# User Recognition Based on Integration of Biometric and Soft Biometric Traits

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***ABSTRACT:*** ***Soft biometric attributes like sex, age, height, weight, ethnicity, and eye shading can't give dependable user recognition since they are not distinctive. Furthermore, such auxiliary data can supplement the personality data given by the primary biometric attributes (face, fingerprint impression, hand-geometry, iris, and so on.). This paper depicts a mixture biometric framework that utilizes face and fingerprint impression as the primary characteristics and sex, ethnicity, and tallness as the Soft characteristics. We have contemplated the impact of the Soft biometric characteristics on the recognition execution of unimodal face and fingerprint impression recognition frameworks and a multimodal framework that utilizes both the primary characteristics. Tests directed on a database of 263 users show that the recognition execution of the primary biometric framework can be improved altogether by utilizing Soft biometric data. The outcomes likewise show that such an exhibition improvement can be accomplished just if the Soft biometric attributes are complementary to the primary biometric characteristics.***

***KEYWORDS:*** ***biometrics, user recognition, soft biometrics, integration, image processing, biometrics.***

## INTRODUCTION

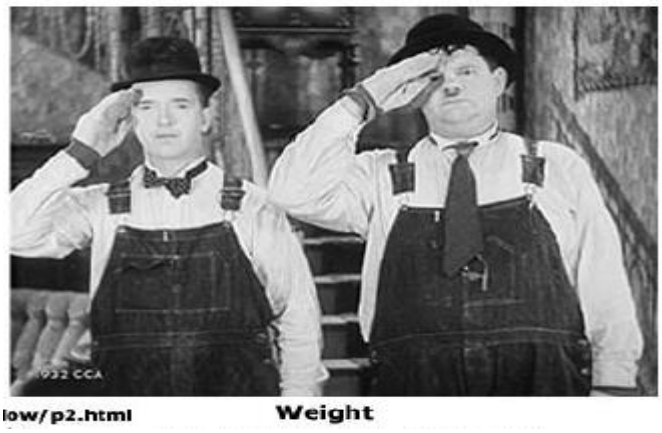
Biometric frameworks perceive users dependent on their physiological and conduct characteristics [1]. Unimodal biometric frameworks utilize a solitary biometric characteristic for user recognition. It is hard to accomplish high recognition rates utilizing unimodal frameworks because of issues like boisterous sensor information and non-comprehensiveness as well as absence of uniqueness of the picked biometric attribute. Multimodal biometric frameworks address a portion of these issues by joining proof acquired from various sources [2]. A multimodal biometric framework that uses various distinctive biometric identifiers like face, fingerprint impression, hand-geometry [3], and iris can be increasingly strong to commotion and reduce the issue of non-comprehensiveness and absence of uniqueness. Consequently, such a framework can accomplish a higher recognition exactness than unimodal frameworks. Be that as it may, a multimodal framework will require a more drawn out confirmation time in this manner making burden the users.

It is conceivable to improve the recognition execution of a biometric framework without settling on ease of use by using auxiliary data about the user like height, weight, age, sexual orientation, ethnicity, and eye shading. We allude to these characteristics as Soft biometric attributes since they give some data about the individual, however come up short on the peculiarity and changelessness to adequately separate any two people (see Figure 1 for instances of Soft biometric characteristics). The Soft biometric characteristics can either be persistent or discrete. Attributes, for example, sex, eye shading, and ethnicity are discrete in nature. Then again, characteristics like height and weight are nonstop factors. Heckathorn et al. [4] have indicated that a blend of Soft properties like sexual orientation, race, eye


**(a)**


**(b)**


**(c)**




**(d)**

**Fig. 1: Representation of Soft biometric charactoristics**

Shading, tallness, and other noticeable imprints like scars and tattoos can be utilized to recognize an individual just with a constrained precision. Subsequently, the subordinate data without anyone else isn't adequate to perceive a user. In any case, Soft biometric [5] characteristics can supplement the customary (primary) biometric identifiers like unique mark and hand-geometry and consequently improve the exhibition of the primary biometric framework.

## AUTOMATIC EXTRACTION OF SOFT BIOMETRIC CHARACTORISTICS

Soft biometric attributes like sex, ethnicity, and age could be gotten from the facial picture of the user. A few investigations have endeavored to recognize the sexual orientation, ethnicity, also, posture of the users from their facial pictures. Programmed age assurance is a progressively troublesome issue because of the constrained physiological or social changes in the human body as the individual develops from one age gathering to another. There are at present no solid biometric pointers for age assurance [6].

Buchanan et al. [7] have been concentrating the distinctions in the compound creation of youngster and grown-up fingerprints that could be utilized to recognize kids from grown-ups. Kwon and Lobo [8] present a calculation for age order from facial pictures dependent on cranio-facial changes in highlight position proportions and skin wrinkle investigation. They endeavored to group users as "babies", "youthful grown-ups", or "senior grown-ups". Be that as it may, they don't give any exactness evaluations to their arrangement plot. The heaviness of a user can be estimated by introducing a weight sensor at the spot where the users stand while giving the primary biometric.

The height can be assessed from a succession of constant pictures got when the user moves into the perspective on the camera. Figure 2 depicts a component for concurrent extraction of the height data and the facial picture of a user. Right now expect that the position of the camera and the foundation scene are fixed. The foundation picture (Figure 2(a)) is at first put away in the framework. Two markers are set out of sight for alignment. The main marker is put at a tallness Hlow over the ground and the second marker is put a ways off Href over the main marker. The vertical separation between the two markers out of sight picture is estimated as Dref . In our trials, Hlow = 150 cm, Href = 30 cm,and Dref = 67 pixels. The foundation picture is subtracted from the present casing (Figure 2(b)) to get the distinction picture (Figure 2(c)). A limit is applied to the distinction picture to distinguish just those pixels having huge power changes.

Middle separating is applied to expel the salt and pepper clamor in the distinction picture. The foundation subtraction is normally acted in shading space [9]. Be that as it may, for straightforwardness in choosing the limit esteem and in the middle sifting activity, we played out the subtraction in the dark scale area. The distinction picture is checked from the top to identify the highest point of the head and the vertical separation between the highest point of the head and the lowermost marker is estimated as Duser (in pixels).

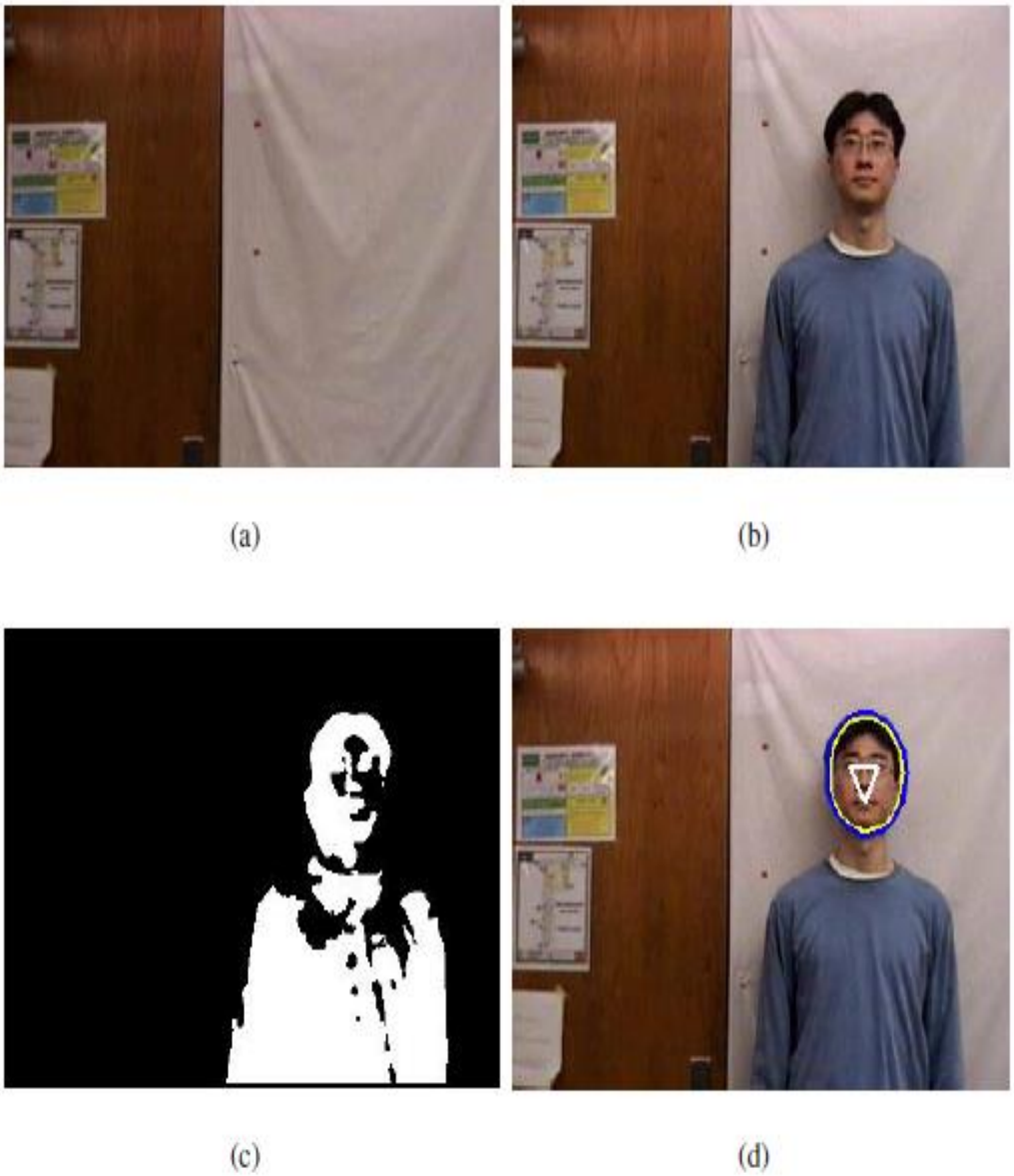



**Fig.2: Extraction of Height and Facial Image from the User (a) Background Image; (b) Current Frame (c) Different Image (d) Location of the Face in the Current Frame.**

## SOFT BIOMETRICS INEGRATION FRAMEWORK

We utilize a similar system proposed in [10] for coordinating the Soft biometric data with the primary biometric framework. Right now, biometric recognition framework is isolated into two subsystems. One subsystem is known as the primary biometric framework and it depends on customary biometric identifiers like fingerprint impression, face furthermore, hand-geometry.

The primary biometric framework could be either unimodal or multimodal. The subsequent subsystem, alluded to as the auxiliary biometric framework, is based on Soft biometric attributes like age, sexual orientation, and tallness. Figure 3 shows the engineering of an individual distinguishing proof framework that utilizes fingerprint impression, face and Soft biometric estimations.

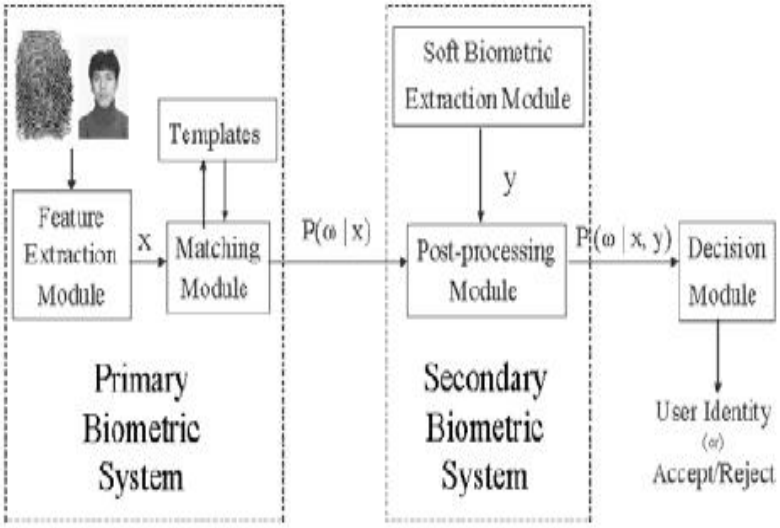



**Fig.3: Integration of Soft Biometric Traits with a Primary Biometric System (x is the Fingerprint Feature Vector, y is the Soft Biometric Feature Vector)**

## CONCLUSION AND FUTURE ASPECTS

We have shown that the use of subordinate user data like sexual orientation, height, and ethnicity can improve the exhibition of the conventional biometric frameworks. In spite of the fact that the Soft biometric attributes are not as lasting and dependable as the customary biometric identifiers like unique mark, they give some data about the character of the user that prompts higher exactness in setting up the user personality. We have additionally indicated that Soft biometric attributes would support just on the off chance that they are integral to the primary biometric characteristics. Be that as it may, an ideal weighting plan based the discriminative capacities of the primary and the Soft biometric characteristics is required to accomplish an improvement in recognition execution.

Our future research work will include building up a progressively formal strategy to decide the ideal arrangement of loads for the Soft biometric attributes dependent on their uniqueness and changelessness. Techniques to fuse time-differing Soft biometric data, for example, age and weight into the Soft biometric structure will be considered. The adequacy of using the Soft biometric data for "indexing" and "filtering" of enormous biometric databases must be contemplated. At last, increasingly precise systems must be produced for programmed extraction of Soft biometric characteristics.

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