# Swapping and Abduction Detection of Infants

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*Abstract-* **This paper explains the development of a prototype to avoid swapping and abduction of infants. Fingerprint and Footprint verification is an important biometric technique for authentication. Thus, hardware used is ATMEGA controller. The project Implementation of feature extraction of finger vein and footprint in ATMEGA controller has been discussed. The Ardunio Mega 2560 is a microcontroller board based on the ATmega2560. It enhances performance, consumes less power, and reduces overall system cost and size. Minutiae extraction for finger vein and PCA features for footprint using MATLAB is employed. To detect abduction zigbee module is used. In case of any emergency buzzer will turn ON and a SMS with GPS location will be sent to the parents as a warning sign as well as to the hospital in charge. This paper also presents a design of a Baby Health Monitoring System. The system architecture consist of sensors for monitoring vital parameters, LCD screen to display infants condition and location and a sound buzzer to alarm in case of any emergency all controlled by a single microcontroller core.**

*Index Terms-* **Finger vein, Footprint, Minutiae, Sensors, GPS, ATmega controller, MATLAB.**

## I. INTRODUCTION

Biometric system is a pattern-recognition system recognizes a person based on feature vector derived from a specific biological characteristics such as Physiological biometric identifiers include fingerprints, hand geometry, ear patterns, eye patterns (iris and retina), facial features, and other physical characteristics. Behavioral identifiers include voice, signature, key stroke, and others. To recognize a person based on pattern characteristics has several advantages over traditional means of authentication such as knowledge-based (e.g., password) or token-based (e.g., key) authentication. The probability that two fingerprints are alike is 1 in 1.9 X 1015.

A captured fingerprint image usually consists of two components foreground and background. Accurate segmentation is important for reliable extraction of features like minutiae. In the online system, by a digital source and computers are used for processing and storage. The newborn's finger vein images captured using a IR scanner. Multi-modality can also be used to increase the reliability of the system by providing appropriate fusion scheme. Implementation of biometric recognition in hardware as embedded systemenhances the performance of the system. Thus hardware used is ATMEGA controller. The chip used is Ardunio Mega 2560 used in transmitter side. It has 54 digital input output pins. It contains everything needed to support the microcontroller. Receiver side is made up of Ardunio UNO it is a microcontroller board based on the ATmega328p. It has 14 digital input/output pins. Likewise, many executable with different application can be created and made to run on ardunio.

## II. RELATED WORKS

S.Balameenakshi, S.Sumathi. Describes about Biometric recognition of Newborns Identification using Footprints concepts using Matlab and Lab view software. It uses match score level fusion [7].

Manvjeet Kaur, et.al. describes about accurate marking all minutiae points. Segmentation using Morphological operations, improved thinning, minutiae marking with special considering the triple branch counting. The minutiae marking are done using the concept of crossing number [2].

Yi Chen, et.al. Provides solution to nonlinear deformations in finger print image by representing relative deformation as an average deformation model based on minutiae location and orientation using 2-D Thin Plate Splines (TPS) [5].

Meenakshi Awasthi, et.al. Discusses about the accuracy in fingerprint matching by integrating two approaches singular points type of fingerprints and then minutiae extraction respectively. Thereby, false acceptance rate get reduced. But computation time increased when compared to other methods [6].

R.Vinothkanna et.al. Discusses about fuzzy vault

fusion based multimodal biometric human recognition system with fingerprint and ear. In fingerprint images, the minutiae features are extracted directly and from ear, the shapes features are extracted using Active appearance model. These extracted features and chaff points are grouped as feature vector points. The secret key points are attached with the grouped feature vector points to formulate the fuzzy vault [10].

Jiangjiang Feng . Discusses about texture-based and minutiae-based descriptors, and use an alignment-based greedy matching algorithm to establish the correspondence between minutiae. Extracts a 17-D feature vector from the matching result, and convert the feature vector into a matching score using support classifier [11].

Pankaj Bhowmik et al. Discusses about Fingerprint Image Enhancement and its Feature Extraction for fingerprint recognition in Open CV (visual c++) for extracting the minutiae points where a curve track finishes, intersect with other track or branches off. A critical step in studying the statistics of fingerprint minutiae is to reliably extract minutiae from the fingerprint images [4].

The paper discuss about image enhancement techniques prior to minutiae extraction to obtain a more reliable estimation of minutiae locations Philippe Parra et al. discusses about fingerprint minutiae extraction and matching for identification procedure. In which it matches one among N fingerprints. Uses minutiae feature extraction and Ransac under an affine transformation model [12].

Ali Ismail Awad et al. Discusses about singular point detection for efficient fingerprint classification. In which comparative study has been done to catch the optimum singular points detection method in terms of the processing time and the detection accuracy. Anil Jain et al. discusses about minutiae extraction and minutiae matching, an alignment-based elastic matching algorithm has been developed [14].

Seonjoo Kim et al. Discusses about algorithm for detection and elimination of false minutiae in fingerprint images. Wherein post processing algorithm uses orientation and flow of ridges as the key factor. Nalini K.Ratha et al. Adaptive flow orientation based feature extraction in fingerprint images. The algorithm uses the flow field to design projection-based ridge segmentation algorithm is used. Many spurious features are deleted in post processing stage. It is been evaluated by computing a "goodness index" (GI)[16].

Asker M. Bazen et al. describes about segmentation of fingerprint images. The method uses three pixel features, being the coherence, the mean and the variance. Morphology is applied as post processing [18].

]. Harish Kumar et al. Provides a comparative study of iterative thinning algorithms for BMP images. Iterative parallel thinning algorithms which generate one-pixel-wide skeletons generally have difficulty in preserving the connectivity of an image. Four parallel thinning algorithms are discussed fast parallel thinning, Guo & hall's parallel thinning Algorithm, Robust parallel thinning algorithm for binary images, all these algorithms are implemented using C languages. Comparative study has been made on quality of skeleton, convergence to unit width and data reduction rate [19].

Sung Bum Pan et al. describes about a VLSI implementation of minutiae extraction for secure fingerprint authentication. It presents a system on chip implementation of the fingerprint feature extraction algorithm. It is been developed for SoC targeted for ARM CPU and AMBA bus can also be extended for many other smart card configurations[17].

Wei Jia et al. propose a novel online newborn personal authentication system for issue based on footprint recognition and employs scale and orientation normalization In recognition stage, four orientation feature based approaches, Ordinal Code, BOCV, Competitive Code, and Robust Line Orientation Code, are exploited for recognition[22].

Steven o. n. silva, lucianosilva discuss about A reduced structure of system was created following the standards of the FHS, containing the necessary system utilities, supporting file handling, device configuration, network settings and support for runtime configuration. The structure still takes the required libraries for applications that use OpenCV. Startup scripts were rewritten to set up an environment for implementation of OpenCV and to start necessary services. Thus, the development of an embedded architecture based on the Linux system and the OpenCV library, focused on the effective use of the hardware, through the selection of specific features required by this library and aims for performance improvement[1].

R N daschoudhary, rajashreetripathy discusses about real time Face detection and tracking the head poses position's from high definition video using Haar Classifier through Raspberry Pi BCM2835 CPU processor which is an combination of SoC with GPU based Architecture. It provides only 4.5 frames per second on 4-core CPU it becomes too slow to process HD stream in real time [9].

Therefore, a solution to this problem is been discussed by parallel modification of OpenCV algorithm for GPU. Patricia Melin, Diana Bravo, and Oscar Castillo describes about pattern recognition using modular neural networks with a fuzzy logic method for response integration. It proposes a new architecture for modular neural networks for achieving pattern recognition in the particular case of human fingerprints. Response integration is based on the fuzzy Sugeno integral to combine the outputs of all the modules in the modular network [13].

Md Kawser Jahan Raihan et al. describes about Raspberry Pi image processing based economical automated toll system. In developing countries RFID for each car does not exist. RFID is still a costly solution. Hence, a image processing technique to detect license plate for auto toll system. The raspberry pi is been used a minicomputer has the ability of image processing and control a complete toll system [15].

Thus, it implies that Raspberry pi provides low-cost solution for image processing computations. Kazuki Nakajima describes about Footprint-Based Personal Recognition wherein an input pair of raw footprints is normalized, both in direction and in position for robustness image-matching between the input pair of footprints and the pair of registered footprints [12]. ]. In addition to the Euclidean distance between them, the geometric information of the input foot print is used prior to the normalization, i.e., directional and positional information. In the experiment, the pressure distribution of the footprint was measured with a pressure sensing mat.
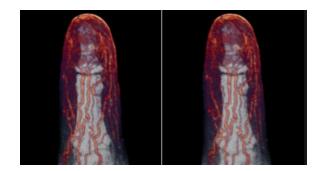
Johannes Kotzerke et al. address the image processing part of the problem and introduce a novel algorithm for the extraction of creases from infant footprints. The algorithm uses directional filtering on different resolution levels, morphological processing, and block-wise crease line reconstruction. Rohit Khokher et al. footprint based biometric identification of an individual by extracting texture and shape based features using Principal Component Analysis (PCA) and Independent Component Analysis (ICA) linear projection techniques. PCA is a commonly used technique for data classification and dimensionality reduction and ICA is one of the most widely used blind source separation technique for revealing hidden factors that underlie sets of random variables, measurements, or signals [24].

Vector for newborn personal recognition system. Newborn footprint matching system based on the extraction of texture features using LBP. System employs low-resolution footprint images to accomplish effective personal authentication. A robust ROI extraction is defined. The features are extracted using LBP and images are classified based on support vector machine and global matching K-NN [23].

### III. PROPOSED WORK

Child abduction or child theft is the unauthorized removal of a minor (a child under the age of legal adulthood) from the custody of the child's natural parents or legally appointed guardians.

The introduction of DNA test in child swapping case, it has become very easy to determine the real parents. The parents remain disturbed throughout their lives. It is quite difficult method and it takes more time.
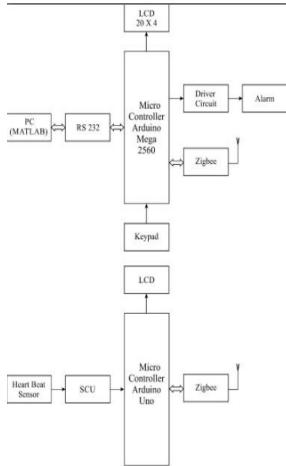


Here using fingerprint verification method child swapping and abduction can be prevented. Fingerprint and Footprint verification is an important biometric technique for authentication. Implementation of feature extraction of finger vein and footprint in ATMEGA controller is done. Minutiae extraction for finger vein and PCA features for footprint using MATLAB is employed. The parent details related to that infant are stored in database. To detect abduction zigbee module is used. This paper also presents a design of a Baby Health

Monitoring System. The system architecture consists of sensors for monitoring vital parameters, LCD screen and a sound buzzer all controlled by a single microcontroller core. For infants extraction of fingerprint is quiet difficult. Theft detection is not used only swapping is detected. Quite expensive. Takes more time.

BLOCK DIAGRAM



The Arduino Mega 2560 is a microcontroller board based on the ATmega2560.It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The keypad consists of three buttons namely increment, decrement, and set. In Our system increment and decrement are used to increase and decrease the values of the sensors output limit. We

can also change the password by altering the program.



ARDUNIO MEGA 2560

Liquid crystal displays (LCDs) have materials which combine the properties of both liquids and crystals. LCD consists of two glass panels, with the liquid crystal material sand liquid, but are grouped together in an ordered form similar to a crystal. In transmitting unit LCD is used to display fingerprint matched and parent details. ZigBee is an open global standard for wireless technology designed to use low-power digital radio signals for personal area networks. ZigBee operates on the IEEE 802.15.4 specification and is used to create networks that require a low data transfer rate, energy efficiency and secure networking. In our system ZIGBEE is used to prevent abduction.

A driver is an electrical circuit or other electronic component used to control another circuit or component, such as a high-power transistor, liquid crystal display (LCD), and numerous others.

Arduino/Genuino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. In our system heart beat sensor is used to measure heartbeat.



ARDUNIO UNO

A device for holding a heartbeat sensor in a relatively fixed relationship with respect to the end of a user's fingertip.

An NTC thermister is a thermally sensitive resistor whose resistance exhibits a large, precise and predictable decrease as the core temperature of the resistor increases over the operating temperature. In our system temperature sensor is used to monitor body temperature of the infants.

The signal conditioning unit accepts input signals from the analog sensors and gives a conditioned output of 0-5V DC corresponding to the entire range of each parameter. This unit also accepts the digital sensor inputs and gives outputs in 10 bit binary with a positive logic level of +5V. The calibration voltages* (0, 2.5 and 5V) and the health bits are also generated in this unit. In receiving unit LCD Display is used to display health conditions of infants.

## IV. CONCLUSION

This paper discusses the implementation of low cost ambient feature extraction of finger vein .On implementing this concept on Ardunio further enhances the performance. The biometric processing is been employed by using MATLAB platform. Zigbee module is used to detect the abduction. Baby health monitoring system is also included. The concept can also be further developed by implementing it on IOT worldwide. A review on finger vein analysis is analyzed as a biometric module is discussed. Appropriate algorithm for finger vein enhancement, feature extraction on Ardunio has been implemented. Hence this method is a low cost solution.

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