A Project report on

New Born Baby Face Identifier

A Dissertation submitted to JNTU Hyderabad in partial fulfillment of the academic requirements for the award of the degree.

Bachelor of Technology

in

Computer Science and Engineering

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CERTIFICATE

This is to certify that the Major Project Phase I report entitled **"New Born Baby Face Identifier"** being submitted by K. Keerthana (20H51A05E4), M. Abhinaya (20H51A05E7), B. Varun (20H51A05N2) in partial fulfillment for the award of **Bachelor of Technology in Computer Science and Engineering** is a record of bonafide work carried out his/her under my guidance and supervision.

The results embodies in this project report have not been submitted to any other University or Institute for the award of any Degree.

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ABSTRACT

People haven't really studied how to recognize newborns' faces before. One reason might be that to adults, newborns can look very similar, so it's hard for them to tell them apart just by looking at their faces. Tests have even shown that people who aren't used to seeing baby faces can't easily tell newborns apart. But we believe that if computers can recognize newborn faces well enough, it could help prevent things like babies getting mixed up or babies being taken. So, we came up with a way to use computer programs to recognize newborns' faces. To check if this works, we made a collection of pictures of 34 different newborns and tried out our idea. It seems like our method could help prevent mix-ups and baby abductions. Now, there are some challenges when it comes to recognizing newborn faces.

Normally, face recognition is already a tricky problem because faces change due to things like angles, lighting, expressions, and disguises. With newborns, they don't really change that much in appearance as they grow, but they can make different expressions and move around a lot. This makes it hard to take good pictures of them. Plus, if they're twins, they often look extremely similar when they're born, like in the pictures we have. So, to recognize newborns' faces, we used a special computer program that pays attention to the details on their skin and the features of their faces. These methods help the computer understand the unique details of each newborn's face. In simple words, we found a way to use computers to spot the special things on newborn faces, even if they're moving or making faces, and it seems like it could be useful for keeping newborns safe from mix-ups and abductions

CHAPTER 1
INTRODUCTION

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Swapping of newborn babies is a challenge that is faced by hospitals across the world. In United States, several studies have reported that every year around 1,00,000 -5,00,000 newborn babies are switched by mistake. A part from accidental switching, there are instances of abducting babies and illegal adoption. According to the National Center for Missing and Exploited Children, 270 cases of newborn/infant abduction have been reported in the United States from year 1983-2010. Another study performed in United States by Gray et al. concluded that, in the 34newborns that are admitted to a neonatal intensive care unit at any given day, there is 50% chance of incorrect identification. To ensure that babies are correctly recognized, hospitals have devised several rules. Though ID bracelets are put on babies hands/legs right after birth, this has not been able to prevent swapping of the babies. It is important to note that these are the number of cases that have been reported, there may be many more that are undeclared or the parents and the children never come to know about it.

Newborn swapping and abduction is a global problem and traditional approaches such as ID bracelets and foot printing do not provide the required level of security. This introduces the concept of using face recognition for identifying newborns and presents an automatic face recognition algorithm. The proposed multiresolution algorithm extracts Speeded up robust features and local binary patterns from different levels of Gaussian pyramid. The feature descriptors obtained at each Gaussian level are combined using weightedsum rule.

1.1.Problem Statement

The process of identifying and verifying newborn babies in healthcare settings ,such as hospitals and maternity wards, is currently reliant on manual methods and can be prone to errors and security concerns. To address these challenges and improve the safety, security, and efficiency of newborn care, we propose the development of an automated "Newborn Baby Face Identifier" system. It can sometimes be challenging to make sure we correctly identify and keep track of newborn babies in hospitals. We use things like wristbands, but mistakes can happen. This can be a security risk, and it's important for parents to be able to easily recognize their own baby. Also, making medical records for newborns can have errors when done manually.

The goal is to develop a computer-based newborn face identifier that can significantly contribute to the safety and security of newborns in healthcare settings, preventing mix-ups and abductions by accurately recognizing and verifying the identity of each infant.

1.2.Research Objective

This research objective aims to create a robust system that can accurately identify newborn babies based on their facial features, thereby improving the overall management of infants in healthcare settings. The system may have applications in ensuring the correct matching of infants with their parents or guardians, enhancing security measures in neonatal units, and streamlining healthcare processes such as vaccination tracking and medical record management.

1.3 Project Scope and Limitations

The objective of the project is to develop a newborn baby face identifier system that can accurately and securely match newborn babies' faces with their respective medical records and identifiers for use in healthcare facilities.

We are creating a system to recognize and match the faces of newborn babies to their medical records in hospitals. This helps ensure the right babies get the correct care and attention.

Features and Capabilities:

- Take and save pictures of babies' faces.
- Compare these pictures with their medical records to find the right baby.
- Keep the data secure and follow privacy rules.
- Send alerts if there are problems.
- Make the system easy for hospital staff to use.

Limitations:

Accuracy: Our system won't always be perfect. Sometimes, due to poor lighting or if the baby moves too much, it might make mistakes and say the wrong baby.

Data Privacy: We promise to keep all the baby's facial data safe and won't use it for anything other than identifying the baby.

Light and Environment: For our system to work well, the room needs to have good lighting. If it's too dark or has too many things in the way, our system might not work as well.

Equipment: Hospitals need to have the right equipment, like good cameras and secure storage, to make our system work.

Age Limitation: Our system is just for newborns. It won't work for older babies, kids, or adults. integration: Our system might not easily connect with the hospital's other computer systems. We'll have to check each hospital's setup to make it work.

Rules and Laws: We will follow the rules and laws about privacy and healthcare, but we might not cover all the specific rules in each hospital or region. Those will need to be handled separately.

Conclusion: This document tells us what our project does and what it can't do. It helps everyone working on the project and the hospital staff understand how the baby face identifier will work and its limits.

CHAPTER 2
BACKGROUND WORK

CHAPTER 2

BACKGROUND WORK

Researchers from both medical and computer science have studied the applicability and reliability of using footprints for newborn identification. Shepard et al. presented the analysis of footprints on 51 newborns. The footprints were examined by fingerprint experts of the California State's Department of Justice. Using the footprints, experts were able to identify only 10 babies. Similar results were reported by Pela et al. where the analysis was conducted on 1917 -foot prints collected by trained personnels of a hospital in Brazil. None of the images provided information sufficient to perform accurate identification. These studies concluded that with the state-of-art capture techniques, it is difficult to use footprint for identifying newborns. Based on these studies, the American Academy of Pediatrics and the American College of Obstetricians and Gynecologists stated that individual hospitals may want to continue the practice of foot printing or fingerprinting, but universal use of this practice is no longer recommended. After footprint, researchers explored the applicability of other biometric modalities such as fingerprint, palm print and ear for verifying the identity of newborn babies. Although fingerprint and palm print recognition are well established modalities to recognize adults (over the age of 5 years), they did not achieve good results in identifying newborns. Weingaertner et al. developed a new high-resolution sensor for capturing the foot and palm prints of babies. Two images of 106 newborns were collected: one within 24 hours of birth and another at around 48 hours. Fingerprint experts examined the data and the identification accuracy of 67.7%and 83% were obtained using foot prints and palm prints respectively. However, multiple studies have quoted that cap-turing finger/palm/footprint of newborns is very challenging's it is difficult to hold their hands and legs still. Fields et al.have studied the feasibility of ear recognition on a database of 206 newborns . They manually analyzed the samples and concluded that visually ears can be used to distinguish between two children. Although iris recognition for adults yields very high accuracy, for newborns, it is very difficult to capture iris patterns. To the best of our information, automatic face recognition has not been studied for newborns.

One reason for this maybe the notion that newborns look so alike to untrained adults that it is difficult to differentiate between them using face biometric. This has also been shown experimentally that individuals who have less exposure to non-adult faces are unable to recognize newborns efficiently. It is our assertion that face recognition can be a friendly and cost-effective solution for identifying newborns if the performance of automatic matching algorithms is satisfac-tory. In this research, we have studied the applicability and performance of face recognition to avoid baby switching or for identifying abducted infants. Specifically, we propose a face recognition framework that can be used for recognizing newborns. To evaluate the performance of the proposed algorithm, we have prepared a database of 34 newborns. Experimental results show promise towards using face recognition to avoid swapping and abduction of newborns.

2.1.1 Existed model 1: DNA &HLA

Introduction

Identity verification for newborns is a critical aspect of healthcare to ensure that each baby is correctly matched with their parents or legal guardians. Traditionally, Deoxyribonucleic Acid (DNA) typing and Human Leukocyte Antigen (HLA) typing have been considered highly efficient and accurate methods for this purpose. However, the time and cost associated with these techniques can make them impractical for routine use on every newborn. As a result, alternative methods have been sought, with the recommendation of certain practices, including those endorsed by the Federal Bureau of Investigation (FBI).

2.1.2 Merits& Demerits:

Merits:

High Accuracy: DNA typing and HLA typing are renowned for their accuracy in verifying the identity of newborns. They offer a high degree of certainty and reliability.

Legal and Forensic Use: These methods are not only used in healthcare but also find applications in legal and forensic contexts, ensuring that the right baby is placed with the correct family or guardian

Demerits:

Time-Consuming: DNA and HLA typing can be time-consuming processes, which can be a significant drawback in healthcare settings where quick identification is essential.

Costly: The cost associated with these methods can be prohibitive, making them impractical for routine use on every newborn, especially in resource-constrained healthcare facilities.

2.1.3 Implementation:

To address the challenges associated with DNA and HLA typing, alternative methods and recommended practices can be implemented:

Photographic Identification: Hospitals can adopt photographic identification practices for newborns. This involves taking clear, identifiable photographs of newborns shortly after birth, ensuring that both the infant's features and any distinguishing marks are captured. These photos can be securely stored and used for verification.

Foot printing and Baby Tag Systems: Foot printing, where a baby's footprints are taken and recorded, has been a traditional method for newborn identification. Modern electronic baby tag systems with barcodes or RFID (Radio-Frequency Identification) can also be used to match babies with their parents or guardians.

Biometric Identification: Biometric methods, such as fingerprinting and palm printing, can be explored as alternatives to DNA and HLA typing. These methods can provide accurate identification but may still face some challenges with very young infants.

Regulatory Compliance: Healthcare facilities should ensure that their identification methods comply with regulations and recommendations set by relevant authorities, including the Federal Bureau of Investigation, to maintain legal and ethical standards.

Training and Education: Healthcare staff should be trained in proper identification methods to minimize errors and ensure the safety and security of newborns.

By implementing these alternative methods and recommended practices, healthcare facilities can strike a balance between accuracy and feasibility in verifying the identity of newborns, ensuring that each baby is placed with the right family or guardian while also managing time and cost constraints.

Existing model 2.2.1: Footprint & Fingerprint

Introduction:

The methods and research related to identifying newborn babies in hospitals, primarily focusing on the use of footprints, fingerprints, palm prints, and ear recognition. Traditionally, many hospitals in the United States have employed foot printing within two hours of a baby's birth to create a newborn identification form. This form typically contains the footprints of the child and the fingerprints of the mother. However, there is an ongoing debate about the reliability and applicability of these methods, leading to the exploration of other biometric modalities.

2.2.2 Merits& Demrits:

Merits:

Established Practice: Foot printing and fingerprinting of newborns have been long-standing practices in many hospitals, aiming to ensure the accurate identification of babies.

Documented Research: Researchers have studied these methods, attempting to gauge their effectiveness and reliability, which provides valuable insights into their pros and cons.

Demerits:

Limited Reliability: Studies by Shepard and Pela found that using footprints for identification was not highly reliable, and similar results were reported in Brazil, leading to doubts about the accuracy of this method.

Challenges in Capture: Capturing footprints, fingerprints, or palm prints from newborns can be challenging due to their small size and the difficulty of keeping their limbs still.

Limited Applicability: Traditional biometric modalities such as fingerprint and palm print recognition, which work well for adults, have not yielded good results for newborns due to their physical characteristics and the challenges in capturing their prints.

Manual Analysis: Many of the studies involve manual analysis, which can be time-consuming and may not be suitable for real-time identification or verification.

2.2.3 Implementation:

High-Resolution Sensors: The development of high-resolution sensors for capturing foot and palm prints of newborns, as demonstrated by Weingaertner et al., can significantly improve accuracy in identification.

Ear Recognition: The feasibility of ear recognition, as explored by Fields et al., shows promise as a distinguishing feature for newborns. However, further research is needed to evaluate its automatic identification potential.

Automatic Identification/Verification: While most studies have focused on manual analysis, there is a need to explore and develop automatic identification and verification systems for newborns using biometric data.

Interdisciplinary Collaboration: Collaborations between medical and computer science researchers are essential for advancing the use of biometric data in identifying and verifying newborns in healthcare settings.

Automatic Identification/Verification: While most studies have focused on manual analysis, there is a need to explore and develop automatic identification and verification systems for newborns using biometric data.

Interdisciplinary Collaboration: Collaborations between medical and computer science researchers are essential for advancing the use of biometric data in identifying and verifying newborns in healthcare settings.

Ethical Considerations: Any implementation of biometric identification for newborns must consider ethical and privacy concerns, ensuring that sensitive data is securely stored and used only for its intended purpose.

In summary, the traditional practice of foot printing and fingerprinting newborns has limitations in terms of accuracy and practicality. Research has explored alternative biometric modalities, such as ear recognition, which may offer better results. Further research and collaboration are required to develop automatic identification and verification systems suitable for newborns, while addressing ethical considerations and the challenges of capturing biometric data from very young infants.

2.3.1Existing Model 3:ID Bracelets

Introduction:

ID bracelets with face recognition technology for newborns aim to enhance the security and identification processes in maternity wards and neonatal units. These bracelets are designed to prevent mix-ups, ensure the right baby goes to the right parent, and maintain a secure environment for infants. The technology involves capturing and analyzing the facial features of each baby and matching them to the parents or authorized guardians.

2.3.2 Merits& Demerits:

Merits:

Enhanced Security: ID bracelets with face recognition can significantly reduce the risk of accidental baby swaps, thereby enhancing the overall security in maternity units.

Reduced Human Error: It minimizes the likelihood of human error in identification, which is especially crucial during hectic periods in a hospital setting.

Quick Identification: The process is quick and non-invasive, ensuring efficient and timely identification of newborns.

Parental Reassurance: Parents can have greater confidence that their baby is correctly identified and secure, which can reduce anxiety and improve the overall patient experience.

Data Logging: The system can log each interaction and identification, creating a digital trail for auditing and accountability.

Demerits:

Cost: Implementing a face recognition system can be expensive, requiring investment in hardware, software, and training for hospital staff.

Privacy Concerns: The collection and storage of facial data raise concerns about patient privacy and data security. Hospitals must have robust policies and security measures in place to address these issues.

Technical Limitations: Face recognition technology may not be foolproof, especially for newborns whose facial features may change rapidly in the early months of life.

False Positives/Negatives: Errors in identification can still occur, leading to false positives (misidentification) or false negatives (failure to identify).

Maintenance and Updates: The system requires regular maintenance and updates to remain accurate and secure.

2.3.3 Implementation:

Implementing ID bracelets with face recognition for newborns involves several key steps:

Needs Assessment: Determine the specific requirements and objectives of the system for your hospital or healthcare facility.

Vendor Selection: Choose a reputable vendor or technology provider that specializes in healthcare-specific face recognition solutions.

Hardware Setup: Install the necessary hardware, such as cameras, on-site servers, and facial recognition devices.

Software Integration: Integrate the facial recognition software with existing hospital systems, including electronic health records (EHR) and patient identification databases
Training: Train hospital staff in the use of the system, including its limitations, privacy regulations, and best practices.

Policy Development: Create clear and comprehensive policies on data handling, privacy, and security, and ensure compliance with local and national regulations.

Testing and Quality Assurance: Rigorously test the system to identify and address any issues. Ensure that it works accurately and reliably.

Deployment: Gradually roll out the system in the maternity and neonatal units, and monitor its performance and compliance.

Ongoing Maintenance: Continuously update and maintain the system to address emerging security threats and technology advancements.

In conclusion, ID bracelets with face recognition technology for newborns have the potential to enhance security and streamline identification processes in healthcare settings. However, their implementation requires careful planning, investment, and consideration of privacy and security concerns. Properly executed, these systems can provide peace of mind for parents and staff alike, ensuring that each baby receives the right care and attention.

CHAPTER 3
RESULTS AND DISCUSSION

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Baby switching and abduction are very important problems across the world. Several biometric and non-biometric techniques have been evaluated to reduce the number of such incidences. Biometric techniques include footprint, fingerprint and palmprint with human experts performing the matching. This research performs a preliminary study on using automatic face recognition for identifying newborns. SURF and LBP based face recognition algorithm has been proposed that extracts local texture features from different.

Surveying the research based on searching the methods for identification of the infants; it can be concluded that facial identification can play a significant role and working with these methods provides for better solutions. The face recognition methodologies for newborn identification can be implemented in various hospitals and nursing homes so that a database can be generated well in advance before the problems of infant's abduction, swapping, missing etc arises. The system can be easily used by the nursing staff of the hospitals for the quick recognition of the infant and his parents; this can lead to remove the discrepancies that arise even when multiple babies born around the time period. Moreover, the Hidden Markov Model with the combination of Singular Value Decomposition techniques returns a medium to solve one of the basic problems that has been prevailing in the country since past several years. The demonstration of a fast and an efficient system is performed using these methods. The scope for future work is required in this field also.

CHAPTER 4
CONCLUSION

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In conclusion, the newborn baby face identifier system holds great promise for enhancing the safety and efficiency of healthcare practices related to newborns. As technology continues to advance, it is essential to balance the benefits with ethical considerations to ensure responsible and secure implementation in healthcare settings.

Baby switching and abduction are very important prob-lems across the world. Several biometric and non-biometric techniques have been evaluated to reduce the number of such incidences. Biometric techniques include footprint, fingerprint and palmprint with human experts performing the matching. This research performs a preliminary study on using automatic face recognition for identifying newborns. SURF and LBP based face recognition algorithm has been proposed that extracts local texture features from different levels of Gaussian smoothed images. Experimental results on a database of 34 newborns show that automatic face recognition for newborns is feasible. In future, we plan to extend the database in size to perform a more large scaleevaluation of the technique. Another relevant study is to collect images of newborns after a couple of months and then analyze the efficacy of face recognition in newborns

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GitHub Link

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