Mühlbauer
High Tech International

IMAGE ENHANCEMENT

SOFTWARE SOLUTION

CONTENTS

MÜHLBAUER GROUP AT A GLANCE 4

MB IMAGE ENHANCEMENT

Quality Portraits for Identification Documents 6

Solution Features 7

IMAGE PROCESSING 8

Requirements 8

Automatic Processing 8

Manual Verification 8

Manual Corrections 8

AUTOMATED PROCESSING STEPS 9

Rotation Adjustment 9

Background Removal 9

Image Clipping 9

Image Optimization 9

Background Re-Filling 9

ICAO-Compliance Check 9

Format Conversion & Compression 9

Final Image 9

TEST APPLICATION 10

Configurable Features 10

MÜHLBAUER GROUP AT A GLANCE

MÜHLBAUER'S BUSINESS UNITS AND SITES

Founded in 1981 in the heart of Bavaria, the Mühlbauer Group has ever since grown to a leading global player in the fields of Parts & Systems, Semiconductor Related Products, Document Solution Related Products and TECURITY® Solutions. With around 3,500 employees, technology centers in Germany, Malaysia, Slovakia, the U.S.A. and Serbia and 35 sales and service locations worldwide, Mühlbauer created a strong competence network around the globe.
We continuously invest in the latest technologies and innovative processes to enhance our competences and provide you with optimized solutions. Our in-house precision part production MPS – Mühlbauer Parts & Systems – guarantees unlimited flexibility and highest customer satisfaction.

Our business unit AUTOMATION does not only develop and assemble individually customized production systems, but also provides matching software solutions for the production process of Document and Solution Related Products. Vision inspection technologies as well as semiconductor and RFID applications complete our comprehensive portfolio.
Our business unit TECURITY® is established as a competent partner for the implementation of security systems for identifying and verifying both documents and individuals. Our clients benefit from more than three decades experiential value which we have gained during the realization of over 300 ID projects worldwide.

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AUTOMATION
Production Equipment & Systems

WORLD OF TECURITY®
Government & Technology Solutions

MB IMAGE ENHANCEMENT

QUALITY PORTRAITS FOR IDENTIFICATION DOCUMENTS

The Mühlbauer Image Enhancement Library is a set of easy-to-use image processing libraries for desktop software solutions for biometric system developers and integrators. It complements biometric data acquisition and fulfills the handling, enhancement and quality check of captured face images.

Automated data optimization and evaluation is fairly complex and has to be handled carefully in order to assure that face images are suitable for optical personalization and automated face recognition systems. Moreover, manual quality assurance and correction functions should be provided, in case automatic processing fails.

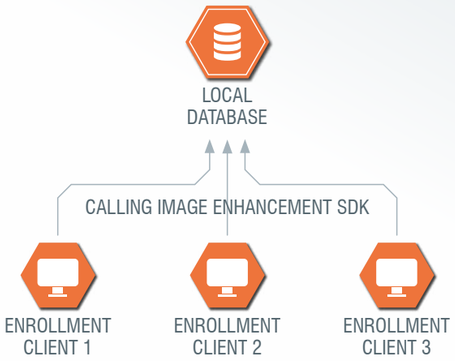


Image Enhancement Library position in a typical enrollment system topology

Our technology ensures system performance and reliability with various state-of-the-art image processing functions. The MB Image Enhancement Library is typically used in data enrollment environments with a need for face image capturing and its preparation for biometric data verification, identification or printing.

An integration of the library is done on programming level and requires extensive knowledge about image processing. The integrator has complete control over the library's data input and output.

SOLUTION FEATURES

FACE FINDING
Recognizing the face in a captured image & extracting it

IMAGE CROPPING
Cutting & resizing the image according to defined settings

POSITION CORRECTION
Rotating & aligning the image horizontally & vertically

COLOR CORRECTION
Adjusting the color palette & white balance

BRIGHTNESS & CONTRAST ADJUSTMENT
Adjusting of the image's brightness & contrast

BACKGROUND REMOVAL / MANIPULATION
Extracting the face from the background & inserting a new background

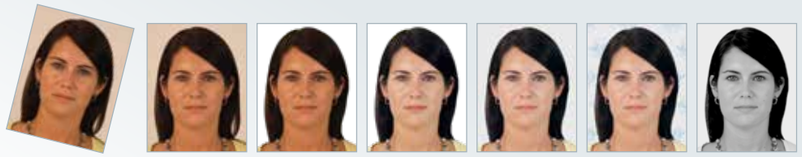
IMAGE CHECK & EVALUATION
Checking & evaluating the image quality according to ICAO recommendations

INTUITIVE APPLICATION PROGRAMMING INTERFACE (API)
Easy to integrate into any software solution

IMAGE PROCESSING

REQUIREMENTS

The biometric data captured during the enrollment procedure need to be optimized and digitally enhanced by processing the images either manually or automatically. This is necessary to both improve the quality and ensure compliance with international standards.



AUTOMATIC PROCESSING

The objectives of facial image processing are the automatic preparation and quality enhancement of the digitized passport photos.

THE FOLLOWING PROCESSING STAGES MUST BE RESPECTED:

- Positional correction of the original image (i.e. twisted paste-up)
- Extraction of the facial contour & elimination of the background
- Face extraction & image cropping according to ICAO standards
- Color, contrast & brightness correction
- Reducing shadows & increasing sharpness
- Background filling with homogenous color according to ICAO standards
- Image assessment, including ICAO-compliance check

MANUAL VERIFICATION

Inaccuracies may occur during automatic image processing. Therefore a manual verification of the processed images is recommended. During this quality assurance procedure all processed images are undergoing close scrutiny. Images with inaccuracies can be selected for manual correction; heavily damaged images can be rejected.

MANUAL CORRECTIONS

Images with inaccuracies can be manually corrected with a specialized software tool that supports efficient image manipulation. A special user guidance ensures that only the processing steps which have caused an inaccuracy are touched.
The operator can make appropriate graphic corrections via simple, easily manageable tools. This also applies to any necessary touch-ups regarding brightness, contrast or color cast elimination.

AUTOMATED PROCESSING STEPS

ROTATION ADJUSTMENT

- Fault-tolerant image acceptance
- Correct positioning of the face
- Eyes on a horizontal line

BACKGROUND RE-FILLING

- ICAO-compliant background (white or 18% grey)
- Possibility to insert a new background

BACKGROUND REMOVAL

- Background is treated separately
- Increased contrast between face & background

ICAO-COMPLIANCE CHECK

- Frontal pose
- Eyes open
- Uniform lighting
- Head size & position
- Image dimensions

IMAGE CLIPPING

- Correct size
- Centered face
- Several modes, e.g. eye distance

FORMAT CONVERSION & COMPRESSION

- Conversion according to requirements
- Image compression based on settings

IMAGE OPTIMIZATION

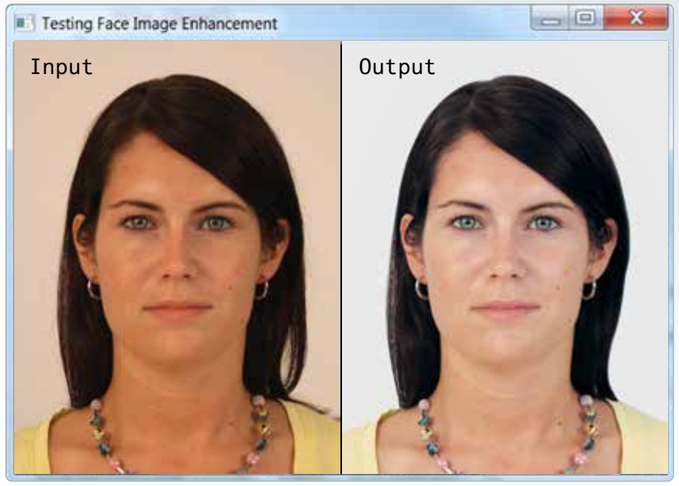
- Correct & natural appearance of the face
- Color, contrast & brightness optimization
- Shadow correction

FINAL IMAGE

- Optimized full frontal images
- Compliant with ISO / IEC standard 19794-5: 2005
- Suggested capturing resolution 1200 x 1600 pixels, i.e. far above the required minimum of 354 x 472 pixels
- File size after compression: aproximately 20KB

TEST APPLICATION

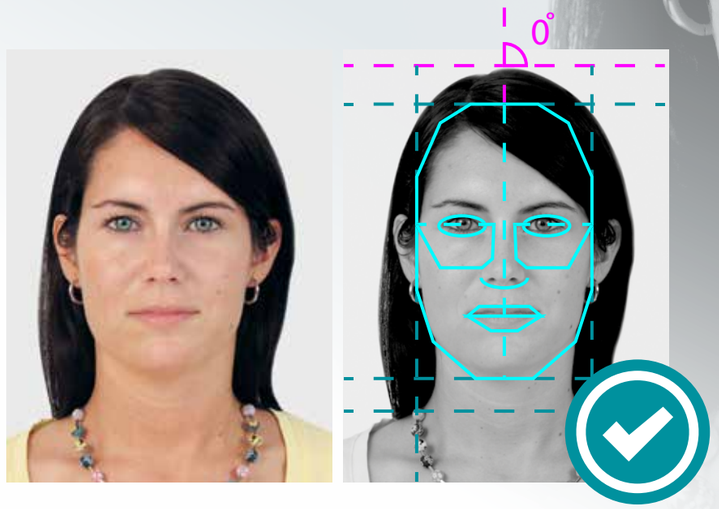
The test application of MB Image Enhancement SDK (Software Development Kit) demonstrates the capability and provided functions for enhancing facial images. An input file is automatically processed by a set of configurable features and the enhanced image is saved in an output file.



Original image (input, left) and enhancement result (output, right)

CONFIGURABLE FEATURES:

- Rotation adjustment
- Correct positioning of the face
- Image cropping
- Correct size
- Centered face
- Background removal
- Histogram adjustment
- Unsharp mask
- Optimized contrast between person & background
- Brightness & contrast optimization
- Shadow correction
- Color & contrast adjustment
- Background refilling: unicolor or pattern (e.g. resized or tiled logo)



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Mühlbauer
High Tech International

MÜHLBAUER ID SERVICES GMBH
Josef-Mühlbauer-Platz 1 | 93426 Roding | Germany
Tel.: +49 9461 952 0 | Fax: +49 9461 952 1101
Mail: info@muehlbauer.de | Web: www.muehlbauer.de

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