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Study on Machine Learning Approach Using Fingerprint Recognition System

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Abstract—The pattern of Fingerprint are permanent and unchangeable on each finger during all the life. In situations where algorithmic methods are either unavailable or too computationally intensive, neural networks allow for the solution of issues. An application for neural networks that seems appropriate is the issue of feature extraction and classification. When compared to traditional technique, they give a substantial speed advantage. Fingerprints are distinctive and remain enduring throughout a person's life. The automatic fingerprint recognition system based on ridges and it's characteristics known as minutiae. It is extremely important to mark these minutiae accurately. In this work we have used ridge termination and ridge bifurcation as minutiae for fingerprint recognition system. At the time of analysis the approaches of attributes impart better result. With this technique recognition rate of this intended method of fingerprint recognition system using neural network is quite impressive. From the extraction outcome we may infer about a very affirmative impact of neural network on recognition rate.

Index Terms—Fingerprints, Feature extraction, Matching, Neural Network

I. INTRODUCTION

Fingerprint recognition refers to the automated method of identifying or confirming the identity of an individual based on the comparison of two fingerprints. Fingerprint recognition is one of the most well known biometrics, and it is by

far the most used biometric solution for authentication on computerized systems. The reasons for fingerprint recognition being so popular are the ease of acquisition, established use and acceptance when compared to other biometrics, and the fact that there are numerous (ten) sources of this biometric on each individual. A fingerprint is one of the more popularly used biometrics used in-person identification (Lee and Gaensslen, 2001). This is because fingerprints are easy to collect, examine, and classify. No two persons have been found with the same fingerprints and are found to be unique. Fingerprint characteristics never change throughout the age of a person. There are three basic fingerprint patterns: the arch, the loop, and the whorl. These patterns are defined by structures known as cores and deltas. The core of the print is the central area. A delta is a triangle-shaped area of a fingerprint where the ridge formation changes direction. The structure of The fingerprint and how The machine divides The overall fingerprint structure In different layers to identify it and learn the basic structure Of it: it is generally trained using A basic structural division of a fingerprint, (1) Global structure, (2) Low level structure, and (3) Low level structure. The first one represents the overall shape of the finger. Thus, the second one represents the valleys and ridges format at local intersecting region, and the later. i.e the low level structure represents the sweat pores on the fingerprint skin. Manual observations of a fingerprint are prone

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to inconsistency and can lead to errors (Ulery et al., 2011).

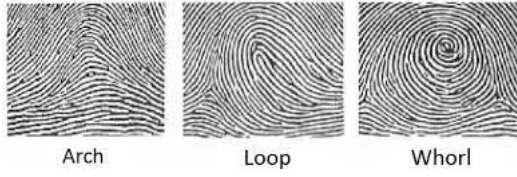


Fig. 1. Types of fingerprints

manual fingerprint matching is time-consuming and may lead to errors. The most widely used system is automatic fingerprint identification system (AFIS) which has replaced human experts in fingerprint recognition as well as classification.

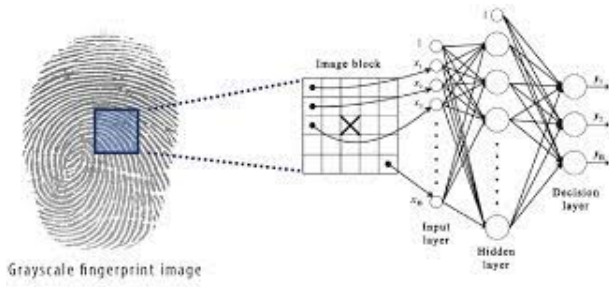


Fig. 2. Fingerprint Recognition System

it begins with the (I) enrollment phase, which basically involves the registration phase where the individual identity (the fingerprint structure) is fed to the machine for it to learn and later identify, the second phase is called the identification phase, however, responsible for extracting The individual identity from The database according to the user claimed identity.

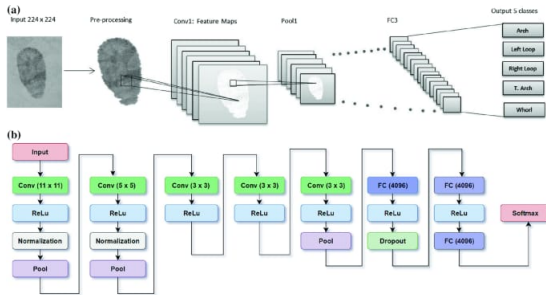


Fig. 3. Fingerprint Recognition

II. EASE OF USE

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The IEEEtran class file is used to format your paper and style the text. All margins, column widths, line spaces, and text fonts are prescribed; please do not alter them. You may

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III. LITERATURE REVIEW

All the fingerprint identification different types of work have been done so far. We have gone through various research papers, till today the methods used different algorithms. These algorithms intend to profit from on this uniqueness to develop the efficiency and provision for matching accuracy the fingerprint the fingerprint recognition and confirmation (1). In this paper neural network back propagation for trained the finger print classifier to identify the fingerprints with time efficient preprocessing.

Biometric measures the uniqueness of an individual based on the physiological, biological and behavioral properties of their body. This tool presents itself as a reliable scientific method to identify and authenticate an individual which are fundamental security principles. The present work makes a contribution on fingerprint recognition which is robust method and has the advantage of security, many attacks are emerging. In field of fingerprint there are fake fingerprints are made by using printed fingerprints, silicone, wood glue or other products [2]. An alternative to classical fingerprint biometrics research is being done on finger veins [3]. This technology uses infrared to observe vein features [4].

The use of infrared has the advantage of extracting characteristics from the skin of finger and from the veins of the fingers to avoid forgery, because veins cannot be forged. More and more studies are made on multimodal biometrics. In this studies, at least two modalities are used. Faced with the complexity and precision of the textures of the sweat bread and fingerprints several studies are interested in the dual of iris paints.

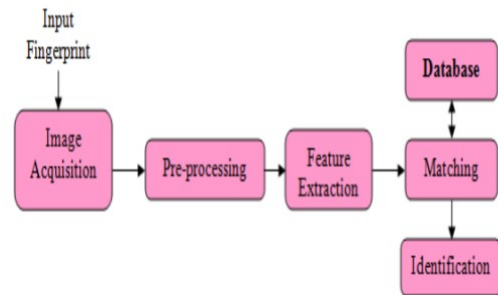


Fig. 4. Fundamental steps of finger print identification system

Recent research focuses on deep learning, which is widely used in computer vision and mainly in biometrics. It's success is due to it's robustness with better recognition scores. The study done in this work shows the performance of con-

volutional neural networks in fingerprint recognition CNN algorithm were applied to the fingerprint database.

A. Abbreviations and Acronyms

Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, ac, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

B. Units

- Use either SI (MKS) or CGS as primary units. (SI units are encouraged.) English units may be used as secondary units (in parentheses). An exception would be the use of English units as identifiers in trade, such as “3.5-inch disk drive”.
- Avoid combining SI and CGS units, such as current in amperes and magnetic field in oersteds. This often leads to confusion because equations do not balance dimensionally. If you must use mixed units, clearly state the units for each quantity that you use in an equation.
- Do not mix complete spellings and abbreviations of units: “Wb/m²” or “webers per square meter”, not “webers/m²”. Spell out units when they appear in text: “. . . a few henries”, not “. . . a few H”.
- Use a zero before decimal points: “0.25”, not “.25”. Use “cm³”, not “cc”).

C. Equations

Number equations consecutively. To make your equations more compact, you may use the solidus (/), the exp function, or appropriate exponents. Italicize Roman symbols for quantities and variables, but not Greek symbols. Use a long dash rather than a hyphen for a minus sign. Punctuate equations with commas or periods when they are part of a sentence, as in:

$$a + b = \gamma \quad (1)$$

Be sure that the symbols in your equation have been defined before or immediately following the equation. Use “(1)”, not “Eq. (1)” or “equation (1)”, except at the beginning of a sentence: “Equation (1) is . . .”

D. \LaTeX -Specific Advice

Please use “soft” (e.g., `\eqref{Eq}`) cross references instead of “hard” references (e.g., (1)). That will make it possible to combine sections, add equations, or change the order of figures or citations without having to go through the file line by line.

Please don’t use the `{eqnarray}` equation environment. Use `{align}` or `{IEEEeqnarray}` instead. The `{eqnarray}` environment leaves unsightly spaces around relation symbols.

Please note that the `{subequations}` environment in \LaTeX will increment the main equation counter even when there are no equation numbers displayed. If you forget that, you might write an article in which the equation numbers skip

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E. Some Common Mistakes

- The word “data” is plural, not singular.
- The subscript for the permeability of vacuum μ_0 , and other common scientific constants, is zero with subscript formatting, not a lowercase letter “o”.
- In American English, commas, semicolons, periods, question and exclamation marks are located within quotation marks only when a complete thought or name is cited, such as a title or full quotation. When quotation marks are used, instead of a bold or italic typeface, to highlight a word or phrase, punctuation should appear outside of the quotation marks. A parenthetical phrase or statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.)
- A graph within a graph is an “inset”, not an “insert”. The word alternatively is preferred to the word “alternately” (unless you really mean something that alternates).
- Do not use the word “essentially” to mean “approximately” or “effectively”.
- In your paper title, if the words “that uses” can accurately replace the word “using”, capitalize the “u”; if not, keep using lower-cased.
- Be aware of the different meanings of the homophones “affect” and “effect”, “complement” and “compliment”, “discreet” and “discrete”, “principal” and “principle”.
- Do not confuse “imply” and “infer”.
- The prefix “non” is not a word; it should be joined to the word it modifies, usually without a hyphen.
- There is no period after the “et” in the Latin abbreviation “et al.”.
- The abbreviation “i.e.” means “that is”, and the abbreviation “e.g.” means “for example”.

An excellent style manual for science writers is [7].

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The class file is designed for, but not limited to, six authors. A minimum of one author is required for all conference articles. Author names should be listed starting from left to right and then moving down to the next line. This is the author sequence that will be used in future citations and by indexing services. Names should not be listed in columns nor group by affiliation. Please keep your affiliations as succinct as possible (for example, do not differentiate among departments of the same organization).

G. Identify the Headings

Headings, or heads, are organizational devices that guide the reader through your paper. There are two types: component heads and text heads.

Component heads identify the different components of your paper and are not topically subordinate to each other. Examples include Acknowledgments and References and, for these, the correct style to use is “Heading 5”. Use “figure caption” for your Figure captions, and “table head” for your table title. Run-in heads, such as “Abstract”, will require you to apply a style (in this case, italic) in addition to the style provided by the drop down menu to differentiate the head from the text.

Text heads organize the topics on a relational, hierarchical basis. For example, the paper title is the primary text head because all subsequent material relates and elaborates on this one topic. If there are two or more sub-topics, the next level head (uppercase Roman numerals) should be used and, conversely, if there are not at least two sub-topics, then no subheads should be introduced.

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a) *Positioning Figures and Tables:* Place figures and tables at the top and bottom of columns. Avoid placing them in the middle of columns. Large figures and tables may span across both columns. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation “Fig. 5”, even at the beginning of a sentence.

TABLE I
TABLE TYPE STYLES

| Table Head | Table Column Head | | |
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^aSample of a Table footnote.

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity “Magnetization”, or “Magnetization, M”, not just “M”. If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write “Magnetization (A/m)” or “Magnetization {A[m(1)]}”, not just “A/m”. Do not label axes with a ratio of



Fig. 5. Example of a figure caption.

quantities and units. For example, write “Temperature (K)”, not “Temperature/K”.

ACKNOWLEDGMENT

The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g”. Avoid the stilted expression “one of us (R. B. G.) thanks ...”. Instead, try “R. B. G. thanks...”. Put sponsor acknowledgments in the unnumbered footnote on the first page.

REFERENCES

Please number citations consecutively within brackets [1]. The sentence punctuation follows the bracket [2]. Refer simply to the reference number, as in [3]—do not use “Ref. [3]” or “reference [3]” except at the beginning of a sentence: “Reference [3] was the first ...”

Number footnotes separately in superscripts. Place the actual footnote at the bottom of the column in which it was cited. Do not put footnotes in the abstract or reference list. Use letters for table footnotes.

Unless there are six authors or more give all authors’ names; do not use “et al.”. Papers that have not been published, even if they have been submitted for publication, should be cited as “unpublished” [4]. Papers that have been accepted for publication should be cited as “in press” [5]. Capitalize only the first word in a paper title, except for proper nouns and element symbols.

For papers published in translation journals, please give the English citation first, followed by the original foreign-language citation [6].

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@articleF2, title=Anti-spoofing method for fingerprint recognition using patch based deep learning machine, author=Uliyan, Diaa M and Sadeghi, Somayeh and Jalab, Hamid A, journal=Engineering Science and Technology, an International Journal, volume=23, number=2, pages=264–273, year=2020, publisher=Elsevier @inproceedingsF3, title=Overview of fingerprint recognition system, author=Ali, Mouad MH and Mahale, Vivek H and Yannawar, Pravin and Gaikwad, AT, booktitle=2016 international conference on electrical, electronics, and optimization techniques (ICEEOT), pages=1334–1338, year=2016, organization=IEEE @articleF4, title=New finger biometric method using near infrared imaging, author=Lee, Eui Chul and Jung, Hyunwoo and Kim, Daeyeoul, journal=Sensors, volume=11, number=3, pages=2319–2333, year=2011, publisher=Molecular Diversity Preservation International (MDPI)

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