New Since June 2021

- Version 2.2
  - Pre-processing bug fixes
  - Other improvements
  - Updated conformance test set
- NIST IR 8382
- Signed Windows, macOS binaries
- Raspberry Pi OS
Implementation Trim Off-By-One Bug

**ISO/IEC 29794-4:2017**

b) For each column $C_i$ in $I$, starting from the left

1) Compute the column arithmetic mean $\mu_{col}$

2) On the first occurrence where $\mu_{col} \leq T_\mu$, set $idx_l = i$

3) On the last occurrence where $\mu_{col} \leq T_\mu$, set $idx_r = i$

**NFIQ 2.0.0 through 2.1**

```c
// start from left of image and find left index that is already part of
// the fingerprint image
int leftIndex = 0;
for (int j = 0; j < img.cols; j++) {
    double mu = computeMuFromColumn(j, img);
    if (mu <= MU_THRESHOLD) {
        // Mu is not > threshold anymore -> left index found
        if (j == 0) {
            leftIndex = j;
        } else {
            leftIndex = (j - 1);
        }
    } else {
        break;
    }
}
// now crop image according to detected border indices
int width = rightIndex - leftIndex + 1;
```

**NFIQ 2.2**

```c
if (mu <= MU_THRESHOLD) {
    // Mu is not > threshold anymore -> left index found
    if (j == 0) {
        leftIndex = j;
    } else {
        leftIndex = (j - 1);
    }
    leftIndex = j;
    break;
}
```

- left = 1
- right = 1
- width = right − left + 1 = 1

https://github.com/usnistgov/NFIQ2/issues/298
ISO/IEC 29794-4:2017

b) For each column \( C_i \) in \( I \), starting from the left

1) Compute the column arithmetic mean \( \mu_{\text{col}} \)

2) On the first occurrence where \( \mu_{\text{col}} \leq T_\mu \) set \( \text{idx}_i = i \)

3) On the last occurrence where \( \mu_{\text{col}} \leq T_\mu \) set \( \text{idx}_r = i \)

// start from left of image and find left index that is already part of
// the fingerprint image
int leftIndex { 0 }, rightIndex { img.cols - 1 };
for (; leftIndex < img.cols; ++leftIndex) {
  if (computeMuFromColumn(leftIndex, img) <= MU_THRESHOLD) {
    break;
  }
}

// If we traversed all the columns, then we don't need to check starting
// from the other side.
if (leftIndex >= img.cols) {
  // If we traversed all columns and never found data, we can stop
  throw NFIQ2::Exception { NFIQ2::ErrorCode::InvalidImageSize,
    "All image columns appear to be blank"};
} else {
  // start from right of image and find right index that is
  // already part of the fingerprint image
  for (; rightIndex >= leftIndex; --rightIndex) {
    left = width - 1 = 2
    right = width - 1 = 2
    \( w = \text{right} - \text{left} + 1 = 3 \)
    \( \text{left} = \text{width} \implies \text{invalid} \)
    Bonus! Don’t redo work
}

https://github.com/usnistgov/NFIQ2/issues/306
Standard Weakness?: Off-White Constant

ISO/IEC 29794-4:2017

a) For each row $R_i$ in $I$, starting from the top
   1) Compute the row arithmetic mean $\mu_{row}$
   2) On the first occurrence where $\mu_{row} \leq T_\mu$ set $idx_i = i$
   3) On the last occurrence where $\mu_{row} \leq T_\mu$ set $idx_p = i$

$\mu \cong 220 - 245$

$T_\mu = 250$

NFIQ 2.2: 36
NFIQ 2.2: 33
NFIQ 2.2: 39
NFIQ 2.2: 53

(crop likely not reasonable to expect from quality algorithm)
ISO/IEC 29794-4:2017

- For each row $R_i$ in $I$, starting from the top
  1) Compute the row arithmetic mean $\mu_{row}$
  2) On the first occurrence where $\mu_{row} \leq T_\mu$ set $idx_1 = i$
  3) On the last occurrence where $\mu_{row} \leq T_\mu$ set $idx_p = i$

$\mu \approx 220 - 245$

$T_\mu = 250$

NFIQ 2.2: 36
$Q_{MIN}^{com} = 40$

NFIQ 2.2: 33
$Q_{MIN}^{com} = 25$

NFIQ 2.2: 39
$Q_{MIN}^{com} = 22$

NFIQ 2.2: 53
$Q_{MIN}^{com} = 38$

(crop likely not reasonable to expect from quality algorithm)
Implementation Weakness?: False Minutiae

Dirty optical platen

NFIQ 2.2: 35
$Q^\text{com}_{\text{MIN}}$: 30

NFIQ 2.2: 39
$Q^\text{com}_{\text{MIN}}$: 36

Image Source: NIST Special Database 302 (00002457_K_500_plain_06.png)
Implementation Weakness?: False Minutiae

NFIQ 2 Pre-processing Crop

Disabled

Enabled

Image Source: NIST Special Database 302 (00002362_R_500_slap_03.png)
Removal of Minimum Image Size

Minimum dimensions in FingerJet anticipate whitespace.

NFIQ 2.1: Error, too small
NFIQ 2.2: Pad

Minutiae Rejection Area

Image Source: NIST Special Database 302 (00002497_N_500_palm_08.png)
1 Scope

This document establishes
— terms and definitions for quantifying finger image quality,
— methods used to quantify the quality of finger images, and
— standardized encoding of finger image quality,

for finger images at 196,85 px/cm spatial sampling rate scanned or captured using optical sensors with capture dimension (width, height) of at least 1.27 cm × 1.651 cm.

(250x325 pixels)

Not enforceable.

Platen size cannot be inferred from image alone.
• Restores as many $Q_{29794-4} = [0-100]$ as possible.
• Adds sanity check images.
1. (More) Build cleanup
2. Android, iOS native (top 5 request)

... 

∞ Alternate impression types/sensors (top 5 request)
  • Data + algorithms are required.

Hello there! You can help! Yes, you!

https://github.com/usnistgov/nfiq2/issues
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