International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 11 Issue: 03 | Mar 2024 www.irjet.net p-ISSN: 2395-0072

SURVEY ON MISSING CHILD IDENTIFICATION

Dr.RaviKanth Motupalli, Aredla Likitha Reddy,Billakanti Sushma,Komarabathini Kavya,Chidugulla Poojitha

[1]*Assistant professor, Dept. Of Computer Science Engineering, VNRVJIET college, Telangana, India*
[2]*Student, Dept. Of Computer Science Engineering, VNRVJIET college, Telangana ,India*
[3]*Student, Dept. Of Computer Science Engineering, VNRVJIET college, Telangana, India*
[4]*Student, Dept. Of Computer Science Engineering, VNRVJIET college, Telangana, India*
[5]*Student, Dept. Of Computer Science Engineering, VNRVJIET college, Telangana, India*

Abstract - *In India many countless numbers of children are reported missing every year. Among those missing child cases a large number of children remain untraced. Many NGOs estimate that the number of children missing is much higher than reported. The missing child from one region may be found in another state or another country, for various reasons. So even if a child is found, it is difficult to identify that child from the reported missing cases.*

In the present scenario, to find the missing child many technologies and methods have been introduced like using Face Recognition technology, through mobile apps etc. Close to 3,000 missing children have been found in New Delhi to the implementation of an experimental Face Recognition Software System. Using Mobile apps by sending notifications 611 missing children have been saved in China. So in this survey we discuss more about techniques for finding missing children.

Key Words: **Missing child, Face Recognition System, Generative Adversarial Networks, FaceNet, Style GAN, Age Progression.**

1.INTRODUCTION

A "missing child" is any child who is lost (separated from family), has been abducted, kidnapped, trafficked, or abandoned, or who has left home on their own without warning.Usually, parents/ family/ guardians file a missing complaint in such cases.According to recent studies, a significant number of youngsters go missing every year. This is primarily higher in India's scenario.

Most of the parents file a police complaint, upload images in social media, attach posters on walls, search nearby places for their children. These methods may be effective if the child is in the nearby area but if the child has gone to a distant area because of trafficking or kidnapping then the tracing of the child would become difficult. It may even take many years to trace the child. Identifying the child after many years is a challenge. This comes with another challenge where extracting the facial features of very small children who are missing at the age of 1-5 years is very difficult.There are many papers focussed on missing child identification but most of them focussed on Matching the child's photo to the database but most of the real issues were hidden.In this survey paper we will discuss the issues of existing missing child identification.

2. LITERATURE SURVEY

G.Alekya [1] project aims to utilize AI, including Haar-Cascade and LBPH face recognition, to identify missing children from CCTV footage in real-time. It creates a unique dataset, linking children's images with IDs, facilitating quick and accurate recognition in public areas to aid law enforcement. The conclusion is based on the successful development of an AI model using Haar-Cascade and LBPH for recognizing missing children from CCTV footage, ensuring efficient identification in real-time scenarios with accuracy of 95% . Future enhancements could include integrating deep learning models for better face recognition, real-time tracking, and integrating with databases for faster child identification.

M. Raghavendra, R. Neha , S. Manasa, Asst Prof. Mrs. A.V Lakshmi Prasuna[2] The objectives include assessing CNN models' performance in locating missing children, evaluating accuracy, and testing robustness to various image conditions. A CNN-based approach using VGG-16 and ResNet-50 architectures is employed to identify missing children by comparing user-uploaded images with a dataset, demonstrating promising potential. Future extensions of the CNN-based missing children identification system could include real-time facial recognition, age progression modeling, and integration with law enforcement databases for enhanced accuracy and efficiency.

D.J. Naidu1, R. Lokesh [3] The objective is to enhance missing children identification using a CNN-based feature extraction and SVM classification system, achieving robust recognition under diverse conditions. Incorporating SVMs with CNN-based feature extraction enhances child identification, achieving 99.41% accuracy, demonstrating robustness for missing children recognition in varied conditions. Future enhancements: Implement real-time video analysis, integrate with social media for wider data

sources, and enhance age progression modeling for increased accuracy.

Dr.S.Matilda [4] The objective is to develop a facial recognition system utilizing web scraping, Haar Cascade Classifier, and machine learning for identifying individuals, primarily criminals, with high accuracy and efficiency. The system combines face recognition, web scraping, and Haar Cascade Classifier to identify individuals; it shows 90% accuracy, is efficient, and resource-friendly. Future enhancements may include real-time surveillance integration, advanced image denoising techniques, and increased accuracy through deep learning models for broader applications.

Piyush Chhoriya [5] The objective of this research is to develop a real-time automated facial recognition system for criminal identification using Haar feature-based cascade classifiers, enhancing security. The paper presents a real-time automated facial recognition system for criminal identification, utilizing Haar cascade classifiers and LBPH recognition, promising enhanced security and efficient crowd surveillance. Future extensions: Enhancing system accuracy, expanding databases, integrating machine learning for continuous improvement.

Debayan Deb, Divyansh Aggarwal, Anil K. Jain[6] proposed a feature aging module that learns a projection in the deep feature space. The main goal is to improve CosFace and FaceNet's functionality. They trained the model on datasets and applied a face aging module. Softmax+Center Loss is used to train FaceNet on a VGGFace2 dataset. CosFace is trained using AM-Softmax loss function on the MS-ArcFace dataset. On a child celebrity dataset, ITWCC. Improved the rank-1 open-set identification accuracies of FaceNet from 16.04% to 19.96% and CosFace from 22.91% to 25.04%.Improved the CosFace rank-1 accuracy from 94.91% to 95.91% on FG-NET, a public aging face dataset. Unconstrained faces cannot use this method.

Pournami S. Chandran; N B Byju; R U Deepak; K N Nishakumari; P Devanand; P M Sasi[7]proposed a missing child identification approach that integrates deep learning facial feature extraction and support vector machine matching.For classifying various child categories, this method combines a powerful deep learning approach based on CNN for feature extraction and a support vector machine classifier|classification achieved a higher accuracy of 99.41%. This indicates that the proposed face recognition technique can be used to accurately identify missing children.

Siritanawan, Prarinya & Ichikawa, Hideki & Kotani, Kazunori[8] presented a research paper that focuses on producing an Age-Progressed image of a missing child from Parental Features. Proposed 2-step method in the first step reconstruct an early growth face, in 2nd step the generator, age/gender conditions, and optimized latent vector acquired in the previous step to generate an age-progressed face. Used CACD dataset. Demonstrated that the similarity of facial features generated from our proposed method to the parents' facial features can be strengthened or lightened depending on the setting of heritability parameters.

Xiao Cui, Wengang Zhou, Yang Hu, Weilun Wang and Houqiang Li[9] proposed a methodology to create the child's facial picture based on the parents' faces using genetic laws as a guide. First, the parents' faces are incorporated into StyleGAN's latent space. Following a little preprocessing, Macro Fusion is used to combine the parents' latent codes. The suggested method processes both at the micro and macro levels in addition to integrating the parents' faces. StyleGAN and Image2StyleGAN were used.

Nevil Susan Abraham, Rithu Ann Rajan, Riya Elizabeth George, Salini Gopinath & v.Jeyakrishnan [10] proposed a methodology to create a productive deep learning system that can be utilized in malls to locate the lost youngster.When a child disappears, the parent goes to security, who uses the parent's phone number to access the previously posted photo that the parent of the missing child uploaded.matches the uploaded child's photo and video using a face recognition algorithm.Utilised facial recognition algorithms to generate optimal outcomes.

Divyansh Yadav1 , Janhvi Tyagi2 , Dipanshu3 , Ritu Tiwari4 , Ms. Pawan Pandey5[11] The project's motive is to develop a Web Server and AI-based solution to locate missing people.It is just carried out by comparing the uploaded image's face encoding to the face encodings of the photos in the database. If a match is observed, the user is directed to that person's profile, where the volunteer's location and phone number are listed. It replaces the huge scanning of databases for each image to check the match with an effective facial recognition approach that completes the work quickly. It will be useful to get the actual position of the person if a match is identified using the integration of Google maps, which would also make police work easier and faster.

Rohit Satle1 , Vishnuprasad Poojary2 , John Abraham3 , Mrs. Shilpa Wakode4[12]The goal of this project is to create a face recognition system utilizing the Principal Component Analysis (PCA) approach.Face recognition algorithms have made substantial use of PCA. It not only decreases the dimensionality of the image, but it also keeps some of the fluctuations in the image data. The method works by projecting a facial image onto a feature space that encompasses the important variances among known face images. The PCA algorithm's calculated accuracy was around 91%. This technique performs admirably for the vast majority of difficulties, including background variations, illumination issues, pose variations, and the quantity of faces in the database.

Mr. A. David Rajkumar, Mr. R. Karthick Raja, Mr. S. Sankar Ganesh, Dr. V. R. S. Mani [13]The aim of this project is to identify a lost person in a busy environment using a drone equipped with a camera, so that the person who is missing in the throng may be easily identified within a minute. The Convolutional Neural Network (CNN) is used to identify a person. Various face traits are used to identify the missing person. This project relies heavily on face detection.AlexNet is being used, which competed in the ImageNet Large Scale Visual Recognition Challenge. AlexNet had eight layers, the first five of which were convolutional layers, some of which were followed by max-pooling layers, and the final three of which were fully connected layers. The KLT algorithm obtains the person's position and provides live tracking.

Wang D-C, Tsai Z-J, Chen C-C, Horng G-J[14]When parents search for missing children, this approach helps to reject the matches with less similarity and narrow down the search. It examines the respective traits of the following two face photographs to anticipate the future face, including face images of the infant prior to disappearance and blood relatives. To achieve prediction, the system uses the StyleGAN2 and FaceNet algorithms. StyleGAN2 is used to style blend two face pictures. FaceNet is used to compare the similarities between two facial images. Experiments reveal that the predicted and expected results have similarity greater than 75%.

Praveen Kumar Chandaliya, Neeta Nain. [15] This paper proposed a system, ChildGAN, which aims to advance research in child face-aging, face recognition, skin tone analysis, age estimation, gender preservation, and kinship face identification. Its objectives include achieving state-of-the-art age estimation while adapting to various racial and ethnic backgrounds, preserving the unique facial characteristics of each group which includes Asians, Blacks, Whites, Indians. IPCGAN, AcGAN, ChildGAN models, along with ICD and MRCD datasets make a significant real-world applications in areas like border control and reuniting missing children with their loved ones. The future scope of this research includes further experiments in face aging with ethnicity bias and 2D-to-3D face aging.

Suman.[16] This paper presents a model that combines deep learning, using VGG-Face for feature extraction, with K-nearest neighbors (KNN) for identifying missing children. It employs Convolutional Neural Networks (CNNs) for robustness against factors like noise, illumination, and occlusion, outperforming previous methods in face recognition-based missing child identification. Its main objective is to aid authorities and parents in missing child investigations, showcasing high accuracy in child identification through rigorous evaluation on a user-defined database. The system's future goal is to expand its capabilities to real-time face recognition using public cameras, which can notify authorities upon detecting a lost person, particularly a child, enhancing the efficiency of missing child location and public safety efforts.

V.Sravani, B.V.G.Haresh, V.Pavan Kumar, D.Nitish, Dr.P.Satish Kumar[17]. This paper presents an innovative system for identifying missing children, using deep learning-based face feature extraction and K-nearest neighbors (KNN) matching. It aims to aid law enforcement and parents in locating missing children by using a national portal for data and image collection. The system uploads images when a child goes missing and a First Information Report (FIR) is filed, enabling public users to search for matches. The future scope includes further development and fine-tuning of the deep learning model and the potential integration of features like facial aging prediction to enhance accuracy in locating missing children.

Hanaa Alamri, Eman Alshanbari, Shouq Alotaibi, Manal AlGhamdi. [18].This paper presented a system combining SIFT, SVM, and LBPH algorithms for accurate face recognition and gender detection. Objectives include improving accuracy and exploring real-world applications like border control. Future research may focus on addressing ethnicity bias and experimenting with 2D-to-3D face aging.

3. RESEARCH GAPS

The existing survey mostly focussed on searching a child's image in the database by not considering the parental features. If considered parental features it doesn't consider any real-time data Analysis. Video Searching of a child's face is done. There is no system where both image searching, Video searching by considering parental features is taken into consideration.

4.METHODOLOGIES

LPBH: Local Binary Pattern Histogram (LBPH) is a texture-based method for face recognition. It works by dividing a face image into smaller regions and extracting Local Binary Pattern features. These features encode patterns of pixel intensity variations. Histograms of these patterns are created and used to represent faces. LBPH is robust to illumination changes and can be an effective technique for recognizing faces in various lighting conditions.[1,5] Accuracy produced by LPBH is 95%.

SIFT: Scale-Invariant Feature Transform is a computer vision technique used to extract distinctive features from images, including face images. SIFT is renowned for its robustness to variations in scale, rotation, illumination, and viewpoint. It identifies key points in an image, describes their local neighborhoods, and represents them as feature vectors. In the context of face recognition, SIFT can identify and extract unique facial features, making it valuable for building a reliable face recognition model. These SIFT-based features are often used as input to machine learning

algorithms like Support Vector Machine (SVM) to create accurate and robust facial recognition systems.

KNN: K-Nearest Neighbors (KNN) is a machine learning algorithm applied in the context of missing child identification. It operates by examining the similarity between a missing child's facial features and those of individuals in a database. KNN measures the proximity of the missing child's characteristics to those of known individuals and identifies the K-nearest matches. This algorithm is a fundamental component of missing child identification systems, helping to locate potential matches from available data, aiding authorities and parents in the search for missing children.

PCA: Facial recognition systems have made substantial use of PCA methods. It preserves some of the variability in the picture data while simultaneously decreasing the dimensionality of the image. Projecting a face image onto a feature space that encompasses the notable differences between recognised face images is how the system operates. The PCA algorithm's calculated accuracy was almost 91% [12].For the majority of problems, such as background variations, illumination issues, pose variations, and the quantity of faces in the database, this technique performs admirably.

VGG-16 and ResNet-50: VGG-16 and ResNet-50 are deep convolutional neural networks used in face recognition. VGG-16 consists of 16 weight layers and has a uniform architecture, making it relatively simple. ResNet-50, on the other hand, is a deeper network with residual connections, allowing for better training and accuracy. Both models are pre-trained on large image datasets, enabling them to extract features and identify faces with high precision.[2] accuracy produced is 99%.

SVM: SVM (Support Vector Machine) face recognition is a supervised machine learning approach. It classifies faces by creating a hyperplane that best separates different face classes, optimizing the margin between them. It's effective for face recognition due to its ability to handle high-dimensional data. SVMs can be trained on face features or raw pixel values, making them a versatile choice for accurate and robust face recognition systems.[3,7]The accuracy produced by SVM is 99.41%.

AlexNet: AlexNet was composed of eight layers: three completely connected layers came after the first three max-pooling layers and the first five convolutional layers. the position of the person is obtained and provided live tracking with the KLT algorithm. The pretrained system[13] trained with targets region of interest would detect the presence of target in given test image and mapping the target region with a bounding box based on the highest score obtained from the detection score mechanism of system .

StyleGAN and FaceNet: GAN (Generative Adversarial Network) face recognition involves using a GAN architecture to create and discriminate between realistic and fake facial images. It can generate lifelike faces and is used for face synthesis and manipulation, but it may not be the primary method for recognition. GANs can augment face datasets, improve privacy protection, or create adversarial examples for testing facial recognition systems. To accomplish prediction, the algorithm[14] uses FaceNet and StyleGAN2 techniques. Two face pictures can be style mixed with StyleGAN2. To compare the similarity of two facial photographs, FaceNet is utilized. According to experiments, there is a greater than 75% similarity between the expected and predicted results.

Age Progression Algorithm: Age progression algorithms use machine learning to predict how a person's face will change as they age. They analyze facial features, such as wrinkles and skin texture, and apply statistical models to estimate how these features will evolve over time. By training on large datasets of aging individuals, these algorithms offer a tool for simulating a person's appearance at different ages, aiding in missing person investigations and entertainment applications.

Table- 1 :Comparison of Different Methodologies

S.no	Methodology	Pros/cons	Accuracy	Gaps
1.	[3][7]SVM	Categorized with higher Accuracy	99%	No Parental features is taken into Consideration
2.	[14]StylGan and Facenet	Effective Feature Extraction and Classification	75%	Not applicable for Unconstrained faces.
3.	[1,5]LPBH	LBPH is famous for its performance and accuracy, which can recognize a person's face from both the front and the side.	95%	The structural information captured is limited, only pixel difference in image is used.
4.	[2]VGG-16 and ResNet-50	It's unique in that it has only 16 layers that have weights, as opposed to relying on a large number of hyper-parameters.	99%	It is a huge network, which means that it takes more time to train its parameters.
5	[12]PCA	Works with even background	91%	Did not consider parental features and age

		variations , pose variations and illumination issues.		progression.

5.CONCLUSION

In conclusion, the integration of facial recognition algorithms for accurate mapping of facial features to age progression models is a powerful tool in the search for missing children. This comprehensive solution combines innovative techniques such as image generation from parental images, machine learning, and deep learning training on extensive datasets. The system's integration with existing databases and information sources enhances its effectiveness in locating missing children. Furthermore, the development of an application that stores information about both the child and parents, aiding in their reunion and providing a matching percentage, brings hope to families torn apart by such unfortunate circumstances. Ultimately, this technology has the potential to make a significant impact in reuniting missing children with their family.

The literature survey highlights the considerable progress made in leveraging advanced technologies for the identification of missing children. These methods offer efficient, accurate, and potentially real-time solutions to address the challenges faced by parents, guardians, and law enforcement agencies in tracing and locating missing children. The continued development and integration of these technologies have the potential to make a significant difference in child safety and security, particularly in regions with a high number of missing child cases, such as India.

REFERENCES

1. Missing Child Identification System using Deep Learning with VGG-FACE Recognition Technique- https://doi.org/10.14445/23488387/IJCSE-V9I9P101

2. Rohit Satle, Vishnuprasad Poojary, John Abraham, Shilpa Wakode, "Missing child identification using face recognition system", International Journal of Advanced Engineering and Innovative Technology (IJAEIT), Volume Issue 1 July - August 2016.

3. B. Sridhar, P. S. Rao, M. R. Naik, S. Sharma, S. Prasad and V. Vishwanath, "Missing Children Identification using Face Recognition," 2022 International Conference on Advancements in Smart, Secure and Intelligent Computing (ASSIC), Bhubaneswar, India, 2022, pp. 1-5, doi: 10.1109/ASSIC55218.2022.10088405.

4.https://medium.com/swlh/familygan-generating-a-childs-face-using-his-parents-394d8face6a4

5.https://github.com/munozalexander/Child-Face-Generation

6.D. Deb, D. Aggarwal and A. K. Jain, "Identifying Missing Children: Face Age-Progression via Deep Feature Aging," 2020 25th International Conference on Pattern Recognition (ICPR), Milan, Italy, 2021, pp. 10540-10547, doi: 10.1109/ICPR48806.2021.9411913.

7.P. S. Chandran, N. B. Byju, R. U. Deepak, K. N. Nishakumari, P. Devanand and P. M. Sasi, "Missing Child Identification System Using Deep Learning and Multiclass SVM," 2018 IEEE Recent Advances in Intelligent Computational Systems (RAICS), Thiruvananthapuram, India, 2018, pp. 113-116, doi: 10.1109/RAICS.2018.8635054.

8.Siritanawan, Prarinya & Ichikawa, Hideki & Kotani, Kazunori. (2021). Facial Age Progression using Conditional Generative Adversarial Network with Heritable Visual Features. 10.1109/SMC52423.2021.9659067.

9.Cui, Xiao & Zhou, Wengang & Hu, Yang & Wang, Weilun & Li, Houqiang. (2021). Heredity-aware Child Face Image Generation with Latent Space Disentanglement.

10.Abraham, N.S., Rajan, R.A., George, R.E., Gopinath, S., Jeyakrishnan, V. (2021). Finding Missing Child in Shopping Mall Using Deep Learning. In: Suresh, P., Saravanakumar, U., Hussein Al Salameh, M. (eds) Advances in Smart System Technologies.

11.Finding Missing Person/Child Using AI https://ijrpr.com/uploads/V4ISSUE5/IJRPR13461.pdf International Journal of Research Publication and Reviews, Vol 4, no 5, pp 5102-5107 May 2023

12Missing child identification using face recognition system http://ijaeit.com/Content/Paper/20192111861000011201 92111861000001.pdf Volume 3 Issue 1 July - August 2016

13.IDENTIFICATION OF MISSING PERSON IN THE CROWD USING PRETRAINED NEURAL NETWORK https://www.irjet.net/archives/V7/i2/IRJET-V7I285.pdf Volume: 07 Issue: 02 | Feb 2020

14.Wang D-C, Tsai Z-J, Chen C-C, Horng G-J. Development of a Face Prediction System for Missing Children in a Smart City Safety Network. *Electronics*. 2022;11(9):1440. https://doi.org/10.3390/electronics11091440

15. Praveen Kumar Chandaliya, Neeta Nain "ChildGAN: Face Aging and Rejuvenation to Find Missing Children", https://www.researchgate.net/publication/360289072_ChildGAN_Face_Aging_and_Rejuvenation_to_Find_Missing_Children April 2022: Article in Pattern Recognition 129(3):108761. DOI:10.1016/j.patcog.2022.108761.

16. Suman "Nearest Neighbor for Missing Child Identification", International Journal of Engineering Research And Management (IJERM). ISSN: 2349- 2058, Volume-07, Issue-12, December 2020.
https://www.ijerm.com/download_data/IJERM0712011.pdf

17. V.Sravani, B.V.G.Haresh, V.Pavan Kumar, D.Nitish, Dr.P.Satish Kumar "Tracing the Missing person using Artificial Intelligence", Vol-9 Issue-2 2023. IJARIIE-ISSN(O)-2395-4396
https://ijariie.com/AdminUploadPdf/Tracing_the_Missing_person_using_Artificial_Intelligence_ijariie19590.pdf

18. Hanaa Alamri, Eman Alshanbari, Shouq Alotaibi, Manal AlGhamdi " Face Recognition and Gender Detection Using SIFT Feature Extraction, LBPH, and SVM " Engineering, Technology & Applied Science Research "file:///C:/Users/DELL/Downloads/ETASR_4735.pdf"
Vol. 12, No. 2, 2022, 8296-8299 8296.

19.POTLURI, T., SISTLA, D.V.P.K. and KRISHNA, D., 2023. DETECTING AUTISM OF EXAMINEE IN AUTOMATED ONLINE PROCTORING USING EYE-TRACKING. *Journal of Theoretical and Applied Information Technology*, *101*(3).