

**Change log**

**AutoSDK**

Version 2.13.0



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### Used abbreviations:

- LP — license plate.
- LPR — license plate recognition.
- CLI — command line interface.

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AUTOSDK 2.13.0 (13.10.2021)

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## 1.1 fixed bugs

- Fixed a bug that caused the program to crash on Windows platform, when working with multiple instances of DNN.
- Fixed a bug that caused the program to crash when handling an OpenVINO exception during inference operation.

## 1.2 changes in image analysis

- Added `VodiK_VPW_TEMPLATE_ANALYSE` analysis level for the `VodiCTL_VPW_ANAL` parameter. Now, on the level `VodiK_VPW_TEMPLATE_ANALYSE` a full analysis of the number is carried out, and on level `VodiK_VPW_TEXT_ANALYSE` everything except analysis using templates is carried out. `VodiK_VPW_TEMPLATE_ANALY` is set by default.

## 1.3 changes in dynamica

- Added track check for maximum allowable acceleration.
- Changed the maximum allowable angle between adjacent movements in the track to 20 degrees.
- Changed the combining license plates procedure from different frames. Now it works without templates usage, which makes it possible to work dynamics in the analysis mode without templates usage.
- Changed the number plate image creation procedure (`vodi_plate_info_spec::pis_image`).

## 1.4 general changes

- Added parameter `VodiCTL_VPW_TEXT_TRANSLIT`, which gives the ability to transliterate the text of the number.

- Added function `VodiImageCreateHeader` (please, check `<Vodi/Vodilib.h>`), which makes it possible to transfer an image to `VodiPrincProcess` without copy operation.
- Added support for DNN execution on following devices:
  - `VodiK_HDDL_DEV` - Intel Vision Accelerator Design with Intel Movidius VPUs
  - `VodiK_NVGPU_DEV` - NVIDIA GPU
  - `VodiK_NVDLA_DEV` - NVIDIA Deep Learning Accelerator
- The DNN support functionality moved into separate modules, which are loaded automatically when the user sets the parameters that require working with DNN. This separation causes third-party libraries to be loaded only when they are needed.
- Added the environment variable `VPW_CUDA_ENGINE_CACHE_DIR`, which allows to store `CUDA-ENGINE` in the specified directory and reuse it. This speeds up the initialization phase of DNN on NVIDIA family devices.
- The `VodiCTL_VPW_DNN_PARMS` parameter has been added, which makes it possible to control loading DNN properties, such as: the devices type and their priorities, which will be used for DNN execution, the device serial number in the system, the number of DNN instances that need to be loaded into the specified device, the data type in which the calculations will be carried out, etc.

The first argument must be the DNN type for which the parameters will be applied. The following DNN types are available in this version:

- `VodiK_VPW_PLATE_DETECTOR_DNN` - plate detector
- `VodiK_VPW_PLATE_PREDICATE_DNN` - plate filter
- `VodiK_VPW_SYMBOL_DETECTOR_DNN` - symbol detector

As the second argument should be passed a pointer to the structures array beginning of `vodi_dnn_conf_t` type, and pass their number as the third argument. Each an element of this array specifies the DNN configuration for one system device. `vodi_dnn_conf_t::dc_type` specifies the type of device, and `vodi_dnn_conf_t::dc_order` specifies the device serial number in the system. The priority of the device is given by the order in this array (the former have a higher a priority). More information about configuration can be found near `vodi_dnn_conf_t` definitions in the file `<Vodi/Types.h>`.

## 1.5 vpwfetch changes

- The option `--dnn-devices (-N)` syntax was changed. Option implemented via parameter `VodiCTL_VPW_DNN_PARMS`, so please find more information at the description for this parameter.

Argument grammar:

```
argument -> dnn_parms
           | dnn_kind_parms
           | [ dnn_kind_parms1, .., dnn_kind_parmsN ] (N >= 0)
```

```
dnn_kind_parms -> dnn_kind : dnn_parms
```

```
dnn_kind -> PD // plate detector
           | PP // plate predicate
           | SD // symbol detector
```

```
dnn_parms -> dnn_conf | [ dnn_conf1, .., dnn_confN ] (N >= 0)
```

```
dnn_conf -> dnn_conf_mod1 + .. + dnn_conf_modN (N >= 1)
```

```
dnn_conf_mod -> devtyp
               | order INT
               | ncaps INT
               | batch INT
               | IGNERR_DEVNOTAVAIL
               | IGNERR_DEVORDNOTSUP
               | IGNERR_DNNGET
               | IGNERR_DNNLOAD
               | IGNERR_NOTCAPS
               | IGNERR_ALL
               | FP16
               | INT8
```

```
devtyp -> CPU | iGPU | MYRIAD | HDDL | NVGPU | NVDLA
```

Examples:

- CPU - run inference for all DNN types of CPU
- [NVGPU + FP16, MYRIAD + FP16, CPU] - run inference for all DNN types with the following priority - NVGPU using FP16, then on MYRIAD using FP16, then on CPU
- PD : NVGPU + FP16 - run plate detector inference on NVGPU with FP16

- [DP : NVDLA, PP : MYRIAD + FP16, SD : NVGPU + FP16] - run plate detector using NVDLA, filter plates using MYRIAD and detect characters using NVGPU

Please, pay attention that vpwf fetch will interpret the argument as a string expression, so you should pass the argument as a string literal, like this: - N "[DP : NVDLA, PP : MYRIAD + FP16, SD : NVGPU + FP16]"

## 1.6 templates changes

- Malaysia
  - Corrected character constraints in templates 1-9
  - Added template 25
- South Sudan
  - Added templates 1-4
- Tanzania
  - Added templates 1-2
- Kenya
  - Added wagon templates 8-11
- Ghana
  - Added templates 1-7
- Czech Republic
  - Added electric vehicles templates 16-17
- Belarus
  - Added electric vehicles templates 20-21
- Finland
  - Allowed VodiK\_I\_SYMBOL symbol in 1-15 templates
- Russia
  - Fixed format in templates 22-23
- Spain
  - Added police template 15
  - Added taxi template 16
- Tunisia
  - Fixed format in templates 1-15
- Indonesia

- Added templates 12-13
- Brunei
  - Added templates 1-17
- India
  - Added templates 18-22
  - Corrected character constraints in templates 1-2,4-13,15

## 1.7 protection changes

- Allowed to work with remote keys

## 1.8 compatibility

- Transition to Bo-2.8.2, Vipm-0.0.11, TensorRT-7.2.2.3 (on windows and linux-x86\_64 based on >=glibc-2.23).

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AUTOSDK 2.11.0 (24.11.2020)

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## 2.1 fixed bugs

- Fixed an access to unaligned memory, that could lead to program emergency stop on ARM platforms

## 2.2 templates changes

- Azerbaijan
  - Added character E for template 11
  - Added character Y for templates 2, 15, 16
  - Added regions 73-75
  - Added police template 19
- Zambia
  - Fixed character constraints in templates 1-3
- Iran
  - Fixed character constraints in template 1
- Qatar
  - Added templates 8-28
- Kenya
  - Added template 7
- Korea
  - Fixed filtering of symbols by geometry.
  - Recognition for the license plates with 2 lines has been improved.
- Latvia
  - Added template 19
- Malaysia
  - Added templates 9-24

- South Africa
  - Fixed geometry in templates 9, 11

## 2.3 compatibility

- Reduced image files size - share/Vodi/platesdef//\*.png

## 3.1 fixed bugs

- Fixed the error in the `LpvlibReadPlateid` function, that led to incorrect result in case the input identifier consisted of three components.
- Fixed the error with duplicate results in an ensemble, that could occur during analysis with multiple threads in the dynamic mode.
- Fixed the error not loading module `vpwi-au-nsw` by module `vpwi-au`.
- Fixed the bug in the composition of affine transformations, which under some conditions could lead to incorrect results.
- Fixed the error in logging settings (`VodiCTL_VPW_LOG_SETTINGS`), which caused a memory leak, when there is no directory to store log.
- On linux platforms the bug has been fixed in the modules `vpwi-jp` and `vpwi-qa`, which made it impossible to load them under some conditions.
- Fixed the error, while working with modules based on convolutional neural networks (DNN). It could lead to a crash, if several principals created with different settings.

## 3.2 image analysis changes

- Added the `VodiCTL_VPW_DNN_DEVICES` parameter, which makes possible to specify a list of devices on which DNN calculations will be performed. The available devices set is defined in the `<Vodi/devType.h>` file.
- Added the `VodiCTL_VPW_PLATECANDS_METHODS` parameter, which allows you to specify methods set for obtaining candidates for numbers.  
Available methods:
  - `VodiF_VPW_PLATECANDS_BY_MORPH` — old method, default;
  - `VodiF_VPW_PLATECANDS_BY_DNN` — new method based on deep neural networks (DNN).

- Added the `VodiCTL_VPW_ANALYSE_LEVEL` parameter, which makes possible to stop the license plate analysis at a given level.

The following levels of analysis are available:

- `VodiK_VPW_PLATECANDS_ANALYSE` — at this level only candidates for license plates will be found, i.e. their bounding rectangles;
- `VodiK_VPW_SYMCANDS_ANALYSE` — at this level additionally will be found candidates for characters on license plates, i.e. their bounding rectangles;
- `VodiK_VPW_TEXT_ANALYSE` — at this level additionally candidates for characters will be processed by character recognizer.

Level `VodiK_VPW_TEXT_ANALYSE` performs a full license plate analysis and is set by default.

- Added the `VodiCTL_VPW_PLATE_ANALYSE_METHODS` parameter, which makes possible to specify methods set for analyzing candidates for license plates. Available methods: `VodiF_VPW_BLURAN`, `VodiF_VPW_NAN`, `VodiF_VPW_TMPLAN`, `VodiF_VPW_DNNAN`, `VodiF_VPW_OTSUAN`. The default are `VodiK_VPW_PLATE_ANALYSE_METHODS_DEFAULT` methods.

`VodiF_VPW_DNNAN` — a new method of number analysis based on a deep neural network. Disabled by default.

`VodiF_VPW_BLURAN | VodiF_VPW_DNNAN | VodiF_VPW_TMPLAN` — the methods set, that gives the highest number of correctly recognized results.

- Added the `VodiCTL_VPW_PLATE_DNN_FILTER_ENABLE` parameter, which makes possible to filter candidates for license plates by a deep neural network (DNN).
- Added the `VodiCTL_VPW_TREAT_PLATECAND_AS_PLATE` parameter, which makes possible to count each candidate as a — license plate. This means, that in case, the candidate analysis for some reason was unsuccessful (for example, it was not possible to recognize the license plate characters), then such candidate will be issued as a license plate result, with partial information about it. All of such results will have `pis_plate_variantc` equal to 0.
- Added the `VPW_RECOGN_OUTSIDE_PLATECAND` environment variable, which makes possible to prohibit the analysis of a license plate outside the rectangular area found by the license plate detector. This is an experimental parameter and could be removed in future.
- The license plate minimum ratio value (relation width to its height) has been changed. This value is reduced to 0.6, in case templates with more, than 2 lines are enabled. This change improves the detection for license plates with 3 lines or more.

- The algorithm for determining the order of points of the license plate rectangle was changed to a more reliable one for narrow license plates. This improves the recognition result for narrow license plates, such as numbers with 3 lines.
- Added a new deep neural network (DNN) license plate detector.
- Added a new character recognizer for China.
- Changed character recognizer for USSR (us).

### 3.3 changes in tracking algorithm

- The tracking algorithm was adapted to work with partially recognized license plates, in which the `pis_plate_variantc` equals to 0. Such license plates appear, when the `VodiCTL_VPW_ANALYSE_LEVEL` parameter is set to the `VodiK_VPW_PLATECANDS_ANALYSE` value, or `VodiCTL_VPW_TREAT_PLATECAN` parameter is set.

### 3.4 general changes

- Changed semantics of `VodiprincProcess` state.  
Possible values:
  - `<0` (`BoS_ERR`) — as before, this indicates an error.
  - `0` (`BoS_NORMAL`) — the operation was successful (as before); there is no result yet, the frame is being analyzed.
  - `>=1` (`BoS_OK`) — the operation was successful (as before); the analysis result (ensemble) is ready.

This provides possibility in multi-threaded mode to understand, when a frame that was submitted earlier has already been processed, and thereby understand from which frame the result (ensemble) was obtained.

- Added the `VodiCTL_VPW_SEQUENTIAL_FLUSH_ENABLE` parameter, which makes possible to change the behavior of the operation `VodiprincFlush`. Without this parameter, the process waited the analysis completion for all frames, transferred the results to the tracking module (if it was enabled), accumulated the results, performed the flush operation for the tracking module, and then returned the accumulated result.  
With this parameter, the process waits the analysis completion for the earliest frame, transfers its result to the tracking module (if it is enabled) and returns its result. Thus, to get all the results that are still being analyzed, it is necessary to call the `VodiprincFlush` operation, while it returns status `>=BoS_OK`.
- Recognition Server (`vpwsrv`) added.

There are two options for working with it:

- on the client, replace the vpw module loading to vpwri module and replace the VpwprincOpenXXX to RvpwprincOpen;
- or replace the vpw module loading to vpwri module.

By default, the client will connect to the server on localhost:3000. This behavior can be changed by setting the client environment variables: VPW\_HOST, VPW\_PORT or by setting explicitly using the RvpwprincOpen operation arguments.

Working with the server adds possibility to run the client application under the debugger, since the required modules set (for working with the server) are not protected from debugging.

Working with the server also makes possible to analyze frames on one platform, and launch the client on another. This can solve the problem, when DNN calculations are not available on the client platform.

## 3.5 vpwfetch changes

- Added the possibility to work with the recognition server (vpwsrv). For this case, it is necessary to specify using the --principal argument the address and, if necessary, the port on which the vpwsrv server is running.

For example:

- --principal localhost
- --principal localhost:3030
- --principal 192.168.100.196:3333

- Added the possibility to specify a list of devices, that will be used for DNN inference using the -N parameter. Possible values: CPU, GPU, MYRIAD.
- Added the possibility to set methods for the license plate detection using -C parameter.

Possible values:

- 1 — VodiF\_VPW\_PLATECANDS\_BY\_MORPH, old method;
- 2 — VodiF\_VPW\_PLATECANDS\_BY\_DNN, new method, using DNN;
- 3 — VodiF\_VPW\_PLATECANDS\_BY\_MORPH | VodiF\_VPW\_PLATECANDS\_BY\_DNN (both options).

- Added the possibility to set the license plate level analysis using the -T parameter.

Possible values:

- 0 — VodiK\_VPW\_PLATECANDS\_ANALYSE, only license plate detection;

- 1 — VodiK\_VPW\_SYMCANDS\_ANALYSE, additionally characters detection;
- 2 — VodiK\_VPW\_TEXT\_ANALYSE, full analysis.
- Added the possibility to set methods for analyzing license plates candidates using the `-A` parameter.  
Possible values:
  - bluran, 0x1
  - nan, 0x2
  - tmlan, 0x4
  - dnnan, 0x8
  - otsuan, 0x10
- Added the possibility to filter license plates candidates using deep learning network (DNN) via the `-P` parameter.
- Added the possibility to repeat the processing of input files via parameter `--repeat`. Zero means indefinitely repeating. The default value is 1.  
For example:
  - `--repeat 0` — repeat unlimited times
  - `--repeat 10` — analyze the input sequence 10 times
- Added the possibility to save the "interesting" frames using `--interesting-frame` parameter. "Interesting" frames are considered as that, for which a non-empty result (ensemble) was obtained, i.e. when at least one license plate number was found.  
Usage examples:
  - `--interesting-frame 'output/${src-seqnum}.bmp'`
  - `--interesting-frame 'output/${src-seqnum}_${src-name}.bmp'`
- Added the possibility to set analysis zones using the `--analyse-zone` parameter.
- Fixed the bug, that could lead to a memory leak.
- The interpretation of unnamed arguments (input files) has been changed. Now they are not considered as string expressions, but simply strings.

## 3.6 templates changes

- Angola
  - Added template 2
- Armenia
  - Changed mask for 19-24 templates

- Belarus
  - Added template 19
  - Corrected temporary templates 10 and 14
- Hong Kong
  - Added templates 2-6
- Zambia
  - Geometry for template 3 was fixed
- Indonesia
  - Geometry for template 2 was fixed
- Spain
  - Added scooter template
- Kazakhstan
  - Changed image and character constraints for template 4
  - Changed character constraints for 15, 18, 19 templates
- Kenya
  - Added trailer templates 5-6
  - Changed character constraints for 1-2 templates
  - Main and trailer templates adapted for use in Uganda and Rwanda
  - Main templates adapted for use in Tanzania and South Sudan
- Congo
  - Added template 1
- Cyprus
  - Added templates 2-17
- Kyrgyzstan
  - Added templates 18-22
- China (PRC)
  - Added templates 5-7
  - Changed symbols translation table for templates 2-4
- Korea
  - Added templates 9-11
- Myanmar
  - Added templates 1-3
- Netherlands
  - Added templates 20-21

- Russia
  - Changed mask for 20, 23, 25 templates
  - Added regions 122, 702, 193, 147, 156, 774, 790, 797
  - Added templates types
- Slovenia
  - Added template 18
- Taiwan
  - Changed symbols translation table for templates 13
  - Geometry for templates 5 and 13 was fixed
- Ukraine
  - Supported DSTU 4278:2019
  - Added military templates 23-24
  - Changed character constraints for main templates
  - Characters output was changed to Latin
  - Added new diplomatic templates
  - Added templates types
  - Added individual template CIKLUM
- Sri Lanka
  - Added templates 4-11
  - Changed templates 1-3

## 3.7 protection changes

- Transition to hasp-api-7.100, hasp-rt-7.103
- Added more informative error messages in the protection system

## 3.8 new platforms

- Added support for ARM64 platform

## 3.9 compatibility

- Transition to OpenVino-2019.3.334, hasp-api-7.100, hasp-rt-7.103, ProjMajster-1.0.5, hProjMajster-0.0.0, Bo-2.8.1, Vipm-0.0.10

- Vpwres and Vpwens implementations were moved from the vpw to the vpws module
- Removed symbols export from archive libraries, such as OpenCV
- File templates\_map.txt location was changed, from share/Vodi/templates/templates\_map.txt to share/Vodi/templates\_map.txt
- Folder share/Vodi/templates moved to share/Vodi/platesdef/templates and its subdirectories was renamed
- The countries flags images was placed in a separate directory share/Vodi/platesdef/countryflags
- File features.xml was renamed to features.{SERIE}.xml, where SERIE corresponds HASP serie

## 4.1 general information

- Added new license plate templates of the following countries:
  - Ukraine [22].
- vpwfetch supports an archived (with delay) license,
- Improved recognition of O and Q characters for Belgium,
- Minor improve and fix bugs in a plate analyse algorithms.

## 5.1 general information

- Added new license plate templates of the following countries:
  - Pridnestrovian Moldavik Republic [5,6],
  - Bahrain [3],
  - Korea [8].
- Changed license plate recognizer for Iran,
- New constraints for Korean templates,
- Added 761 region to Russian Federation,
- Deleted letter O from Czech Republic recognition.

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AUTOSDK 2.7.1 (06.04.2019)

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## 6.1 information for developers

### 6.1.1 Fixed bugs

- Fixed memory leak

## 7.1 general information

- Added new license plate templates of the following countries:
  - Kazakhstan [30],
  - India [10-17],
  - Sweden [5-6],
  - Russian Federation [22-25],
  - Croatia [9-11],
  - Macedonia [8],
  - Kosovo [11],
  - Ukraine [19-21].
- Changed license plate recognizer for Russian Federation.

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AUTOSDK 2.6.1 (18.01.2019)

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## 8.1 general information

- Added new license plate templates of the following countries:
  - Oman [6-10],
  - Nigeria [3-4],
  - Russian Federation [18-21],
  - Korea [5-7],
  - Armenia [19-25].

## 9.1 general information

- Added new license plate templates of the following countries:
  - Belgium [17-20],
  - Bulgaria [14-17],
  - Germany [68-92],
  - Great Britain [15-25],
  - Liechtenstein [1-4],
  - Luxembourg [10],
  - Mexico [37],
  - Monaco [1-8],
  - Netherlands [16-19],
  - New South Wales (Australia) [14-29],
  - Qatar [2-7],
  - Queensland (Australia) [11],
  - Saudi Arabia [1-9],
  - Slovakia [11],
  - Spain [13],
  - Victoria (Australia) [23-51],
  - Zambia [1-3],
  - Iran [3-7],
  - Tajikistan [8],
  - Botswana [1-6].

## 9.2 information for developers

### 9.2.1 Improvements

- Added alternative method to search a plate numbers, which is switched on by the environment variable `VPW_PLATES_BY_BLUR=1`. In some cases it works better than the current method, for instance, numbers on trucks. But it decreases a total performance to 50%. This depends on an analyzed image and searched plate sizes (`VodiCTL_VPW_PLATE_SIZE_MIN`, `VodiCTL_VPW_PLATE_SIZE_MAX`).
- Added the ability to recognize the characters `Ö` and `Ü`, which improves number recognition for countries where they can meet
- Updated templates California (USA) [6]
- Updated templates Switzerland [3]
- Updated templates Luxembourg [4]
- Added 198 region to the `ru.1` template and updated `ru.11` template
- Updated templates Kazakhstan [11-12]
- Updated templates Victoria (Australia) [23]
- Updated templates Western Australia [1-2]

### 9.2.2 Fixed bugs

- Fixed error which can lead to abort program when use recognition for Korea and Iran
- Fixed error which in some cases can lead to decreases a performance comparing to 2.5.25 and 2.5.26 versions

### 9.2.3 Compatibility

- Added the `vodi_bool_t` type for better compatibility with C++

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AUTOSDK 2.5.26 (11.07.2018)

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## 10.1 general information

- Added new license plate templates of the following countries:
  - Great Britain [14],
  - India [5-6],
  - Croatia [14-17],
  - Mexico [33-36],
  - California [6-13],
  - Florida [8-12],
  - Madagascar [1-8],
  - Norway [7-8],
  - South Africa [30-59],
  - Turkey [26].

## 10.2 information for developers

### 10.2.1 Improvements

- Improved analyzing in the VodiCTL\_VPW\_PLATE\_PRECISE\_ANALYSE mode.

### 10.2.2 Fixed bugs

- Fixed error which can lead to abort program.

### 10.2.3 Compatibility

- Protection with 3995 feature on ARM platforms
- Renamed the module vipm to vipm-def

- Renamed "Taiwan, Province of China" to "Taiwan"
- Changed the coordinate system of symbols to relative original image

## 11.1 general information

- Added the parameter `VodiCTL_VPW_PLATE_EXTRA_RANGES_ANALYSE`, which enable more accurate finding candidates of plates.
- Added templates type of trailer: `by.3 dk.3 gr.2 ie.3 lt.2 lv.6 no.3 si.6`
- Added support partial inversed plates, like `az.11`
- Added ability to set default parameters by the environment variables.
- Added new license plate templates of the following countries:
  - Albania [7-13],
  - Arab Emirates Ajman.2,
  - Armenia [9-18],
  - Austria [18-68],
  - Bosnia and Herzegovina [3-5],
  - Croatia [5-8,12-13],
  - Finland [12-15],
  - France [20-23],
  - Germany [21-67],
  - Greece [5-7],
  - Iceland [4-5],
  - Ireland [14-39],
  - Latvia [13-18],
  - Lithuania [20-23],
  - Luxembourg [8-9],
  - Macedonia [2-9],
  - Malaysia [6-9],
  - Malta [4-9],
  - Moldova [22-25],

- Mongolia [6-7],
- Montenegro [2-8],
- Norway [6],
- Portugal [10-13],
- Romania [11-17],
- Serbia [10-12],
- Singapore [1-14],
- Slovakia [5-10],
- Slovenia [15-17],
- Turkey [9-25],
- Uruguay [4,9],
- Vatican [3-4].

## 11.2 information for developers

### 11.2.1 Improvements

- A new recognition algorithm for a large number of countries has been obtained.
- Improved and applied a number of algorithms for analyzing the plate, which increased the average probability of recognition by 10 percent.
- Static image analysis works completely without dynamics. Thus, only one result per plate falls into the dynamics.

### 11.2.2 Fixed bugs

- Fixed a bug in the dynamics of the accumulation of information about the symbols, which sometimes led to incorrect results.
- Added entry in the configuration log for the value of the parameter `VodiCTL_VPW_PLATE_PREC`
- The value of the field `vodi_plate_info_spec::pis_inversed` has always been false.

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AUTOSDK 2.5.24 (30.10.2017)

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## 12.1 general information

- Added ability to read video files by the vpwfetch on linux.
- Added the command `VodiCTL_PRINT_APPLIED_SETTINGS`, which prints string of settings.
- Added new license plate templates of the following countries:
  - Bulgaria [13],
  - Poland [25-29],
  - Serbia [6-9].

## 12.2 information for developers

### 12.2.1 Improvements

Improved template selection.

### 12.2.2 Fixed bugs

- Fixed errors in the following templates: ae.aj.1 de.[1-18] ua.3 kz.[14-15,17-19].
- Fixed a bug in vpwfetch, which could result inappropriate geometry in output.
- Fixed a bug in the printing '\*' for some templates.
- Fixed a bug in the analysis of the number plate that could cause to crash the application.

### 12.2.3 Compatibility

- The format for parameter logging has been changed, you can now use it as config for vpwfetch.
- Internal modules removed: vpwps, vpwsr, simlib.

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AUTOSDK 2.5.23 (22.09.2017)

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## 13.1 general information

- Added the option `--hide-abnormal-keys` into the command `lsvpwc`, which doesn't view keys without ability to use.
- Updated license plate recognizer for Guatemala.
- Added new license plate templates of the following countries:
  - Bulgaria [9-12],
  - Poland [22-24].

## 13.2 information for developers

### 13.2.1 Improvements

Improved the vehicles trajectories analysis when Dynamics mode is on. This reduces the possibility of sudden trajectory merge.

### 13.2.2 Fixed bugs

- Fixed the bug in the analysis of the options for the `lsvpwi` and `lsvpwc` commands.
- Fixed the bug in the operation `LpvlibMinus`.
- Fixed errors in the following templates: `pl.[18-19]` `tw.11`.

### 13.2.3 Compatibility

The feature 4048 now allows you to work with templates of all the Arab Emirates.

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AUTOSDK 2.5.22 (14.08.2017)

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## 14.1 general information

- Added ability for Korea's license plate recognition (templates 1-4).
- Updated license plate recognizers for Cuba, Kuwait, Luxembourg, Andorra, Austria, Italy, Netherlands, Portugal, Sweden, Tunisia, Peru, Uzbekistan, Iran.

## 14.2 information for developers

### 14.2.1 Improvements

- Optimized parallel analysis of the image.
- Added regions 716, 799 and deleted 188 for Russian's templates.
- Improved analysis with the `VodiCTL_VPW_PLATE_PRECISE_ANALYSE` parameter.

### 14.2.2 Fixed bugs

Fixed errors in the following templates: md.[11,13,14,16-21].

### 14.2.3 Compatibility

- Now for selection license with delay (archive) feature needs to use new version for open the principal with required parameters.
- Now there is a difference between 0 and 1 values of the `ThreadCountMax` parameter; at 0 - the image process will be in the same thread that calls it; at 1 - the image process will be in the separate thread.
- Changed the value by default of the `VodiCTL_VPW_IMAGE_THRESHOLD` parameter from 21 to 40, which is optimal for the tests we conducted.

## 15.1 general information

- Added new license plate templates of the following countries:
  - Israel [19-21],
  - Taiwan [34],
  - Belarus [14].
- Updated license plate recognizers for Algeria, Austria, Belgium, Bosnia and Herzegovina, Costa Rica, Cuba, Cyprus, Czech Republic, Dominican Republic, Equatorial Guinea, Georgia, Greece, Guatemala, Honduras, Hungary, Ireland, Kazakhstan, Kuwait, Luxembourg, Macedonia, The Former Yugoslav Republic of, Malta, Montenegro, Netherlands, Nigeria, Norway, Paraguay, Peru, Philippines, Portugal, Romania, South Africa, Spain, Sweden, Venezuela, Bolivarian Republic of, Viet Nam.

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AUTOSDK 2.5.20 (19.04.2017)

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## 16.1 general information

- Added new license plate templates of the following countries:
  - Kuwait [8-11],
  - Jordan [9-10],
  - The Philippines [14-15],
  - Ethiopia [1-10],
  - Belgium [14-15],
  - Netherlands [11-12].
- Updated license plate recognizers for Bulgaria, Azerbaijan, Germany and other countries.

## 16.2 information for developers

### 16.2.1 Improvements

Simplified processing of narrow fonts' symbols.

### 16.2.2 Fixed bugs

- Fixed an error when VodiCTL\_VPW\_PLATE\_FILTER\_SYMCOUNT parameter was used.
- Fixed errors in description of the following templates: kw.[5-7], ke.[3-4], ca.ab.[3], kz.
- Fixed an error that occurred with the "Dynamics" mode on. The error led to program's crash when specific templates set was chosen.

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AUTOSDK 2.5.19 (07.03.2017)

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## 17.1 general information

Added new license plate templates of the Netherlands [5-10].

## 17.2 information for developers

### 17.2.1 Fixed bugs

Fixed the error in license plate image analysis, which led to increase in overall recognition quality.

### 17.2.2 Compatibility

Introduced the new Vipm library to be used for image processing.

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AUTOSDK 2.5.18 (17.02.2017)

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## 18.1 general information

- Added new license plate templates of the following countries:
  - France [18-19],
  - Great Britain [6-9].
- Improved the recognition algorithm's performance, which gave the gain in frames processing speed.
- Updated the recognizer of French license plates.

## 18.2 information for developers

### 18.2.1 Improvements

Improved the algorithm of automatic template selection when recognizing symbols (from the templates set specified by user). Decreased the affect brought by perspective distortions.

### 18.2.2 Fixed bugs

Fixed the error in template selection algorithm which led to application crash.

### 18.2.3 Compatibility

Dynamic libraries of OpenCV are now used on ARM platforms.

## 19.1 general information

- Added new license plate templates of the following countries:
  - Bahrain [2],
  - Indonesia [8-11].
- Protected the functionality of [ADR](#) pictograms recognition, which is now a parameter of license.

## 19.2 information for developers

### 19.2.1 Improvements

- Improved the algorithm of automatic identification of tracked vehicle loss (when the vehicle is out of the frame).
- Added the `VodiCTL_VPW_DYNAMIC_LOSTALG_ENABLE` parameter. It allows to enable/disable the algorithm of automatic identification of tracked vehicle loss. The parameter is enabled by default. Within the `vpwfetch` utility, the `--with-lost-alg` option is used to set the parameter.
- Improved the vehicles trajectories analysis when Dynamics mode is on. This reduces the possibility of sudden trajectory merge.

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AUTOSDK 2.5.16 (05.12.2016)

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## 20.1 general information

- Added new license plate templates of the following countries:
  - the Philippines [13],
  - Kyrgyzstan [16-17],
  - Slovakia [2-4].
- Added new feature to **vpwfetch** utility: now tracked vehicles' movement trajectories can be marked on the output frames.

## 20.2 information for developers

### 20.2.1 Improvements

- Improved description of the following templates: br.[3-6].
- Advanced license plates analysis with the `VodiCTL_VPW_PLATE_PRECISE_ANALYSE` flag activated.
- Updated the recognizer of Mexican license plates.

### 20.2.2 Fixed bugs

Incorrect line quantity of the following licence plate templates: jo.[2-3,7].

### 20.2.3 Compatibility

Removed the `VodiK_VPW_TYPE_MAX` constant.

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AUTOSDK 2.5.15 (01.11.2016)

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## 21.1 general information

Added new license plate templates of the following countries:

- the Philippines [11-12],
- Panama [6-9],
- Costa Rica [14-18],
- Nicaragua [4-8],
- El Salvador [12],
- Honduras [6],
- Puerto Rico [3-11],
- Dominican Republic [3-4],
- Cuba [7-9],
- Jordan [2-8].

## 21.2 information for developers

### 21.2.1 Improvements

- Added the `plate-track` variable into `vpwfetch` utility.
- Improved the algorithms of inversed license plates analysis and dynamics.
- Supplemented the internal information about several license plate templates of Russia, Canada, Panama, Costa Rica and Guatemala, which facilitates for greater accuracy of recognition of the corresponding license plate types.

### 21.2.2 Fixed bugs

Changed encoding of `doc/templates/**/*.png` files from JPEG to PNG.

### 21.2.3 Compatibility

- Changed the behavior of **vpwfetch** utility: now the default output data encoding is UTF-8.
- Changed the name of **vpwfetch-0a2410** utility to **vpwfetch** (for UNIX-like OSs).
- Changed the callback interface for the `VodiCTL_VPW_DYNAMIC_COMPARE_CALLBACK` function.
- Changed the structure of usage examples and added the new ones: `track.c`, `bestframe.c`.
- Rewrote the functionality that used ImageMagick with the help of OpenCV.

## 22.1 general information

- Added new LP templates of the following countries: Indonesia [1-7], Venezuela [3-9], Bahrain [1], Qatar [1], Kuwait [5-7], Kyrgyzstan [7-15], Kazakhstan [21-23].
- Added the 'type' parameter for LP templates (e.g. for the LP to be specified as police or diplomatic).<sup>1</sup>

## 22.2 information for developers

### 22.2.1 Improvements

- Added the VODI\_IMAGE\_WStride macro function<sup>2</sup>.
- Advanced the analysis of license plates that were only partially "captured" during the detection.
- Changed symbols constraints of kz.[11-12,14-15,18-20] templates (which allows for more precise recognition).
- Added a new neural network<sup>3</sup> for recognition of LPs of the following countries: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Peru, Paraguay, El Salvador, Uruguay.

### 22.2.2 Fixed bugs

- Fixed the description of es.2 and su.[1-3] templates, which makes for more efficient usage of them during the recognition.
- Fixed the translation of Arabic symbols.

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<sup>1</sup> In the current AutoSDKrelease, the LP templates' types can be viewed with help of `lsvpwi` utility.

<sup>2</sup> `\_opt\include\Vodi\Types.h`

<sup>3</sup> aka "Imperial recognizer"

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AUTOSDK 2.5.13 (29.08.2016)

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## 23.1 general information

- Added new license key *features* which enable recognition of LPs of specific groups (for example, Europe, Asia).<sup>1</sup>
- Added LP templates of Ecuador [3-4].

## 23.2 information for developers

### 23.2.1 Fixed bugs

Fixed masks for ru.[13-16] templates.

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<sup>1</sup> For information on AutoSDKlicensing, visit [Seenaptecwiki](#). For more detailed description of Sentinel LDK solution, see the Gemalto documentation.

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AUTOSDK 2.5.12 (19.08.2016)

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## 24.1 general information

- Added the **lsvpwc** CLI application, which prints the information on the licensing keys that are currently available on the local machine.
- Added an opportunity to receive recognition results with 30-second delay.

## 24.2 information for developers

### 24.2.1 Fixed bugs

- Fixed error in the **lsvpwi** application, due to which the information on the "real\_size" field could not be received.
- Fixed values of the former sg.[27-28] template identifiers, as they caused conflicts with the current (new) ones.

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AUTOSDK 2.5.11 (01.08.2016)

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## 25.1 general information

- Added new license plate templates for the following countries:
  - Georgia [8-24],
  - Peru [8-12],
  - Russia [17].
- Excluded the license plate templates of Peru [6-7].

## 26.1 general information

- Added new license plate templates for the following countries:
  - Mexico [13-14,16,18-32],
  - Uruguay [5-8],
  - Peru [6-7],
  - Chile [3-16],
  - Brazil [7-8],
  - Argentina [9],
  - Vietnam [2-15],
  - Latvia [9].
- Excluded obsolete license plate templates for the following countries:
  - Uruguay [4],
  - Argentina [2].
- Added a CLI application (**lsvpwi**) which prints information on the available LP templates. The application is an alternative to **doc/templates/templates\_map.txt** file.

## 26.2 information for developers

### 26.2.1 New opportunities

- Added the **Vodi/services/Lpvlib.h** file with the following functions:
  - LpvlibModulesOf
  - LpvlibCanonize
  - Lpvliblselemof
  - Lpvliblnull

- Lpvlblsuniverse
- LpvlblEq
- LpvlblProsubset
- LpvlblSubset
- LpvlblProsuperset
- LpvlblSuperset
- LpvlblUnion
- LpvlblMinus
- LpvlblIntersec
- LpvlblComplement
- LpvlblShowPlateid
- LpvlblReadPlateid
- Added a list of elements which represent the countries and their subdivisions in accordance with ISO3166. With the help of new `VodiISO3166children` function, you can get a list of all children elements (subdivisions) of a specific parent element (country).
- Added `pv_tmpl_id` field into `vodi_plate` structure.
- Implemented the automatic loading of needed country modules (`vpwi-[country_code]`) when using the `vpwfetch` application (depending on the set of selected templates).

For detailed functionality description, see the AutoSDKguide for developers.

### 26.2.2 Improvements

- Added a new classifier for Mexico.
- Added the "infrared" attribute for Ukraining police LP template [3], as well as the rule for emblem recognition.

### 26.2.3 Fixed bugs

- In table of outlines-to-symbols translation for Ukrainian LP templates [7,8].
- In table of Cyrillic-to-Latin translation for LP templates of the following countries: UAE, USA, Argentina, Australia, Canada, Oman, El Salvador [9,11].
- When setting a non-zero value to `VodiCTL_VPW_PLATE_FILTER_SYMCOUNT` parameter of the `Vodi princSetparam` function.
- In translation of 'У' symbol (for Mongolian LP templates).

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AUTOSDK 2.5.9 (25.04.2016)

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## 27.1 general information

- Added new double-line license plate templates for Georgia.
- Added new license plate templates for Argentina.

## 27.2 information for developers

### 27.2.1 Improvements

- Added unit tests for **vipm** service operations.
- Added test for recognition of license plate images which were automatically generated in accordance with random templates and alphanumeric strings.
- Added specific classifier of symbols for Belarus, Kazakhstan, Russia and Mongolia.
- Improved recognition of region codes on Russian license plates.
- Improved overall recognition quality for all supported issuer-states due to increase in the symbol height limit.

### 27.2.2 Fixed bugs

- In assert expression within the template initialization operation.
- In **vpwfetch-srv** utility (which led to recognition information loss).
- In translation of Cyrillic Capital Letter Abkhazian Dze symbol for Mongolia.
- When performing the additional recognition of symbols after templates determination.

## 28.1 general information

- Added support of ARM v8 x32 (AArch32) architecture.
- Added new templates of Ukrainian license plates.

## 28.2 information for developers

### 28.2.1 New opportunities

- Additional modules for USA (**vpwi-us**), Canada (**vpwi-ca**), Australia (**vpwi-au**) and UAE (**vpwi-ae**) were added. They were implemented for loading all the administrative region modules of listed countries.
- The **templates\_map.txt** file was added to the **doc/templates/** directory. It contains the listing of old LP template identifiers with corresponding new ones.

### 28.2.2 Improvements

- Basic error handling functionality was added into **vpwfetch-srv** utility.
- Geometry of Ukrainian double-line LP templates was optimized.
- Ukrainian military LP templates were updated.

### 28.2.3 Fixed bugs

- When accessing to un-aligned memory.
- In **vpwi-us** module.
- In operations of matrix multiplication by a constant.

## 29.1 general information

- Added new license plate templates for the following countries:
  - Singapore;
  - Ukraine (including the double-line LPs);
  - Azerbaijan (including the double-line LPs).
- Improved the quality of Great Britain license plates recognition.
- Raised the speed of AutoSDKoperation on the ARM platform.
- The advanced frame analysis can be activated when recognizing number plates under adverse conditions (e.g. bad weather or camera characteristics/settings not fully corresponding to requirements). This leads to increase in recognition quality, but requires more time for image processing (20-30% longer, depending on frame resolution).

## 29.2 information for developers

### 29.2.1 New opportunities

- Added support of Intel IPP 8.2.
- Extended the collection of math operations which are supported by the **vipm-opencv** module (on the basis of OpenCV library).
- Added histogram equalization in process of license plate recognition.
- Added the `VodiCTL_VPW_PLATE_PRECISE_ANALYSE` parameter which is used for activation of advanced LP analysis mode (see “General Information”).
- Added the new fields to the `vodi_plate_symbol` structure:
  - `ps_bcolor` (symbols background color);
  - `ps_color` (symbols color).

- Added the new field (`pv_subdivision_id`) to the `vodi_plate` structure. It describes the administrative unit where the recognized license plate belongs. The field is reserved for recognition of USA, Canada, Australia and UAE license plates.

### 29.2.2 Improvements

- The `vpwfetch` utility loads the `vpw` module by default.
- The `vpwfetch-srv` utility doesn't recreate the recognition object every time it gets the new configuration.
- The internal structure of LP templates is simplified.
- The creation process of internal dynamics objects is changed. The `vpwresOpen` procedure is performed for each object.

For more information, see the AutoSDKuser manual.

### 29.2.3 Fixed bugs

- Incorrect recognition of Ukrainian diplomatic license plates.
- Incorrect license checkout (performed by protection modules).
- Incorrect license plate templates protection.
- Incorrect conditions of recognition result returning (with "Dynamics" mode on).
- Incorrect implementation of math operations modules.
- Incorrect set of allowed symbols for Great Britain LP templates.
- Incorrect recognition of license plates which are small-sized relatively to frame size (with the help of filters by symbol height).
- Incorrect operation of `_Bool`.
- Incorrect principal object opening with the `vpwfetch-srv` utility.
- Incorrect information on symbols displayed with the `vpwfetch` utility.
- Incorrect usage of images which don't have the Retain/Release interface.

### 29.2.4 Known bugs

- Incorrect recognition of Ukrainian police license plates at night (when using the IR projectors).
- Incorrect license plate coordinates with "Dynamics" mode on (in some cases).
- Incorrect recognition of Russian license plates which have the bolt near the administrative region ID.

### 29.2.5 Compatibility

Binary compatibility with the 2.5.6 version is lost.

## 30.1 general information

- Added support of double-line license plate recognition for the following countries: Brazil, Mongolia, Russian Federation, Kazakhstan, Moldavia.
- Added functionality for specifying license plate templates of country's administrative divisions. This feature is available for USA, Canada, Australia and UAE number plates.
- Added support of ARM v7 architecture (accelerated processing units).
- Added the **TLW** service for traffic lights state recognition.
- Implemented the automatic activation of inverse LPs recognition based on templates selected by user.
- Optimized the internal algorithms which led to increase in recognition speed and quality.
- Added intellectual filters by symbol height to decrease the number of wrong detections during recognition.

## 30.2 information for developers

### 30.2.1 Information for developers

- Modules of mathematical operations are added:
  - **vipm-ipp** — based on Intel IPP library;
  - **vipm-opencv** — based on OpenCV library.
- The **vpwi-almost** module is added for loading of all the country modules.
- New AutoSDKprotection modules (**vpwc**) are implemented.
- The following functionality is moved to separate modules:
  - Identification of administrative divisions where the recognized license plates belong.

- Mathematical operations on images and matrices (the **vipm** module).
- Modified and optimized functionality of symbols recognition module (**vpwsr**).
- The new LP templates naming (within each module) is introduced.
- In general, the number of modules required for loading decreased to two (**vpw** and **vpwi-...** modules).
- Simplified API usage:
  - there is no more need to harmonize the values of frame resolution parameters between different interfaces;
  - while recognition object opening (**VpwprincOpen**):
    - \* all available templates are selected automatically;
    - \* there is an opportunity to specify the recognition mode (freeflow or parking);
    - \* passing the structure with parameters is not necessary.
- Symbols recognizer specification (based on activated templates) is implemented.
- Utilities for testing the image processing functions are added.
- **VodiUTILS** library, which now supplements the **libVodi** library with the new functionality (e.g. image reading/saving), is added.
- New controllers for handling the active templates are added:
  - **VodiCTL\_GETVPWI**;
  - **VodiCTL\_ADDVPWI**;
  - **VodiCTL\_SETVPWI**;
  - **VodiCTL\_DELVPWI**.
- The **vodi\_plate\_info\_spec** structure is extended with the **pis\_exact\_quad** field (the rectangle which specifies the license plate coordinates within the frame).
- Recognition mask logging is added.
- Condition of results returning in “Dynamics” mode is changed. If **with\_duplicate** parameter is set to true, there won’t be strict orientation on recognition quality.

See the **AutoSDKuser** documentation for detailed functionality description.

### 30.2.2 Improvements

- Optimized the function for identifying the contours within the image.
- Eliminated the **vpw** recognition module’s direct dependency on OpenCV library.
- Added the new operations to **Vodiens** service (e.g. **VodiensForeach**).
- Improved the accuracy of license plates coordinates determination within the image.

### 30.2.3 Fixed Bugs

- Incorrect positioning of recognition zones within the frame (not corresponding to the settings).
- Incorrect license plate templates selection (in some cases).
- Incorrect logging of AutoSDKsettings.
- Incorrect determining of symbols coordinates.
- Incorrect symbols filtering by height.
- Incorrect detection of double-line numbers.

### 30.2.4 Known Bugs

In rare cases the incorrect license plate coordinates are returned (with “Dynamics” mode on).

### 30.2.5 Main difference from 2.4.x versions

- The AutoSDKpackage size decreased due to elimination of modules number, as well as the new protection system. Unused files are removed (Vodi/Vimg-Grabber.h, platesdef.xml).
- It is not necessary to load the **vpwc-\*** and **vipaz-mlnn** libraries.
- The new naming of LP templates is established. The former numeration is marked as obsolete.
- Recognition quality decreased for the following license plate issuers: Uzbekistan, Mexico, Netherlands, Costa Rica, Belgium. As for the rest of the supported countries, the recognition quality increased.
- Half-inversed license plates of Azerbaijan (ID 1233) are removed.
- The Arabic LP templates don't have the escape character.
- Several controllers are marked as obsolete and will not be used in the future:
  - VodiCTL\_VPW\_PRINCIPAL\_ENABLE;
  - VodiCTL\_VPW\_RUNNING\_TIME;
  - VodiCTL\_VPW\_IMAGE\_WIDTH;
  - VodiCTL\_VPW\_IMAGE\_HEIGHT;
  - VodiCTL\_VPW\_IMAGE\_BRIGHTNES;
  - VodiCTL\_VPW\_IMAGE\_CONTRAST;
  - VodiCTL\_VPW\_IMAGE\_REVERSED;
  - VodiCTL\_VPW\_IMAGE\_ANGLE;

- VodiCTL\_VPW\_MD\_ENABLE;
  - VodiCTL\_VPW\_MD\_CELL\_SIZE;
  - VodiCTL\_VPW\_MD\_THRESHOLD;
  - VodiCTL\_VPW\_MD\_SQUARE\_MIN;
  - VodiCTL\_VPW\_MD\_MASK;
  - VodiCTL\_VPW\_MD\_MASK\_H\_SIZE;
  - VodiCTL\_VPW\_MD\_MASK\_V\_SIZE.
- Wide ranges recognition is not supported now, so the following controllers were deleted:
    - VodiCTL\_VPW\_PLATE\_EXTRA\_RANGES\_ANALYSE;
    - VodiCTL\_VPW\_PLATE\_CLOSE\_MASK\_SIZE;
    - VodiCTL\_VPW\_PLATE\_BHAT\_MASK\_SIZE.
  - Number of binarization levels cannot be set (VodiCTL\_VPW\_PLATE\_BIN\_LEVEL\_COUNT.).
  - The principal (recognition object) opening interface is changed.