



Biometric Standards, Performance, and Assurance Laboratory



DEPARTMENT
OF
INDUSTRIAL TECHNOLOGY
PURDUE UNIVERSITY

A Statistical Analysis of Image Quality on Live, Generated, and Fake Fingers

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Problem

The problem of this study is to determine the difference in image quality between live, generated, and fake fingerprints by comparing quality scores and skin moisture content. A major active attack that can occur on biometric systems is spoofing or masquerading. This is an impersonation of one entity by another. There are previous studies that have successfully spoofed fingerprint devices, but there is little work published on the findings of these studies. According to Matsumoto, Matsumoto, Yamada, and Hoshino, "Security evaluation against attacks using such artificial fingers has been rarely disclosed." Therefore, a method must be determined for fingerprint scanners to distinguish between live, fake, and generated fingerprints.

Procedure

For this study, three groups of fingerprints were used:

- Live
- Fake
- Generated

Live prints

- Taken from database of previous study by N. Sickler
- Extract random samples and their corresponding quality scores and moisture content

Fake Prints

- Co-operatively lifted off of glass objects
- Lifted print is used to create a mold of the fingerprint
- Mold is used to generate fake prints
- Test quality score and moisture content of each print using QualityCheck by Aware

Generated Prints

- Generate banks of prints using SfinGe software
- Test quality score of each print using QualityCheck by Aware

Conclusions

- Study could be a possible way or partial method to distinguish between live, fake, and generated prints

Future Work

- Algorithm Development
- Collaboration within Purdue University and/or Additional Universities for specific research areas

Moisture Content

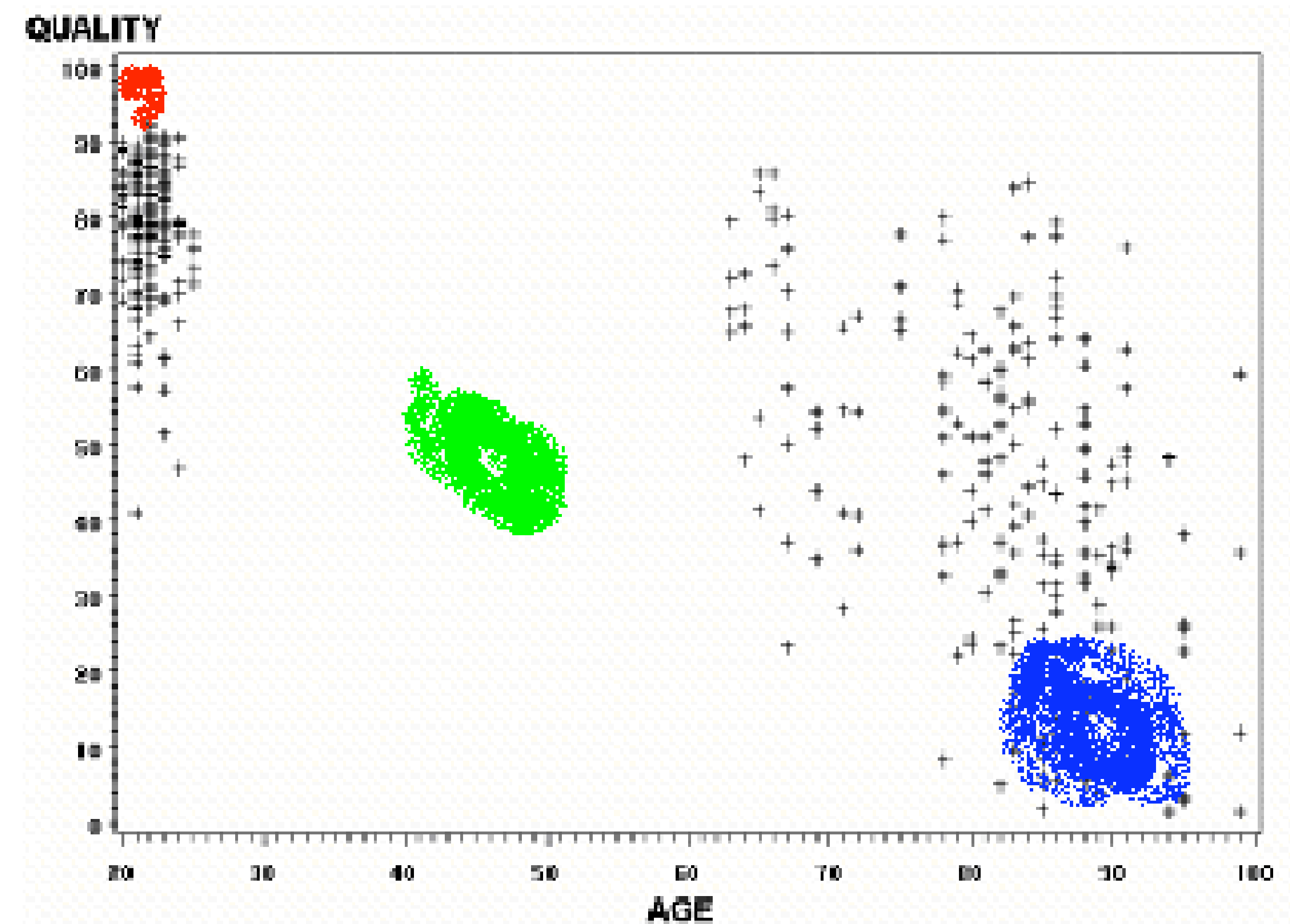


Figure 1 – Quality score of live images (Sickler, 2003).

Hypothesis

In the above figure from Sickler (2003), the red area of the graph shows almost perfect quality, the green area shows average quality, and the blue area shows poor quality. In analyzing this figure, no images acquired fell in the red area region of the graph. Therefore, if the quality of images collected from the created fake fingerprints or generated fingerprints fall in this region it could indicate that a print is too good and should not be accepted by the system. On the other hand, if the qualities of the images collected fall below 40 for 20 year olds it could indicate that a print is too poor and also should not be accepted by the system. If the images collected from the fake and generated prints fall in the green or blue zone of the graph a problem is introduced because the quality of the image will not be enough to distinguish between the live, fake, and generated prints.