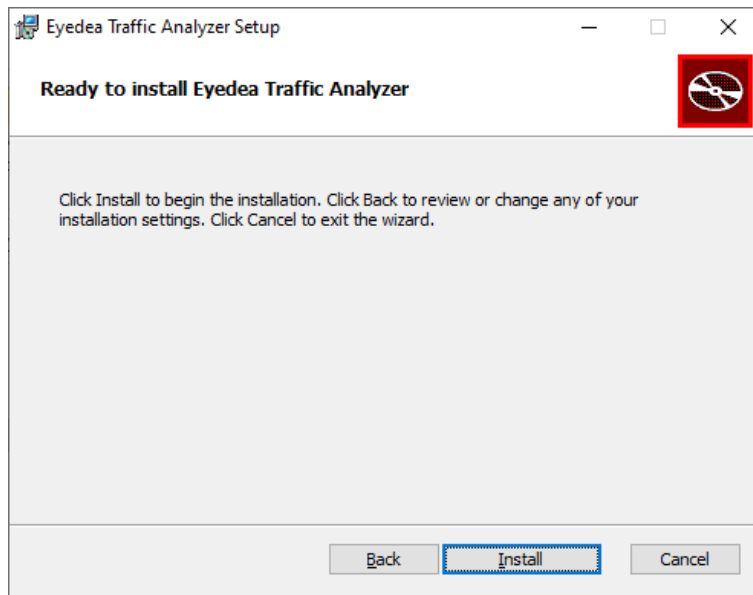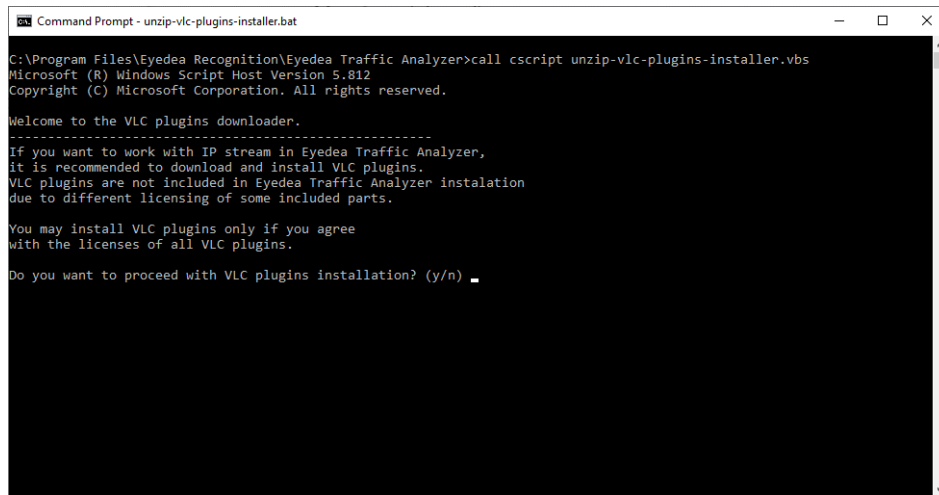
Now it is possible to start the installation itself using the **Install** button. This installation copies all necessary files and if needed, it also installs a driver of a Sentinel hardware key.
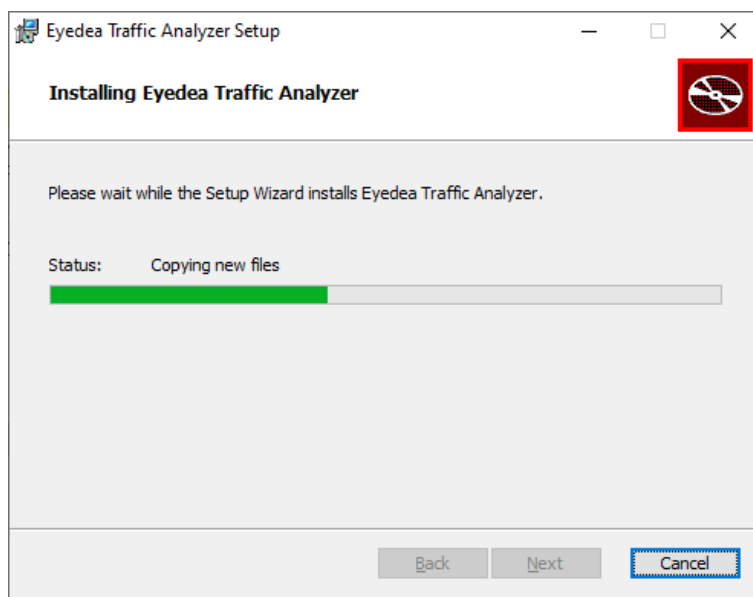
The installation of the hardware key driver takes place automatically, but it can require confirming a report on finishing the installation.
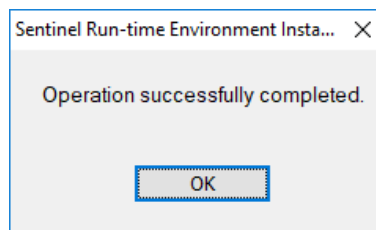
After installing the hardware key, you will be asked whether you want to install VLC plugins. For IP camera stream processing, it is recommended to install them by choosing "y" (yes). However, if you do not want to use the application for connecting to such sources, feel free to not install the plugins.

When the installation is complete, the following window appears. Press the **Finish** button to exit the installer.
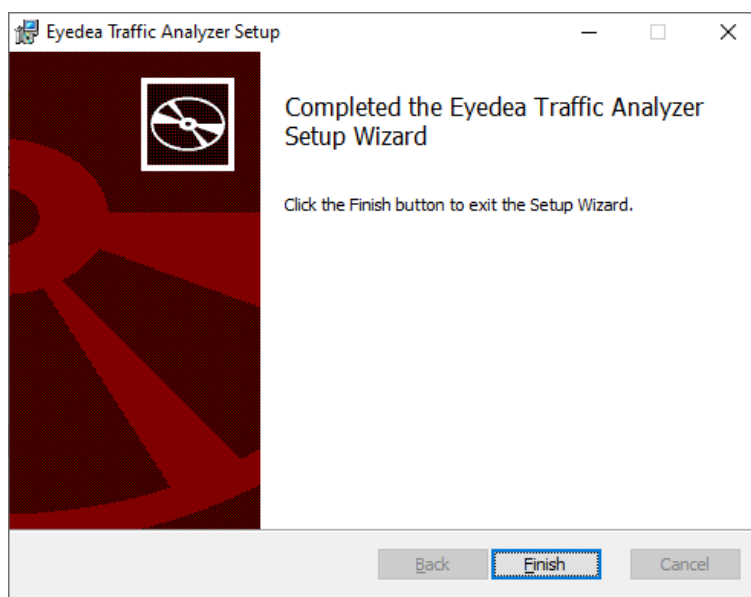
Now the application is installed and ready for use.

4.2 Network license setting

After the successful **Sentinel License Server** installation, open the address http://localhost:1947 in a web browser and check whether the license server is running. If the **Sentinel Admin Control Center** web application is displayed, the license server is running. License server can be configured to allow to connect clients to use available licenses (configured as a server) or it can connect to another license server (configured as a client).
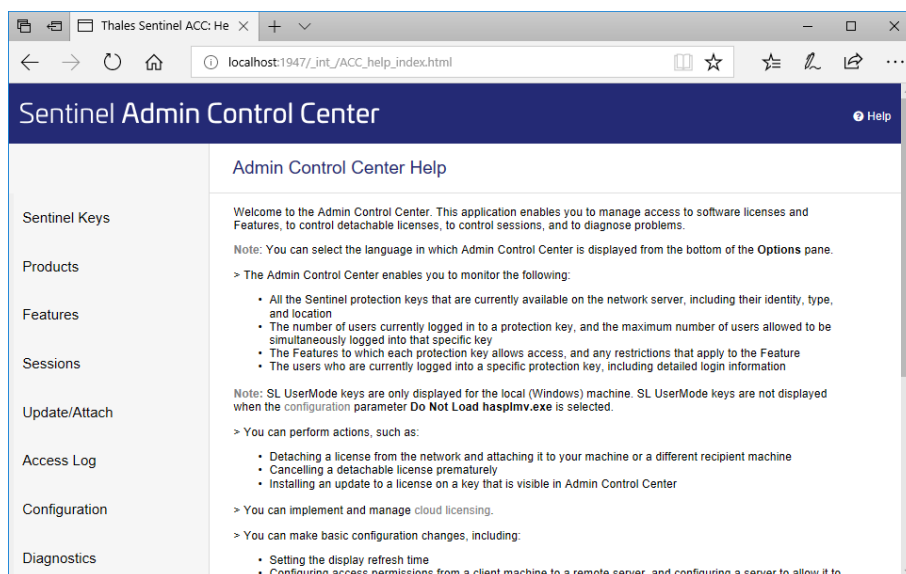
Server configuration

To set the license server as a license provider, please open the address in your web browser http://localhost:1947/_int_/config_from.html and choose the appropriate option from Allow Access from Remote Clients to allow other clients to connect to the network license key plugged in the server.

Client configuration

To set the license server as a client, open the address http://localhost:1947/_int_/config_to.html in a web browser and choose the Allow Access to Remote Licenses option. If the license provider is in another network than the computer, put the server's IP address into the field Remote License Search Parameters.

5 Program control

5.1 Starting the program

When you start the program, you see an empty player screen covering most of the application window with a collapsible Playlist on the right.

Below the player screen, there are playback controls on the left (they differ according to the source type) and ROI control buttons (see chapter 5.4 Region of interest) and the Settings button (see chapter 6 Settings) on the right.

If your operating system is in Czech, the application will be switched to Czech at its first run, otherwise it will be in English (you can switch between English and Czech using the Options → Language → English / Czech menu, or Možnosti → Jazyk → Angličtina / Čeština in Czech).

5.2 Source selection

The application currently operates with the following sources:

- Video files
- Image files (both individual images and image sequence)
- Web camera
- IP camera stream

Use the Open menu to show the requested tab of the Open Media dialog.

5.2.1 Video files selection

To analyze video files, use Open → Video Files to open a dialog for specifying which video files to analyze.
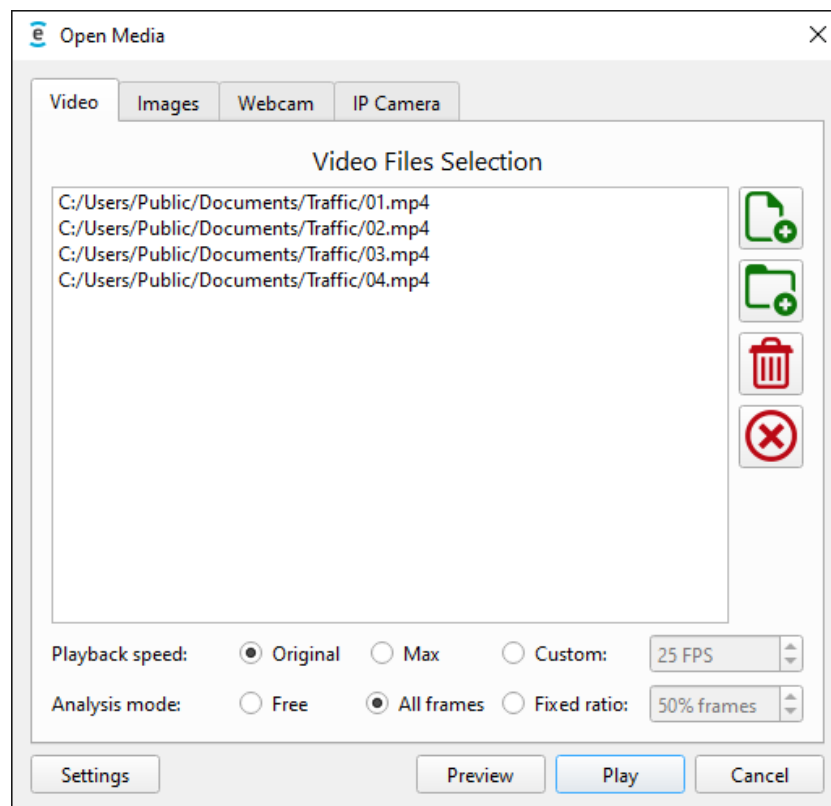
In the center of the dialog, there is a list of video files selected for processing with control buttons on the right. Use the first green button to add video files to the list (multiple file selection is allowed), the second green button adds all video files from the selected folder (and its subfolders). Using the first red button you can remove the selected files from the list and using the second button you can clear the entire list.

Supported are most of the common video formats with codecs of the ffmpeg standard (which is most of the known codecs[1]), including AVI, MPG, MP4 and MOV.

There are several modes of video playback and its analysis.

Playback speed:

- *Original* – The playback speed is limited by its original speed. (If checked, video playback will not be faster than the original video. However, it but may be slower.)
- *Max* – The playback speed is not limited, the video will play as fast as possible.
- *Custom* – The playback speed is limited by the speed specified by the user in frames per second. (If checked, video playback will not be faster than the given speed. However, it but may be slower.)

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[1] In the case that it is necessary to process the video, which codec the program does not support, it is necessary to re-encode the video before processing.

Analysis mode:

- *Free* – Video playback does not wait for analysis, there is no guarantee which frames will be analyzed. It is recommended NOT to use this option in combination with a high playback speed if the computation resources are not sufficient.
- *All frames* – All video frames must be analyzed (which may cause video playback to be slowed down).
- *Fixed ratio* – Ratio of frames specified by the user is analyzed. (If selected 50% frames, the odd frames will be analyzed, the even ones will not. If selected 75% frames, every fourth frame will not be analyzed.)

The Settings button opens the Settings dialog (see chapter 6 Settings).

Press the Play button to start playing the video in the player. Press the Preview button to show the preview of the first frame of the paused first video – you may find this option useful when setting the Region of interest (see chapter 5.4 Region of interest); to start playback, there is the Play button in the player.

5.2.2 Image files selection

To analyze image files, use Open → Image Files to open a dialog for specifying which image files to analyze. Most of the common image formats are supported, including JPG, JPEG, PNG and BMP.
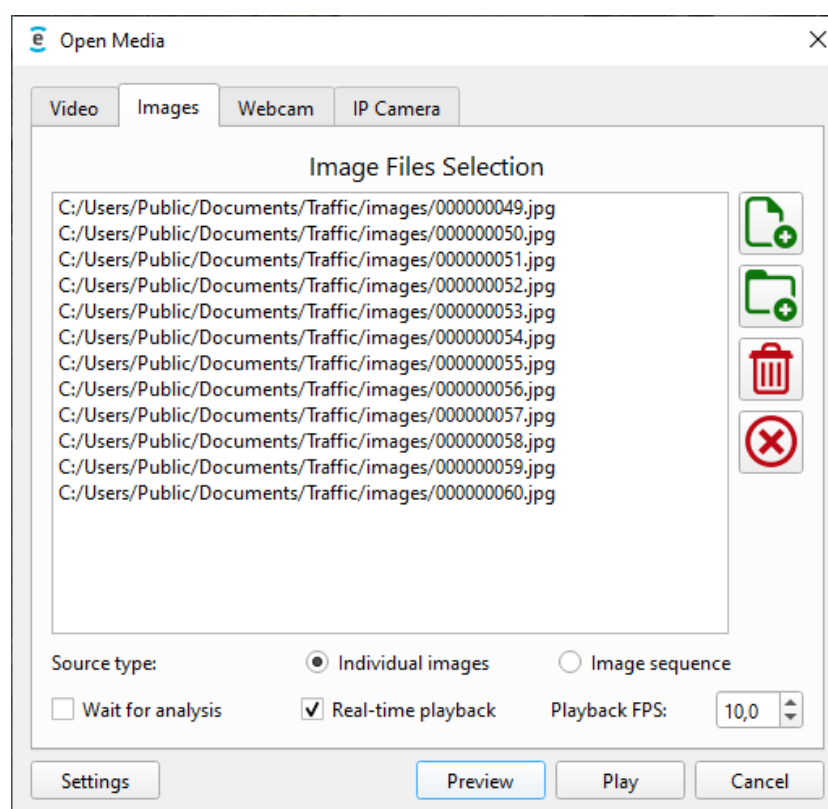
The function of the control buttons on the right for adding and removing files is the same as for videos.

The processing of image files differs depending on the *Source type* – they can be processed as *Individual images*, or as an *Image sequence*.

Individual images:

As the name suggests, *Individual images* are treated independently without usage of tracking management.

For performance reasons, the application performs the OCR and MMR analyses asynchronously which means that their results may not be known at the time when the player paints the scene. This is perfectly fine for any kind of video (with sufficient frame rate) because the partial results should be consistent for the whole track. However, this is not applicable for individual images, as there is no tracking management. This is the reason for the *Wait for analysis* option. If this option is checked, the playback will be slowed down to wait until all requested analyses are complete. If there is no need for the visual control of the player, you can uncheck this option; only detections will be displayed, and processing will be faster.

The *Real-time playback* option works the same as for videos. If it is checked, the playback frame rate will not exceed *Playback FPS* (frames per second). Otherwise, the *Playback FPS* option is irrelevant, and the images will be processed as fast as possible.

Image sequence:

On the other hand, *Image sequence* resembles a video divided into frames, and it is also processed in this way. The main differences are that every image of the image sequence is always analyzed (in case of video, you have also other options than *All frames*), and you have to specify the source camera frame rate in the *Source FPS* field for proper tracking and logging even if the *Real-time playback* option is not checked (which has the same meaning as for individual images and videos).
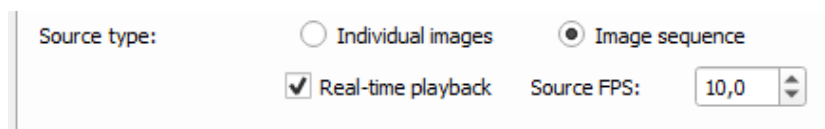
If the tracking management settings collide with *Source FPS*, a warning appears so you can adjust either of these values (to change the tracking management settings, press the Settings button in the Open Media dialog; for more information see the *Tracking management* section of the chapter 6.2 Recognition tab).

5.2.3 Web camera selection

To analyze the webcam video, use Open → Web Camera. In the dialog you can select from a list of connected web cameras and choose the desired combination of resolution (in pixels), frame rate (in frames per second) and pixel format supported by the camera.

Press the Refresh button to update the list of available web cameras.
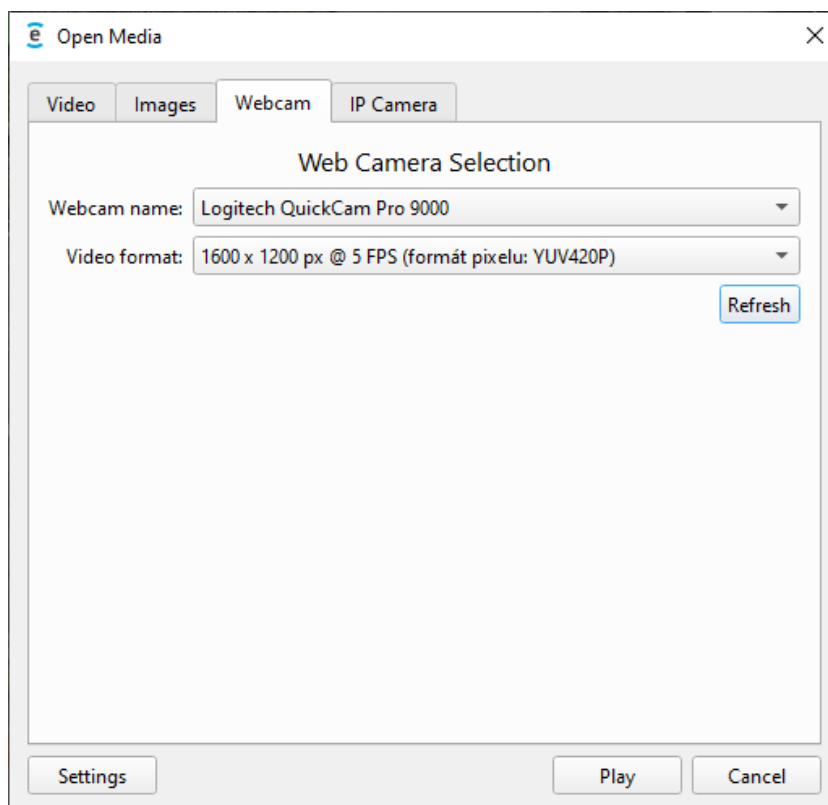
5.2.4 IP camera stream selection

Use Open → IP Camera Stream to open a dialog for specifying the stream parameters. Either fill in the *Network URL* field, or let the application construct it from the fields below.
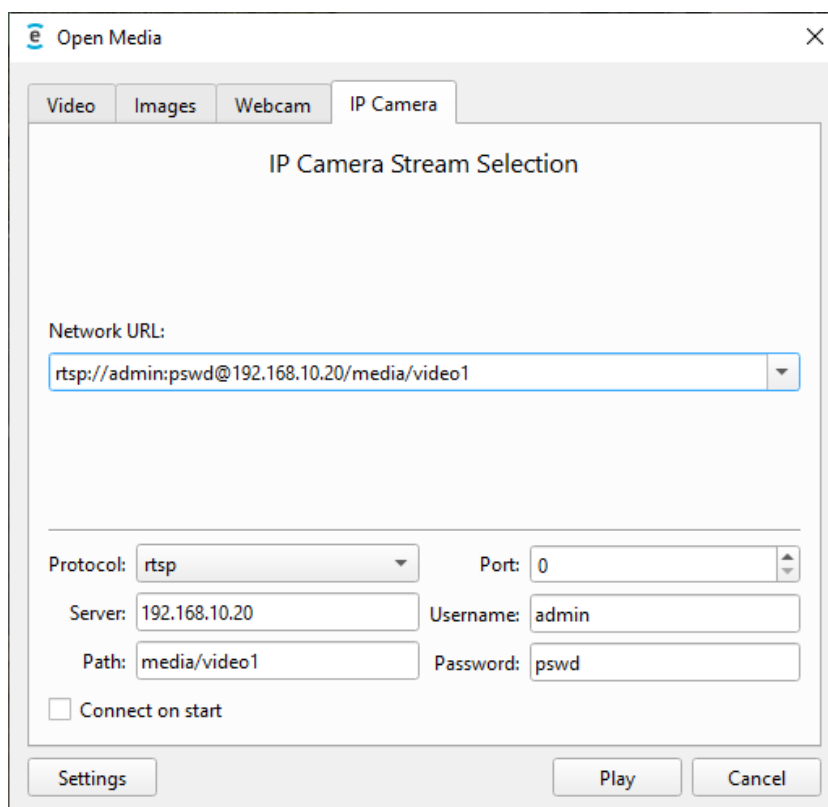
5.3 Playback

The analysis will start with the playback. Detections with confidence above the defined threshold (*Detection min confidence* field in Settings) are displayed as a red rectangle around the vehicle license plate. Underneath the license plate there is a semitransparent dark rectangle with the OCR and eventually MMR analysis results: the license plate text and its country, and make, model and category of the vehicle. The text color of uncertain values (with confidence below the *OCR min confidence* / *MMR min confidence* threshold) is gray, values that are considered sufficiently certain are green. Values that are not analyzed further are marked in yellow (*Stop OCR processing* field on the Recognition tab in Settings).

The displayed OCR and MMR results are the most confident results of the track; see chapter 5.5 Tracking for details. If the license plate is partially occluded (so the text is probably not all there), an asterisk is displayed after the license plate text.
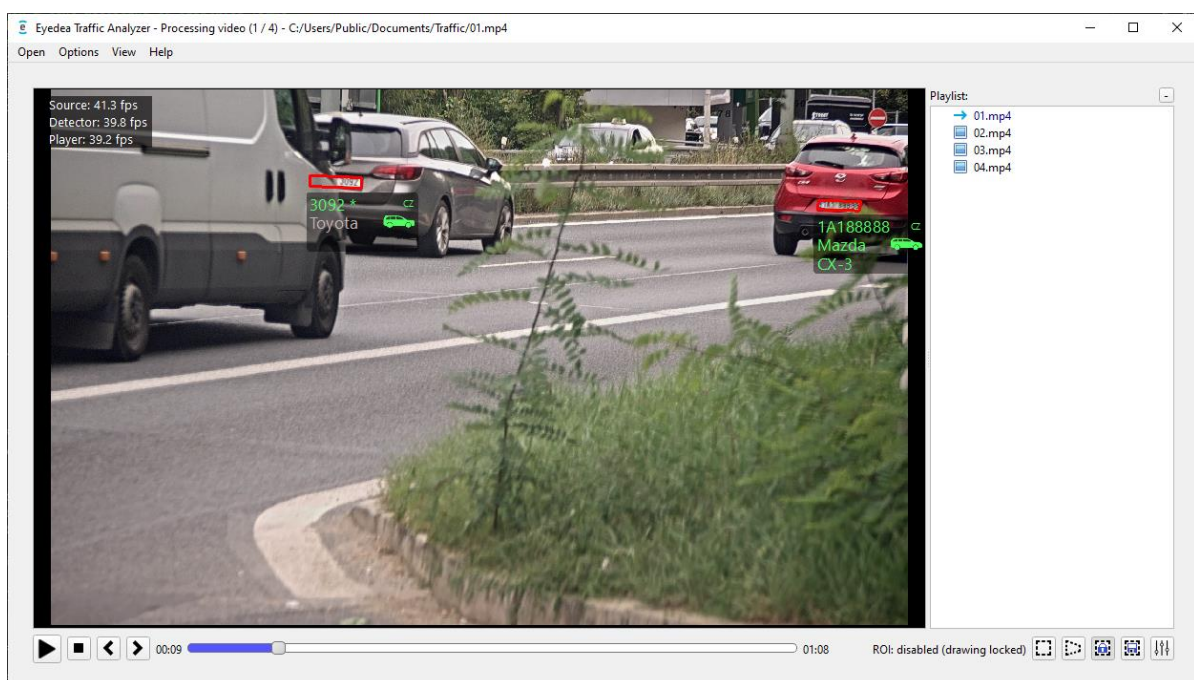
In the top-left corner you can see *Source*, *Detector* and *Player* labels signaling the current speed in frames per second (*Player* visualization may be slower than *Detector* analysis, which may be slower than *Source* input processing). You can change the visibility of this info using the option View → Statistics from the menu.

Below the player, there is a control panel with *Play / pause* and *Stop* buttons. For video and image files, there are also buttons for navigating to the *Previous* and *Next frame*, and a seek bar. When using these control elements to go backwards, or forwards for more than one frame, keep in mind that the program will **finish all current tracks** (and log them if confidence is high enough) and start tracking anew from the new position. Records that have been already saved in the output CSV file will not be deleted.

The playlist on the right side of the player lists the video files. Move the mouse pointer over the file name in the Playlist to show a tooltip with the file path. A small icon signals the status:

- Green checkmark – successfully processed without error.

- Red cross – finished with error.
- Blue arrow – currently being processed.
- Image icon – video to be processed.

If an error occurs during the playback, the error message is shown in the Playlist. The user is also informed about the first runtime malfunction of the key features (detection, OCR, MMR or logging) by a message box.

The playlist panel can be hidden by a small - button in the top-right corner. You can also hide/show this panel by clicking the menu option View → Statistics or drag the border between the player and the playlist with the mouse.
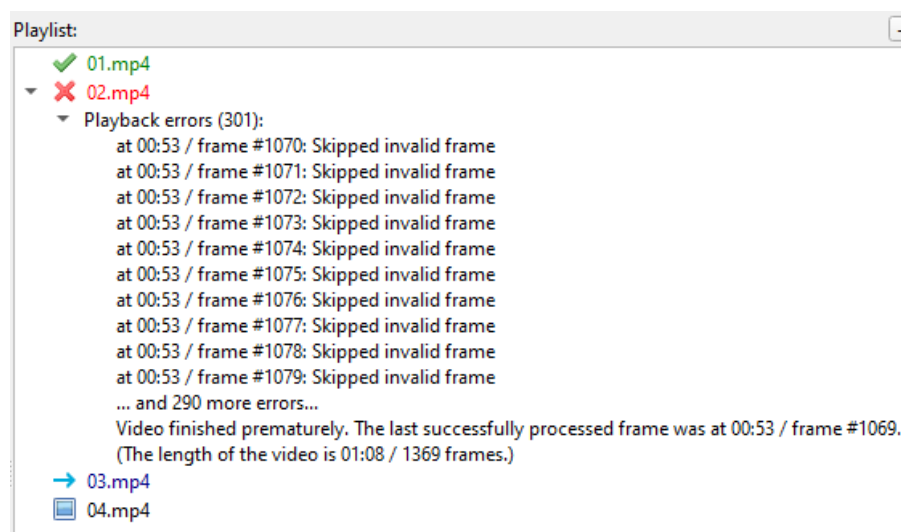
5.4 Region of interest

In the player, you can mark a region of interest (ROI). The program will ignore every part of the video except the area specified by ROI so unwanted detections can be filtered out.

The ROI control buttons are in the bottom right corner:
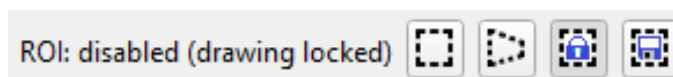
For rectangular shaped easy-to-use region of interest activate the left ROI control button (goes dark) and click and drag your cursor from the top left point of your specified area to the bottom right of the area.

If your region of interest is more complex, you can use the polygon shaped ROI feature by activating the middle ROI control button and clicking on the screen the points of your polygon. To close the polygon and activate the ROI you need to click the first point again signaling the application that this is the last point of ROI. You can remove the last point at any time by right-clicking on the screen.

To turn off the region of interest, deactivate the active ROI button.

Because any clicking on the player screen removes the active ROI, you can lock your region of interest by activating the right ROI control button; it is also locked when the application starts. Press this button again to unlock the ROI drawing.

For convenience, the current ROI status is displayed to the left of the ROI control buttons.

Use the ROI button with the floppy disk image to save the current region of interest so that you can use it for the same scene in the future (see chapter 6 Settings).

5.5 Tracking

Apart from individual images, all sources use tracking management: the application interprets the frames as a continuous sequence; the vehicles usually enter the scene on a certain frame, move (change their position) on the following frames and finally leave the scene.

In most cases, we are not interested in individual results on each frame; what matters is the overall classification of the vehicle over the entire time it was visible – and this is what *tracking* is about. The track of a vehicle is a series of detections of that vehicle which are classified into a single result.

5.6 Online logging

Every track is written to the log file after a specified period (*Remembering track for* field in Settings) for which there are no more detections corresponding to that track. This ensures that the track can continue when it is lost for a while. However, such a behavior might be problematic when a vehicle stays a long time in the scene – it would be logged too late (possibly when the video is stopped, or camera disconnected) and the OCR would be still analyzing its license plate even if it was read with a high confidence. For such cases there is a feature called **online logging**.

When online logging is enabled, Eyedea Traffic Analyzer calculates a dynamic OCR confidence for each track. If the score is high enough, the license plate will no longer be analyzed by OCR, the text will be printed in yellow on the screen, and potentially the current results for the unfinished track will be written to the log file (with empty *Last frame time* field, see chapter 5.7 Results). However, tracking and the MMR analysis will still go on (if enabled)

and after the track is finished, the actual results will be logged again (with *Last frame time* field filled).
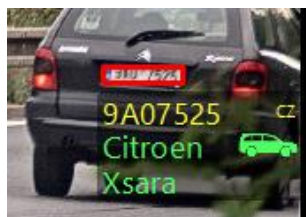
In Settings, you can set two parameters – whether and when to *Stop OCR processing* (*ANPR adjustment* on the Recognition tab), and whether to *Log unfinished confident tracks* (on the Output tab). If the first one is OFF, the second is irrelevant as there will be no track considered to be confident.

5.7 Results

The output of the program are CSV files where each row represents one track, and its fields are separated by a semicolon. On the Output tab in Settings, you can specify which fields will be included in the CSV file, as well as the folder where the CSV files will be saved; the default folder is your *Documents* folder.

The following table describes the fields that may appear in CSV files:

Field	Comment
ID	The internal identifier of the track.
Detection confidence	The license plate detection confidence factor. Range 0 – 1.
License plate	The license plate text recognized by the OCR.
License plate confidence	The confidence factor for the license plate text. Range 0 – 1.
Country	The international license plate country code.
Country confidence	The confidence factor for the country prediction. Range 0 – 1.
License plate occluded	1 for occluded license plate (probably incomplete text), 0 for fully visible.
License plate width (mm)	The width of the license plate in mm.
License plate height (mm)	The height of the license plate in mm.
License plate dimensions confidence	The confidence factor for the license plate width and height prediction. Range 0 – 1.
View	The recognized vehicle view, either "frontal", or "rear".
View confidence	The confidence factor for the view result. Range 0 – 1.
Category	The recognized vehicle category, e.g., "BUS", "CAR", "HVT", ... For the full list of possible categories and their definition, check the Eyedea MMR SDK documentation.
Category confidence	The confidence factor for the category result. Range 0 – 1.
Make	The recognized vehicle manufacturer, e.g., "VW", "Ford", "Fiat", ... For the full list of supported makes, check the Eyedea MMR SDK documentation.
Make confidence	The confidence factor for the make result. Range 0 – 1.
Model	The recognized vehicle model (vehicle instance defined by a bodywork), e.g., "Golf", "Mondeo", "500", ...
Model confidence	The confidence factor for the model result. Range 0 – 1.

Generation	The recognized vehicle generation (vehicle mark and first model year), e.g., "Mk VI (2019)", "Mk I (2020)", ...
Generation confidence	The confidence factor for the generation result. Range 0 – 1.
Variation	The recognized vehicle variation (vehicle trim level and/or body type), e.g. "AMG", "AMG-Line SUV", "Coupe", ...
Variation confidence	The confidence factor for the variation result. Range 0 – 1.
Color	The recognized vehicle color, e.g., "BLUE", "GRAY", "RED", ...
Color confidence	The confidence factor for the color result. Range 0 – 1.
Tags	The recognized tags (whether a vehicle belongs to certain group), e.g. "caravan", "ambulance", "pickup", … For the full list of supported tags, check the Eyedea MMR SDK documentation. The field may contain multiple comma-separated tags.
Number of detections	The number of frames with positive license plate detection.
Number of positive OCR results	The number of frames successfully analyzed by the OCR and conforming the "OCR min resolution" condition.
Number of ignored OCR results	The number of frames analyzed by the OCR, but results ignored due to the "*OCR min resolution*" condition.
Number of positive MMR results	The number of frames successfully analyzed by the MMR.
Number of ignored MMR results	The number of frames NOT analyzed by the MMR due to the "*MMR min resolution*" or "*MMR min offset from top*" condition.
First frame number	The frame number of the first detection of the track (starting with 1).
First frame time	The time of the first detection of the track. Empty for individual images.
First frame license plate X-coordinate	The horizontal coordinate of the license plate center within the first frame.
First frame license plate Y-coordinate	The vertical coordinate of the license plate center within the first frame.
First frame license plate center	The coordinates of the license plate center within the first frame.
First frame license plate corners	The coordinates of the top-left, top-right, bottom-right and bottom-left corners of the detected license plate within the first frame.
Last frame number	The frame number of the last detection of the track (starting with 1).
Last frame time	The time of the last detection of the track. Empty for individual images.
Last frame license plate X-coordinate	The horizontal coordinate of the license plate center within the last frame.
Last frame license plate Y-coordinate	The vertical coordinate of the license plate center within the last frame.
Last frame license plate center	The coordinates of the license plate center within the last frame.
Last frame license plate corners	The coordinates of the top-left, top-right, bottom-right and bottom-left corners of the detected license plate within the last frame.
Best frame number	The frame number of the detection with the highest OCR confidence (starting with 1).
Best frame time	The time of the detection with the highest OCR confidence. Empty for individual images.

Best frame license plate X-coordinate	The horizontal coordinate of the license plate center within the best frame.
Best frame license plate Y-coordinate	The vertical coordinate of the license plate center within the best frame.
Best frame license plate center	The coordinates of the license plate center within the best frame.
Best frame license plate corners	The coordinates of the top-left, top-right, bottom-right and bottom-left corners of the detected license plate within the best frame.
ROI coordinates	The coordinates of ROI if set (see chapter 6.2 ROI settings).
Source file name	The source video or image file name (empty for webcam or stream).
Source file link (EN)	Formula containing a clickable link to the source video or image file (empty for webcam or stream) when opened in English version of MS Excel.
Source file link (CS)	Formula containing a clickable link to the source video or image file (empty for webcam or stream) when opened in Czech version of MS Excel.
Saved image file name	The file name of the saved image (if saving enabled, see below).
Saved image file link (EN)	Formula containing a clickable link to the saved image (if saving enabled, see below) when opened in English version of MS Excel.
Saved image file link (CS)	Formula containing a clickable link to the saved image (if saving enabled, see below) when opened in Czech version of MS Excel.

If an unfinished track has been logged due to high OCR confidence (online logging), the track will finally appear twice in the results: first with empty *Last frame* fields, second with all fields filled (MMR results may vary, in which case the final entry is more trustworthy).

Likewise, if the *Log tracks without OCR* option is enabled, *Best frame* and *Saved image file* fields may be empty for certain result entries as they are related to the frame with the highest confidence of the license plate text recognized by the OCR.

The name of the CSV file is automatically generated and consists of date and time when the file is created (i.e., usually when the analysis started) and a part that depends on the source type:

- the analyzed file name for video file,
- "individual-images" or "image-sequence" for images,
- webcam name for web camera,
- network URL (with protocol and username & password omitted) for stream.

If *Save pictures of detections* is enabled in Settings, a picture containing the detection with the highest OCR confidence per track is saved into a folder with the same name as the CSV file without extension. The image file name consists of the frame number, internal track identifier, country and license plate text. The image file name may also be saved into the CSV file.

Example:

| Source video file	C:\Users\Public\Documents\video1.mp4
Output folder (in Settings)	C:\Data
CSV file	C:\Data\20200218_131517_video1.mp4.csv
Images	C:\Data\20200218_131517_video1.mp4\000000005_1_CZ_ABC1234.jpg
	C:\Data\20200218_131517_video1.mp4\000000038_2_CZ_9U90909.jpg

6 Settings

The application allows you to adjust your settings in the Settings dialog which is separated into the following tabs: *Recognition*, *SDK*, *Output*, *Config Files*, and *Image Effects*. You can navigate directly to the requested tab from the Options menu, or to the most recently visited tab using the button in the bottom right corner of the application:


The Settings dialog can also be opened using the Settings button in the Open Media dialog.
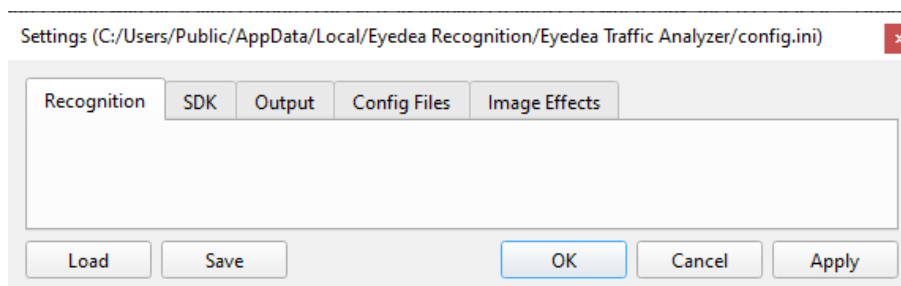
Every change in settings is applied to the current application instance after confirming the dialog window (OK, which also closes the dialog, or Apply buttons).

6.1 Saving and loading settings

Settings from the *Recognition*, *SDK,* and *Output* tabs can be saved (and are by default) into a config file – press the Save button to open the Save Settings dialog. Here you can select the config file name and the settings groups (corresponding to the sections on these three tabs described later) that will actually be saved. If the *Set as startup config* option is checked, the *Startup config file* on the *Config Files* tab will be replaced with the saved one (that field specifies from which config file are the settings loaded when the application is started).
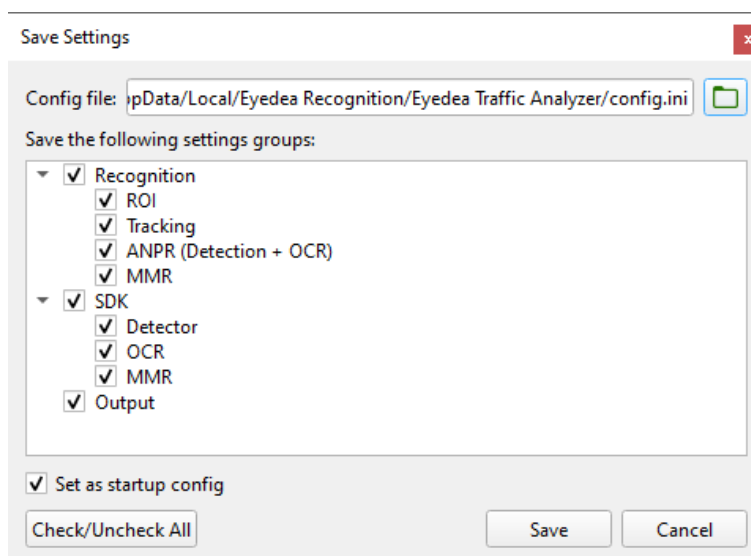
To load settings from a file or use the default settings, press the Load button to open the Load Settings dialog. Here you can specify which settings groups have to be overwritten with values from the selected config file or with default values; confirm your choice by pressing the Load button. Note that the Settings dialog must be confirmed with OK or Apply to apply the changes.
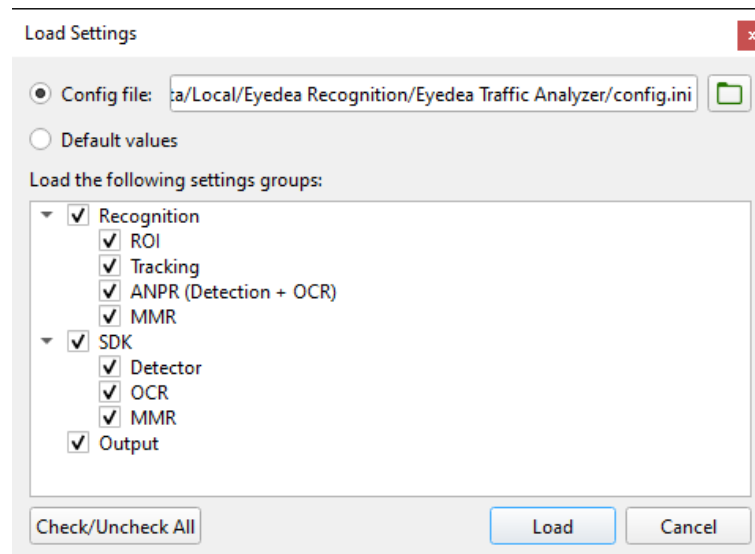
With config files you can have specific settings for different scenes and use cases. This approach also simplifies running multiple instances of Eyedea Traffic Analyzer with different settings at the same time. However, the disadvantage is that the current settings are stored locally; if you want to start the application with the last settings you used, you must save them to a file before applying the settings (or, at the latest, before closing the application) and set that file as the startup config.

Because it may be unintuitive and not all users appreciate the benefits this brings, there is an option on the *Config Files* tab to automatically save (all) settings to the current startup config file when the Settings dialog is confirmed. If this option is selected, the name of the config file is shown in parentheses in the header of the Settings dialog window.

6.2 Recognition tab
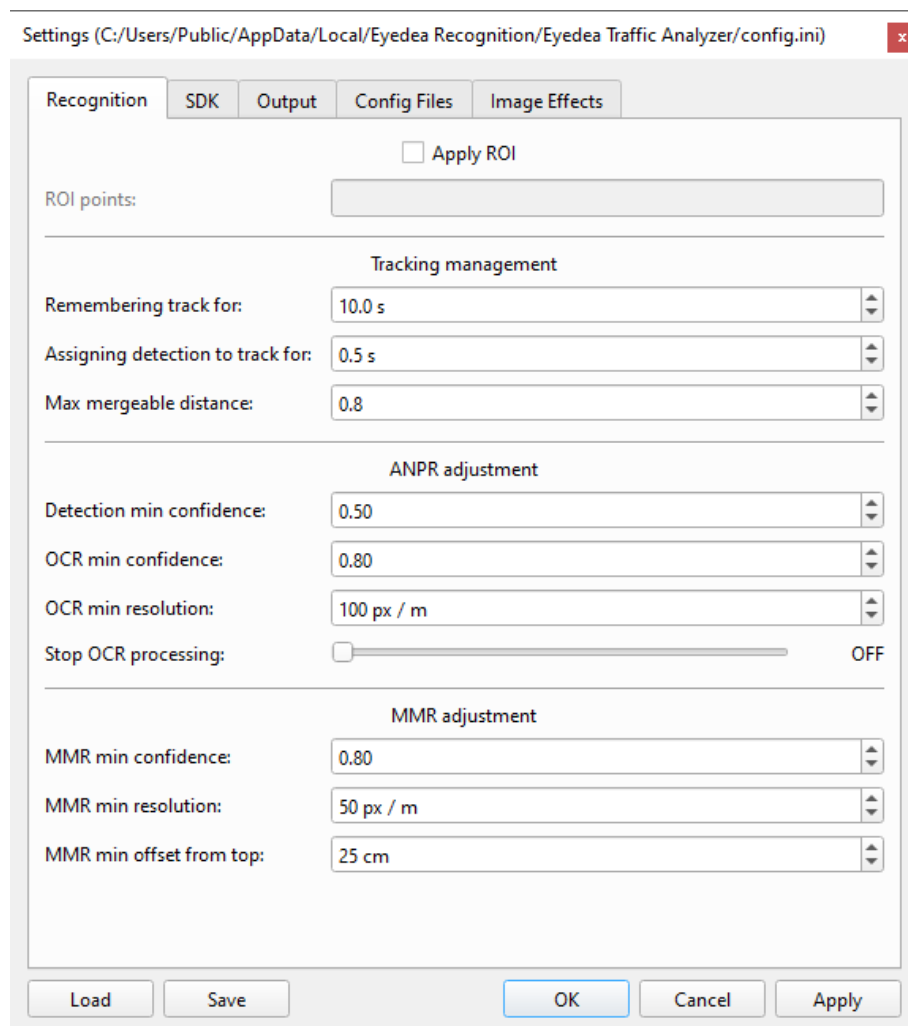
ROI settings:

In the *ROI* section, you have the option to turn on/off the Region of interest and you can define it here as a set of points in format of $(x_1,y_1), (x_2,y_2),...,(x_n,y_n)$ where x and y define the position of each vertex.

Tracking management:

In the *Tracking management* section, you can set parameters to keep track of a vehicle. For explanation, see the chapter 5.5 Tracking.

The *Remembering track for* parameter defines an interval for which the track is kept alive after the last detection. Afterwards, the finished track is logged.

There are two mechanisms of appending a track:

- If there is a detection within *Assigning detection to track for* interval which is not farther than *Max mergeable distance* license plate units from the estimated position, the detection is added to the track (if the condition is fulfilled by more than one detection, the closest one is chosen). Such a track is called "active", otherwise it is "lost".

- If there is a "lost" track with a similar license plate to an "active" track, the "active" track may absorb the "lost" track within the *Remembering track for* interval.

The tracking management is not applicable for individual images.

ANPR adjustment:

In the *ANPR adjustment* section, you can set the confidence thresholds for license plate detection and OCR (reading license plate text). Results with confidence below this threshold will be ignored.

OCR min resolution specifies the minimum horizontal resolution in pixels per meter for which a detection will be processed by OCR (modern net detectors also detect license plates that are too small to be read by OCR; for a common European single-line license plate with a width of 52 cm and *OCR min resolution* set to 100 px / m, the minimum width of the license plate in pixels must be 100 * 0.52 = 52).

You can also select from predefined levels when to *Stop OCR processing*; see chapter 5.6 Online logging for details (the dynamic OCR confidence limit decreases for levels: *OFF > when sure > late > early*).

MMR adjustment:

In the *MMR adjustment* section, you can set the confidence threshold for MMR (affects only MMR text color in the player; it has no impact on logging).

MMR min resolution specifies the minimum horizontal resolution in pixels per meter for which a detection will be processed by MMR (for a common European single-line license plate with a width of 52 cm and *MMR min resolution* set to 50 px / m, the minimum width of the license plate in pixels must be 50 * 0.52 = 26).

MMR min offset from top specifies the minimum vertical offset of the license plate center from the top edge of the image to be processed by MMR.

6.3 SDK tab
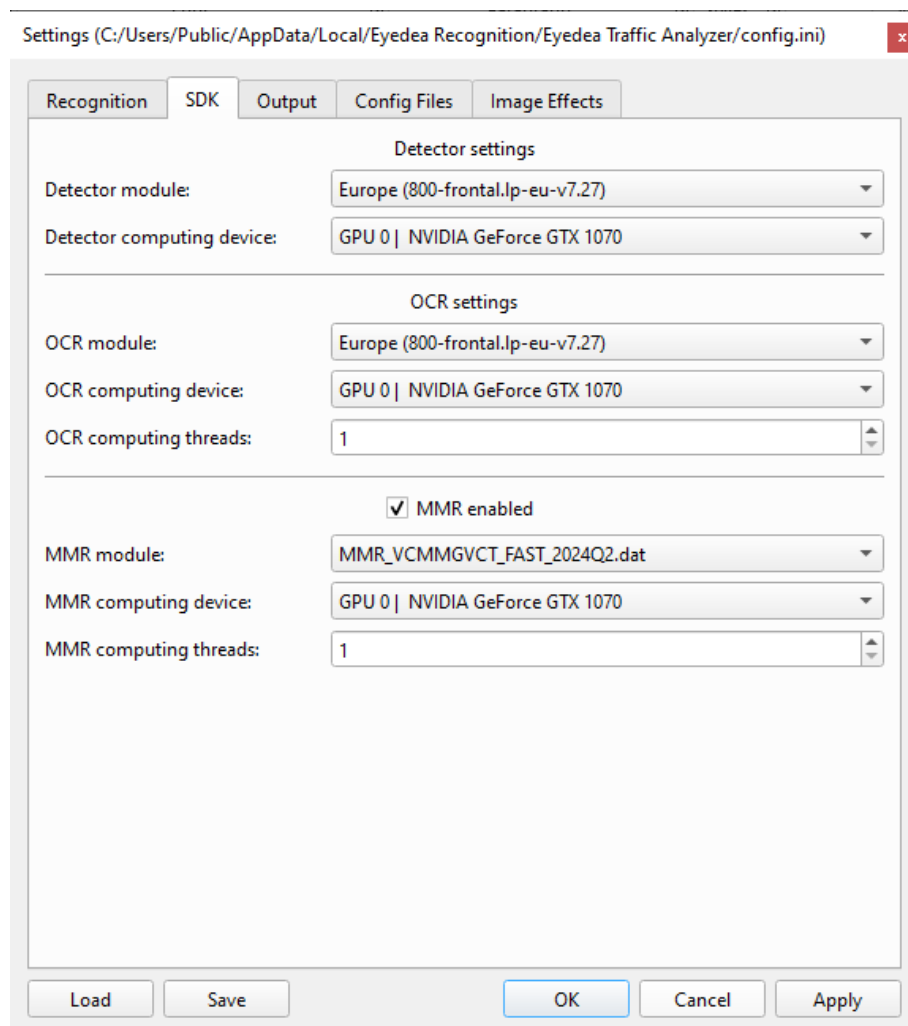
Detector settings:

In the *Detector settings* section, you can select the *Detector module* (modules you want to choose from must be in subfolder *bin\SDK\LPM\modules-v7\x64* of the folder where you installed the application) and the *Detector computing device* (either CPU, or GPU if supported).
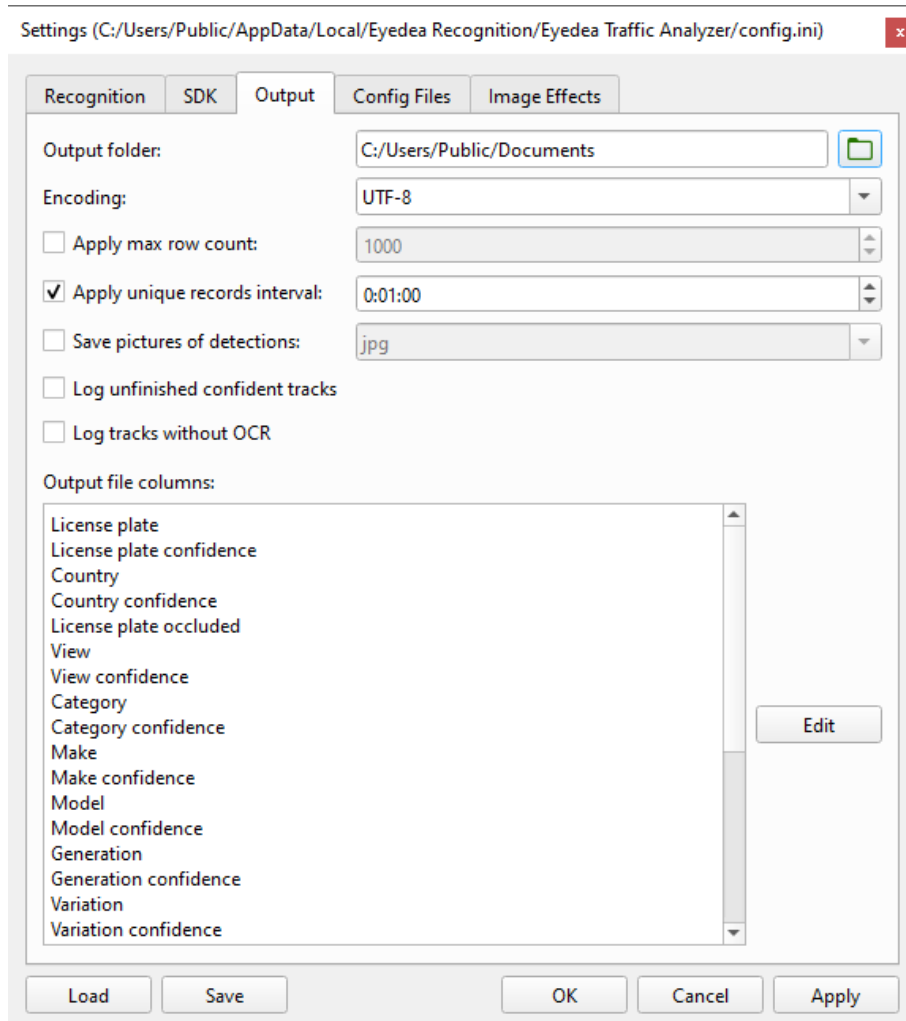
OCR settings:

The *OCR settings* section defines the settings of the component that is responsible for reading the license plate text and recognizing some of its parameters. In the *OCR settings* section, you can select the *OCR module* (modules you want to choose from must be in subfolder *bin\SDK\LPM\modules-v7\x64* of the folder where you installed the application), the *OCR computing device* (either CPU, or GPU if supported) and the number of *OCR computing threads*.

MMR settings:

The *MMR settings* section defines the settings of the component that is responsible for recognizing vehicle parameters such as model or color. In the *MMR settings* section, you can turn on/off MMR analysis using the *MMR enabled* checkbox, and select the *MMR module* (modules you want to choose from must be in subfolder *bin\SDK\MMR\model* of the folder where you installed the application; all vehicle attributes are recognized by the

*_VCMMGVCT_* module), the *MMR computing device* (either CPU, or GPU if supported) and the number of *MMR computing threads*.

6.4 Output tab

The *Output folder* field specifies the folder in which output CSV files are saved.

In the *Encoding* field, you can select the output CSV file encoding from the predefined list or type the name of the encoding (when applying the Settings dialog, you will be warned if the specified encoding is not supported). Note that if using an encoding other than UTF-8, some characters (returned by OCR or contained in a file path) may not be supported by that encoding (they would then be stored as UTF-8).

To avoid creating too large files which are harder to operate with, *Max row count* specifies the maximum number of result rows (header excluded) after which a new CSV file is created. Check *Apply max row count* to apply the limit.

Unique records interval is a period after a track's end for which a track with the same license plate text will not be logged again (except for online logging). This interval applies from the last detection of a logged license plate to the beginning of a new track with the same license plate text (in case of its re-occurrence, the beginning of the interval is updated). To log every occurrence of a license plate, uncheck *Apply unique records interval*.

If *Save pictures of detections* is checked, an image containing the best detection (with the highest OCR confidence) will be saved for each track. See chapter 5.7 Results for details.

If *Log unfinished confident tracks* is checked, each track may appear twice in the output file – first, as soon as its OCR result becomes confident enough (see *Stop OCR processing* field in the *ANPR adjustment* on the *Recognition* tab), and later after the track is finished. The couple of records have the same OCR results but may differ in MMR results; the final record also has a valid *End time* value whereas this field is empty in the "unfinished track" record. See chapter 5.6 Online logging for context.

By default, only tracks with a sufficiently recognized license plate are recorded in the output CSV file. However, in some cases it is desirable to record all vehicles, regardless of whether the license plate has been read or with what confidence. For this purpose, there is the *Log tracks without OCR* option; if checked, the *OCR min confidence* field from the *ANPR adjustment* section of the *Recognition* tab will be ignored and any track, even with blank license plate text, will be recorded. Please note that in this case vehicles with an empty license plate text or with a low license plate text confidence may be recorded several times.

6.5 Config Files tab
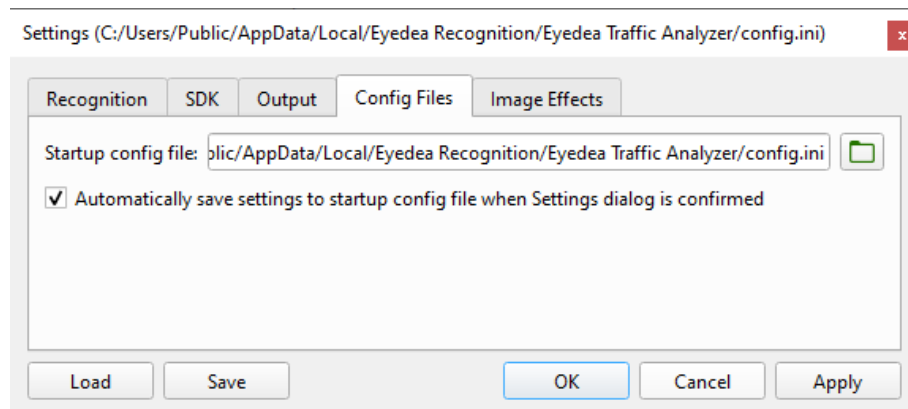
Startup config file is a file from which the settings (from the *Recognition*, *SDK,* and *Output* tabs) are automatically loaded when the application starts.

If the *Automatically save settings to startup config file when Settings dialog is confirmed* option is checked, the startup config file will be automatically synchronized with the local settings without the need to save the settings manually. This option should be used in most cases. We recommend NOT to use this option if you are running multiple instances of Eyedea Traffic Analyzer at the same time with different settings.

If the *Automatically save ...* option is enabled, the startup config file is shown in parentheses in the title of the Settings dialog window.

6.6 Image Effects tab
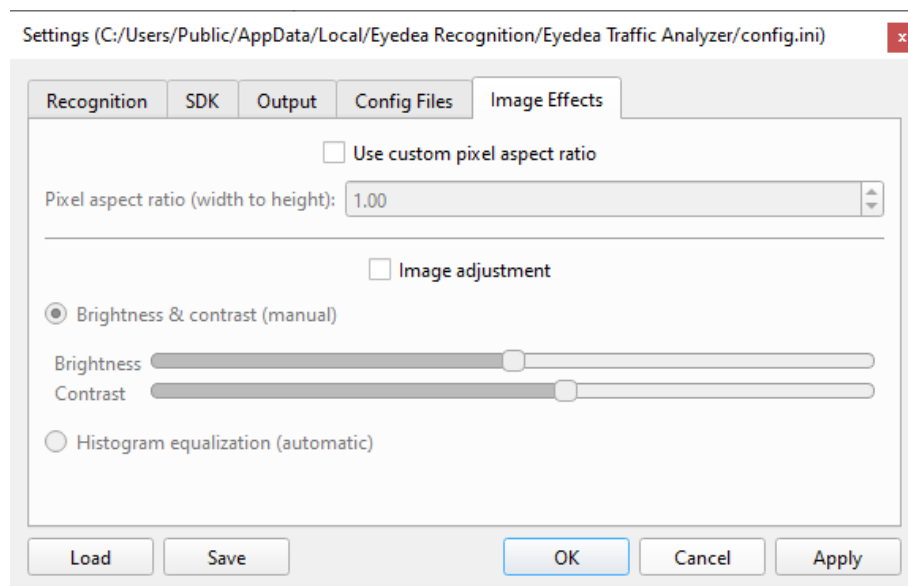
Custom pixel aspect ratio:

Some imaging systems store an image as a grid of rectangular pixels, in which the pixel width and height are different. Pixel aspect ratio describes how the width of a pixel in a digital image compares to the height of that pixel. By default, Eyedea Traffic Analyzer tries to detect such a value in video files and display it properly.

To use a custom value (for any source), check the *Use custom pixel aspect ratio* checkbox and set its value. If you want to stretch the image to width, use a value greater than 1; to narrow the image, use a value less than 1.

The usage of custom pixel ratio and its value apply until they are changed or the application is closed; they are reset each time the application is started.

Image adjustment:

To adjust the brightness and / or contrast of video in the player, check the *Image adjustment* option. Then you can either adjust them manually or use an automatic histogram equalization.

Note that image adjustment applies only in video player – it does not affect detection and computation of results. The image adjustment is turned off when the application starts.