

Smart ID Engine v. 1.1

Technical Reference Manual

Contents

Abbreviations and their meanings.....	2
General Information	2
Software concise description	2
Software Key Features.....	2
Architecture and Software Sizing (или Software Architecture Volume).....	4
Software interfaces (или Interface-based Programming).....	5
Functionality.....	6
The List of recognized documents.....	8
Interoperability	13
Computer Architecture	13
Operating Systems	13
Russian computer systems.....	13

Abbreviations and their meanings

Smart ID Engine, SOFTWARE – the computer program "Smart ID Engine", certificate of state registration of the computer program № 2020616758. Registered in the computer program registry on 22.06.2020

General Information

Software concise description

Smart ID Engine is a cross-platform, autonomous software which recognizes and detects ID document forgery, ownership documents, visas and other documents used for identification and access control, in a video stream, photo or image.

Smart ID Engine does NOT transmit customers' personal data for processing to third-party services and/or third parties for manual data input, does NOT save data - the recognition process is carried out on the device's RAM and does NOT require any kind of connection to Internet.

Using Smart ID Engine, it is NOT necessary to consent to processing of customers' personal data.

Software Key Features

GreenOCR. Developed as part of the Green AI ("green" artificial intelligence) initiative, GreenOCR technology provides superior recognition quality and speed with minimal power consumption and environmental impact.

Accuracy. A new generation of OCR technologies is used, which demonstrates outstanding quality among traditional approaches by using the latest achievements in computational intelligence and deep learning.

Security. Data is NOT transmitted, NOT stored, Internet access is NOT required, and data processing is performed in RAM. This “the rule of three NOT” ensures a high security level for our clients. The whole recognition process is run directly on end-user devices in offline mode without network data transmission, which is confirmed by the independent international audit.

Four-Dimensional OCR. The use of computational geometry, anytime algorithms and the integration of the results have become the key components of recognition in the video stream, especially under low sunlight conditions or excessive light (twilight, sunlight) and at different angles.

Speed. The original integer image processing pipeline, which includes 8- and 4-bit deep neural network architectures, provides high recognition speed even on old smartphones due to maximum using of hardware resources.

On-device/On-premise. The recognition process is performed on devices without data transmission and does not require **immense/additional** computational resources, which allows you to run it even on common low-end devices (thin clients, data collection terminals, mobile sales registers/service, etc.) and use it for robotic process automation (RPA).

Efficiency. The highest performance has been achieved due to computer vision algorithms and compact deep neural networks. Automatic recognition of a 12-megapixel **photo/image** takes 0.25 seconds. The architecture and performance allow you to create high-performance recognition solutions based on Smart ID Engine for several thousands of documents per hour.

Reliability. To increase the reliability of the result, the “I recognize what I see” approach is implemented. This approach involves **advanced/innovative** achievements in AI: accurate recognition without dictionaries and grammars, reliable and compact networks. In addition to the recognition results, the user has access to confidence assessment, information about the presence of glare (including their **coordinates/location/position**), and other information about the recognition process.

Computational Document Forensic. Smart ID Engine detects signs that may indicate digital or physical forgery of ID documents. The proprietary algorithm implements an integrated approach to the analysis of information available in a document: from cross-validation of data, checking the validity of a document and calculating checksums, and ending with a neural network analysis of important features of a document blank.

Key features. Smart ID Engine provides recognition of a wide class of ID documents: passports, identification cards (ID cards), residence permits, visas, driver's licenses and certificates of birth, death, marriage, divorce and vehicle registration. Automatic recognition of more than 1300 different documents from 210+ jurisdictions is supported.

Convenience. Smart ID Engine algorithms automatically detect the document in the frame, automatically detect the document type, find the details and recognize them. Smart ID Engine is resistant to various geometric distortions, noise, **light changes/different lighting conditions**, excessive or insufficient lighting, printing defects and low resolution.

Functional coverage. Smart ID Engine allows you to recognize documents in almost 93 languages worldwide, both using Cyrillic or Latin alphabets and languages where Korean, Chinese

and Japanese scripts are used. Smart ID Engine automatically **finds/detects** photos, stamps and signatures.

Video Stream. Smart ID Engine uses video stream recognition received directly from a mobile device's camera or a simple webcam. This allows you to automatically determine when the most accurate result is achieved. Smart ID Engine automatically selects and presents the best frame for biometric identification.

Photos. Smart ID Engine provides high accuracy not only in the video stream, but also in **individual/selected** photos in conditions of projective distortion, different lighting conditions, digital noise and low resolution.

Web and Document cameras. Smart ID Engine is compatible with various web and document cameras. Data entry using a webcam takes 1.5-2 seconds, which is comparable to specialized passport scanners and much faster than conventional flatbed scanners.

Face matching. The technology allows you to compare the face ID image with the holder's face in another photo including a selfie taken by the user.

Document liveness. Smart ID Engine detects the use of forged documents, photocopies, as well as ID images from a computer screen, tablet or smartphone. The algorithms used to solve this problem detect holographic security elements, special visual security elements (monograms, ornaments, etc.), check the geometry of the form, and also control the behavior of the document in real conditions of observation in the video stream and on separate frames. The “liveness” detector, according to its principle of operation, belongs to the “passive” class, that is, it does not require the user to perform special actions.

Architecture and Software Sizing (или Software Architecture Volume)

Smart ID Engine consists of the following modules:

1. The main library is a binary code designed for different computer architectures run by different operating systems.
2. The configuration for document recognition (или Configuring Document Recognition Setting) is in a separate configuration file which is called the "bundle file".

The implemented mechanism allows you to initially integrate only the binary code (the library itself) into the client solution and load the necessary configuration (the necessary bundle file) as necessary, depending on the required documents.

The following table shows the size of the dynamic binary library (in MB) for the most common cases:

Operating System	The Library Size, MB
Android	15
CentOS 6	22
CentOS 7	22
MacOS	20
Ubuntu 14.04	22
Ubuntu 16.04	23
Windows 32 bit	12
Windows 64 bit	16

The typical size of the main configurations (bundle files) is shown in the following table:

Configuration File	Bundle-file Name	Size, MB
CIS Documents (mobile mode)	bundle_cis_mobile.zip	17
CIS Documents (server mode)	bundle_cis_server.zip	17
Russian Documents (mobile mode)	bundle_full_mobile.zip	11
Russian Documents (server mode)	bundle_full_server.zip	11
Worldwide documents (mobile mode)	bundle_international_mobile.zip	126
Worldwide documents (server mode)	bundle_international_server.zip	125
Russian Documents (server mode)	bundle_passport_anywhere.zip	3
Russian Documents (mobile mode)	bundle_passport_mobile_fullpage.zip	3

Software interfaces (или Interface-based Programming)

Smart ID Engine contains APIs for the following programming languages:

Name	Version
C (C11 standard and later)	1.0.0
C++ (standard C++11 and later)	1.0.0
C# (version 6.0 and later)	1.0.0
Java (version 1.7 and later)	1.0.0
Python (version 3.7.2 and later)	1.0.0

PHP (version 5 and later)	1.0.0
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The following SDKs are supported:

Name	Version
React	1.0.0
Flutter	1.0.0

Integration with other programming languages is provided by using the C-language API.

Examples of Software integration

The SDK already contains examples of using Smart IDReader in C/C++/C#/Java/PHP/Python. Additional materials and examples of Smart IDReader integration are available on the website:

<https://github.com/SmartEngines>

Functionality

Item	Version
Text field recognition in a visually controlled area	1.0.0
Machine readable zone (MRZ) recognition and decoding in accordance with the ISO/ICAO standard	1.0.0
Font-independent text recognition (see the list of supported languages below)	1.0.0
Single-line and multi-line text field recognition	1.0.0
Recognition of both all document fields and part of the fields from the document given in the input parameters	1.0.0
Simultaneous adjacent document pages recognition (for a number of CIS passports holders and other ID documents worldwide)	1.0.0
Extracting predefined image document fields	1.0.0
Extracting customized graphic document fields	1.0.0
Document image reset given specified field masking	1.0.0
Automatic detection of handwritten fields (page 2 and 3 of the ordinary Russian passport)	1.0.0
Handwritten text recognition (HTR) (page 2 and 3 of the ordinary Russian passport)	1.0.0
MRZ recognition in accordance with the standards	1.0.0
Scanned documents recognition	1.0.0

Photo-captured documents recognition	1.0.0
Support for a wide range of image resolutions of recognized documents from 100 to 600 dots per inch (dpi)	1.0.0
Video sequence recognition (ordered frame sequence)	1.0.0
Colour (RGB) and single channel gray-scale image recognition	1.0.0
Recognition of rotated images by an angle multiple of 90 degrees	1.0.0
Recognition of a skewed document up to 5 degrees	1.0.0
Preliminary (before text recognition) automatic document type identification by its image and field recognition of the identified document type	1.0.0
Document recognition without ROM usage (temporary and intermediate data storage on the ROM memory)	1.0.0
Information recognition without reference to resources external to the device (application servers, on-line services, etc)	1.0.0
Document fields and the individual details reset for each input image	1.0.0
Independent frame recognition while processing a video sequence	1.0.0
Integration of results of each frame independent recognition when processing a video sequence	1.0.0
The reset of the “best” document holder’s photo when processing a video sequence	1.0.0
The reset of the “best” document template image when processing a video sequence	1.0.0
Data verification of the visually controlled document zone with the MRZ data zone	1.0.0
Hash total monitoring of all numeric fields in the MRZ zone	1.0.0
Integrity monitoring of the MRZ zone (presence of all necessary MRZ elements)	1.0.0
Document validity check, logical checks of the date of birth, date of issue and validity period	1.0.0
Required fields monitoring in the visually controlled area	1.0.0
Cross-validation check within the single document data	1.0.0
Control of the document form compliance (check of individual (graphic) document form features and compliance of the document form with other document data)	1.0.0
Control of necessary graphic elements (required elements check)	1.0.0
Document colour control	1.0.0
Control of the MRZ font authenticity	1.0.0
Font authenticity control of individual fields in the visually controlled area	1.0.0
Holograms check (hologram document detection and control of their presence in the required place)	1.0.0

Screen capture control (detection of the fact that the document image was taken from a screen, monitor, tablet, etc.)	1.0.0
Document signature control	1.0.0
Document holder's photo control	1.0.0
Data recognition from graphic elements (seals, stamps, logos, etc.)	1.0.0
Control of document security elements in the UV and IR ranges	1.0.0
The use of 8-and 4-bit deep neural network architectures for text and graphic elements recognition	1.0.0
Document liveness detection	1.0.0
Automatic document type selection mode	1.0.0
Face matching	1.0.0
Ability to control the number of worker threads	1.1.0
Parallel configuration	1.1.0

The List of recognized documents

Smart ID Engine supports recognition of more than 1540 different document types, including:

- Passports – 193 UN member states + 17 additional jurisdictions
- ID cards – 151 countries worldwide
- Driver’s license – 116 countries worldwide
- Visas – 37 countries worldwide
- Residence permits – 42 countries worldwide
- Work permits – The USA, Singapore, The Russian Federation
- Birth, death, marriage, divorce, name change certificates – The Russian Federation
- Vehicle registration certificate– 15 countries worldwide
- Medical (Health) insurance cards – The USA, The Russian Federation, France
- Social security cards – The Russian Federation
- Military ID cards – The Russian Federation
- Refugee travel documents – The Russian Federation
- Temporary ID documents – The Russian Federation

The key documents supported by Smart ID Engine is listed below:

Appliance	Version
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Passports of all UN member States	1.0.0
European ID cards	1.0.0
ID cards of the CIS member States	1.0.0
Mexican ID cards	1.0.0
Australian ID cards	1.0.0
US driver's license	1.0.0
Canadian driver's license	1.0.0
Mexican driver's license	1.0.0
Australian driver's license	1.0.0
European driver's license	1.0.0
Driver's license of the CIS member States	1.0.0
US Health insurance card	1.0.0
French Health insurance card	1.1.0
US work permits	1.0.0
Singaporean work permits	1.0.0
Russian work permits	1.0.0
Russian birth, death, marriage, divorce, name change certificates	1.0.0
Compulsory Health Insurance (Russia)	1.0.0
Vehicle registration certificate (Russia)	1.0.0
Vehicle registration card (Russia)	1.0.0
Insurance Number of Individual Ledger Account (SNILS in Russia)	1.0.0
Military ID card (Russia)	1.0.0
Individual Taxpayer Number/ Taxpayer Identification Number (INN in Russia)	1.0.0
Migration card (Russia)	1.0.0
Temporary ID documents (Russia)	1.0.0
Permanent residence registration (Russia)	1.0.0

The full list of supported document types is provided in a separate document.

Smart ID Engine supports document recognition of 193 countries which are members of the United Nations (UN):

Appliance	Version
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<p>The Commonwealth of Australia, The Republic of Austria, The Republic of Azerbaijan, The Republic of Albania, The People's Democratic Republic of Algeria, The Republic of Angola, The Principality of Andorra, Antigua and Barbuda, The Argentine Republic, The Republic of Armenia, The Islamic Republic of Afghanistan, The Commonwealth of the Bahamas, The People's Republic of Bangladesh, Barbados, The Kingdom of Bahrain, Belarussia, Belize, Belgium, The Republic of Benin, The Republic of Bulgaria, The Plurinational State of Bolivia, Bosnia and Herzegovina, The Republic of Botswana, The Federative Republic of Brazil, The Nation of Brunei, Burkina Faso, The Republic of Burundi, The Kingdom of Bhutan, The Republic of Vanuatu, Great Britain, Hungary, The Bolivarian Republic of Venezuela, The Democratic Republic of Timor-Leste, The Socialist Republic of Vietnam, The Gabonese Republic, The Republic of Haiti, The Co-operative Republic of Guyana, The Republic of The Gambia, The Republic of Ghana, The Republic of Guatemala, The Republic of Guinea, The Republic of Guinea-Bissau, The Federal Republic of Germany, The Republic of Honduras, Grenada, The Hellenic Republic, Georgia, The Kingdom of Denmark, The Republic of Djibouti, The Commonwealth of Dominica, The Dominican Republic, The Arab Republic of Egypt, The Republic of Zambia, The Republic of Zimbabwe, The State of Israel, India, The Republic of Indonesia, The Hashemite Kingdom of Jordan, The Republic of Iraq, The Islamic Republic of Iran, The Republic of Ireland, Iceland, Spain, Italy, The Republic of Yemen, The Republic of Cabo Verde, The Republic of Kazakhstan, The Kingdom of Cambodia, The Republic of Cameroon, Canada, The State of Qatar, The Republic of Kenya, The Republic of Cyprus, The Kyrgyz Republic, The Republic of Kiribati, China, The Republic of Colombia, The Union of the Comoros, The Republic of The Congo, The Democratic Republic of the Congo, North Korea, South Korea, The Republic of Costa Rica, The Republic of Côte d'Ivoire, The Republic of Cuba, The State of Kuwait, The Lao People's Democratic Republic, The Republic of Latvia, The Kingdom of Lesotho, The Republic of Liberia, The Lebanese Republic, The State of Libya, The Republic of Lithuania, The Principality of Liechtenstein, The Grand Duchy of Luxembourg, The Republic of Mauritius, The Republic of Madagascar, The Republic of Malawi, Malaysia, The Republic of Mali, The Republic of Maldives, The Republic of Malta, The Kingdom of Morocco, The Republic of the Marshall Islands, The Islamic Republic of Mauritania, The United Mexican States, The Republic of Mozambique, The Republic of Moldova, The Principality of Monaco, Mongolia, The</p>	<p>1.0.0</p>
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Republic of The Union of Myanmar, The Republic of Namibia, The Republic of Nauru, The Federal Democratic Republic of Nepal, The Republic of The Niger, The Federal Republic of Nigeria, The Netherlands, The Republic of Nicaragua, New Zealand, The Kingdom of Norway, The United Arab Emirates, The Sultanate of Oman, The Islamic Republic of Pakistan, The Republic of Palau, The Republic of Panama, The Independent State of Papua New Guinea, The Republic of Paraguay, The Republic of Peru, The Republic of Poland, The Portuguese Republic, The Russian Federation, The Republic of Rwanda, Romania, The Republic of El Salvador, The Independent State of Samoa, The Republic of San Marino, The Democratic Republic of Sao Tome and Principe, The Kingdom of Saudi Arabia, The Republic of North Macedonia, The Republic of Seychelles, The Republic of Senegal, The Federation of Saint Kitts and Nevis, Saint Lucia, The Republic of Serbia, The Republic of Singapore, The Syrian Arab Republic, The Slovak Republic, The Republic of Slovenia, The United States of America, The Solomon Islands, The Federal Republic of Somalia, The Republic of the Sudan, The Republic of Suriname, The Republic of Sierra Leone, The Republic of Tajikistan, The Kingdom of Thailand, The United Republic of Tanzania, The Togolese Republic, The Kingdom of Tonga, The Republic of Trinidad and Tobago, Tuvalu, The Republic of Tunisia, Turkmenistan, The Republic of Turkey, The Republic of Uganda, The Republic of Uzbekistan, The Ukraine, The Oriental Republic of Uruguay, Micronesia, The Republic of Fiji, The Republic of The Philippines, The Republic of Finland, The French Republic, The Republic of Croatia, The Central African Republic, The Republic of Chad, Montenegro, The Czech Republic, The Republic of Chile, The Swiss Confederation, The Kingdom of Sweden, The Democratic Socialist Republic of Sri Lanka, The Republic of Ecuador, The Republic of Equatorial Guinea, The State of Eritrea, The Republic of Estonia, The Federal Democratic Republic of Ethiopia, The Republic of South Africa, The republic of South Sudan, Jamaica, Japan

Smart ID Engine supports document recognition of 23 jurisdictions:

Appliance	Version
Abkhazia, Aruba, Anguilla, Bermuda, Curacao, The Cayman Islands, The British overseas territories, Gibraltar, Hong Kong, Macao, Montserrat, Palestine, French Polynesia, The Republic of Kosovo, Saint Helena Islands, Ascension and Tristan da	1.0.0

Cunha, Sint Maarten (Dutch part), The Turks and Caicos Islands, Taiwan, The African Union, The Holy See, The British Virgin Islands, The Economic Community of West African States, Order of Malta	
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Smart ID Engine supports document recognition in 99 languages:

Appliance	Version
The Cyrillic script (Russian, Abkhazian, Belarusian, Bulgarian, Kazakh, Kyrgyz, Mongolian, Ossetian, Serbian, Tajik, Uzbek, Ukrainian)	1.0.0
Latin script (English, Azeibarjan, Aymara, Albanian, Afrikaans, Berber, Bosnian, Hungarian, Woleai, Haitian Creole, Danish, Zulu, Indonesian, Irish, Icelandic, Spanish, Italian, Cantonese, Castilian, Catalan, Quechuan, Comorian, Xhosa, Latvian, Lithuanian, Luxembourgish, Macedonian, Malay, Maltese, Mandarin, Maori, Moldovan, Nauruan, Ndaou, Ndebele, German, Dutch, Norwegian, Palau, Polish, Portuguese, Rwanda, Romanian, Rundi, Swazi, North Soto, Seychelles Creole, Sesotho, Slovak, Slovenian, Somali, Swahili, Tamazight, Tetum, Tok Pisin, Tonga, Tswana, Tsonga, Turkish, Turkmen, Fiji Hindi, Fijian, Filipino, Finnish, French, Croatian, Chewa, Czech, Chibarve, Chichewa, Shangani, Swedish, Shona, Estonian, Southern Ndebele)	1.0.0
Chinese (classic, 20,000 characters)	1.0.0
Japanese (Hiragana, Katakana and Kanji)	1.0.0
Korean (Hangul)	1.0.0
Sinhalese	1.0.0
Greek	1.0.0
Georgian	1.0.0
Armenian	1.0.0
Hebrew language	1.0.0
Arabic	1.0.0
Persian	1.0.0
Urdu	1.0.0
Tamilian	1.0.0

Interoperability

Computer Architecture

Smart ID Engine works without emulation mode on the following computer architectures:

Name	Version
x86	1.0.0
x86_64	1.0.0
ARMv7-v8 (AArch32 и AArch64)	1.0.0
MIPS (MIPS32 и MIPS64)	1.0.0
Elbrus	1.0.0

Operating Systems

Smart ID Engine independently functions on computing devices running the following operating systems (OS):

Name	Version
Android (version 5.1 and later)	1.0.0
iOS (version 9 MS Windows для ПК)	1.0.0
Sailfish Mobile OS (version 2.2 and later)	1.0.0
OC Аврора (version 3.1.0 and later)	1.0.0
MS Windows for PC (version 7.0 and later)	1.0.0
Ubuntu (version 14.04 and later)	1.0.0
CentOS (version 6 and later)	1.0.0
SUSE Linux Enterprise Server (version 12 and later)	1.0.0
Astra Linux (version 1.6 and later)	1.0.0
RED OS (version 7 and later)	1.0.0
macOS (version 10.13 High Sierra and later)	1.0.0
OSL (version 8.11 and later)	1.0.0

Russian computer systems

Smart ID Engine supports the following Russian computer systems at the machine-instruction level:

Name	Version
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Elbrus-4S	1.0.0
Elbrus-8S	1.0.0
Elbrus-8SV	1.0.0
Elbrus-1S+	1.0.0
Elbrus-2S+	1.0.0
Elbrus-16S	1.0.0
THE KOMDIV-32 (1890BM2T, 5890BE1T, 1900BM2T)	1.0.0
THE KOMDIV-64 (1890BM5Φ, 1890BM6Я, 1890BM8Я)	1.0.0
THE KOMDIV-128 (1890BM7Я, 1890BM9Я)	1.0.0
Baikal-T1	1.0.0
Baikal-M	1.0.0