IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 11, Issue 5, May 2023

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.379

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 5, May 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1105237 |

Implementation of Currency Detection for Visually Impaired Using Ml

Professor Nilam Honmane[1], Bhushan Dhiware[2], Sandesh Kadam[3], Karan Kadam[4] , Vishal Kachar[5], Chandan Bharate[6]

Guide, Department of Information Technology, Zeal College of Engineering and Research, Narhe, Pune, Maharashtra, India [1]

Student, Department of Information Technology, Zeal College of Engineering and Research, Narhe, Pune, Maharashtra, India [2-6]

ABSTRACT: Individuals with visual impairments encounter significant difficulties in distinguishing between different denominations of paper currency. The similarity in texture and size among various notes poses a challenge for them, impeding their ability to carry out financial transactions and navigate their daily lives independently. While digital payment methods have gained popularity, physical cash remains widely used due to its convenience. Consequently, automatic currency recognition systems have become vital in addressing this issue, employing image processing techniques to assist visually impaired individuals.

These systems utilize Convolutional Neural Networks (CNN) to accurately differentiate between Indian currency denominations regardless of the location or time. By considering essential factors such as color, size, and texture, a classification model is developed to enhance the accuracy of currency recognition. Texture, size, and color serve as crucial elements in accurately identifying the denomination of paper currency, facilitating seamless financial interactions for individuals with visual disabilities.

KEYWORDS: Currency Recognition, CNN, Android Studio,tflite, Currency Detector Application

I. INTRODUCTION

People with visual disabilities face significant challenges in recognizing and identifying different denominations of currency, whether due to congenital or acquired visual impairments. According to a study conducted by the World Health Organization, out of approximately 285 million individuals surveyed, 39 had some form of visual impairment. This highlights the urgent need for a reliable system that can assist visually impaired individuals in identifying currency notes accurately.In Maharashtra, India, the prevalence of visual disabilities is particularly high, with an estimated 165 individuals per lakh being visually impaired. Among them, 82% are blind, while 18% have low vision. Therefore, it is crucial to develop an efficient and dependable currency recognition system that can help these individuals identify different denominations of currency.Recent advancements in image processing technology, coupled with the growth of the banking industry, provide an opportunity to leverage machine learning techniques to create an accurate and reliable currency detection system. Such a system would enable visually impaired individuals to quickly and easily identify currency notes, enhancing their ability to carry out financial transactions independently and reducing their vulnerability to fraud or exploitation.

One approach to developing this system involves utilizing a basic Convolutional Neural Network (CNN) model a converting it into a tflite model. By incorporating this model into an Android app, it becomes easily accessible and installable on smartphones, reaching a wide range of users. The primary objective of this research is to design a low-cost and user-friendly solution that empowers visually impaired individuals to conduct financial transactions independently and confidently.By improving their ability to recognize currency notes, we can enable visually impaired individuals to become more self-sufficient, reducing their reliance on others for financial assistance. This, in turn, enhances their overall quality of life, promotes their independence, and upholds their dignity.Expanding on this research, future endeavors may involve incorporating additional features into the currency recognition system. For example, real-time voice feedback could be integrated to provide auditory cues, assisting individuals with low vision.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 5, May 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1105237 |

Additionally, exploring the integration of the system with other assistive technologies, such as wearable devices or smart glasses, could further enhance the user experience and accessibility for visually impaired individuals.

Ultimately, the goal is to create an inclusive society where visually impaired individuals can participate fully and independently in financial transactions, thereby breaking barriers and fostering equal opportunities for all.

II. RELATED WORK

The authors of[1] a publication proposed a method to detect the country and denomination of currency notes. By analyzing different regions of the banknote and considering specific features like patterns and symbols, the system can determine the country of origin. It further examines characteristics like size and markings to accurately identify the denomination. This method contributes to currency recognition systems with practical applications in finance, assisting visually impaired individuals, and enhancing security measures.

The author [2] introduced a method for currency identification using a neural network. The process involved data collection, processing, and classification using weighted Euclidean Distance. By training the neural network with diverse currency images, it could learn to recognize unique visual features. The approach holds potential for currency recognition systems, aiding visually impaired individuals and enhancing financial transactions and security measures. Future research could explore advanced neural network architectures and larger datasets to improve accuracy and expand applications

.in their study, the authors [3] explored the unique features of Indian currency and used neural networks to develop a system for detecting and recognizing banknotes. By training the network with Indian currency images, they demonstrated its potential in automating tasks like counting and verification, improving currency handling processes.

In their publication [4], the author presented a detailed and comprehensive explanation of the Convolutional Neural Network (CNN), covering all its fundamental aspects. The paper provided a thorough understanding of how CNNs work, their architectural components, and the underlying principles that govern their operation. The author's explanation offered valuable insights into the workings of CNNs, making it accessible and understandable for readers seeking to grasp the intricacies of this neural network model.

In the book [5], readers can find in-depth information about Convolutional Neural Networks (CNNs) and their diverse layers. The book elucidates the functioning of CNNs through mathematical illustrations and graphical representations, providing a comprehensive understanding of the subject matter. It delves into the process of converting an image into a matrix format, which is then used for detection and matching with a trained model. The book covers the entire process involved, including the mathematical calculations that occur during matrix formation and recognition stages. Furthermore, it explores the impact of different convolutional kernels on detecting horizontal and vertical edges. Overall, this book serves as a valuable resource for gaining detailed insights into CNNs and their applications.

[6] Van De Sande conducted a study that compared the effectiveness of local color descriptors and gray value descriptors. To assess the local gray value invariants, Mikolajczyk and Schmid's evaluation framework was employed. The findings of the study indicated that a combination of color information and Scale-Invariant Feature Transform (SIFT) yielded superior results. The study highlights the significance of incorporating color information alongside SIFT for improved performance in image analysis and recognition tasks

III. METHODOLOGY

Implementing currency detection for visually impaired individuals can involve the synergistic use of computer vision and machine learning techniques. The process typically includes steps such as image acquisition, preprocessing, feature extraction, classification using trained models, and providing audio or tactile feedback to the user. By combining these approaches, a robust system can be developed to for visually impaired individuals in recognizing and differentiating currency notes, enabling greater independence and accessibility.

Gathering Information i.e Data Collection:- To train the machine learning algorithm, gather a diverse dataset of currency notes captured from various angles and lighting conditions. This collection of images will provide the necessary information for the algorithm to learn and accurately recognize different types of currency notes.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 5, May 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1105237 |

Pre-Processing:- Before further analysis, it is essential to pre-process the collected images. This involves eliminating any unwanted noise, standardizing the images to a consistent format, and cropping them to focus on the regions of interest, specifically the areas containing the denomination of the currency. These pre-processing steps ensure the quality and consistency of the images for subsequent analysis and classification.

Feature Extraction:- Using computer vision techniques, features are extracted from the pre-processed images. These features encompass a variety of characteristics, such as color, texture, shape, and other relevant attributes. By analyzing these features, the system can gain valuable information about the visual properties of the images, which is crucial for subsequent analysis and recognition tasks.

Machine Learning:- By utilizing the pre-processed images and the extracted features, a machine learning algorithm is trained. The purpose of this training is to enable the algorithm to accurately identify and classify various denominations of currency. Through iterative learning and optimization, the algorithm becomes proficient in recognizing the distinct characteristics and patterns associated with each denomination, facilitating reliable and automated currency recognition.

Deployment:- After the successful training of the machine learning algorithm, it can be deployed on a portable device like a smartphone or wearable device. This deployment allows the device to capture images of currency notes using its camera, and subsequently utilize the trained algorithm to accurately determine the denomination of the captured currency. This seamless integration of technology empowers users to conveniently and independently identify different denominations of currency on the go.

Feedback:- The algorithm can undergo continuous refinement and improvement by incorporating valuable feedback from visually impaired users and gathering additional data. This iterative process enables the algorithm to adapt and enhance its accuracy and performance over time. By actively involving users and collecting more diverse data, the algorithm can better cater to the specific needs and challenges faced by visually impaired individuals, ensuring a more reliable and inclusive currency recognition solution.

In summary, this approach provides a valuable solution that empowers visually impaired individuals to independently and easily recognize various denominations of currency notes. By utilizing advanced technologies such as computer vision and machine learning, this system ensures accessibility and inclusivity for visually impaired individuals, enabling them to confidently engage in financial transactions and navigate their daily lives with greater independence.

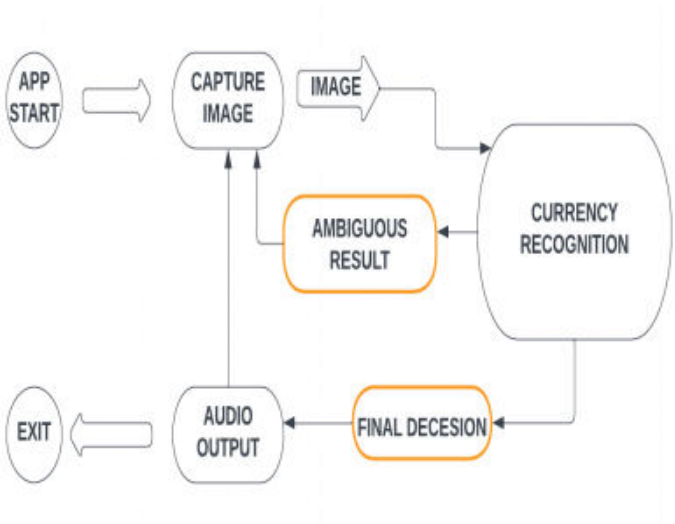

FIG:- 3.1

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 5, May 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1105237 |

IV. SYSTEM ARCHITECTURE

When the user opens the application, they can easily navigate and follow the guidelines provided through the assistance of TalkBack accessibility feature.

Based on the user's preference, they can select their desired language within the application to receive the output in their chosen language, ensuring a personalized and user-friendly experience.

To capture an image, the user has the option to tap anywhere on the screen or use the designated capture button. This action initiates the currency identification process, enabling the system to analyze the image for denomination recognition.At the end of the process, the user receives the output in their preferred audio language, ensuring that they can easily understand and interpret the information provided by the system based on their language preference.

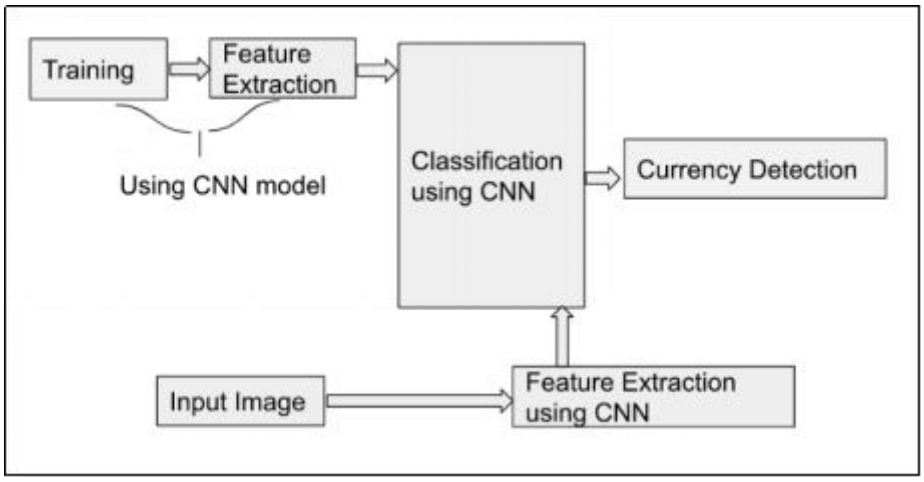

FIG:- 4.1

V. SYSTEM DESIGN

1. Android Studio

Android Studio is a powerful software tool that empowers developers to efficiently create Android applications. With its versatile features, including code editing, layout design, and error detection and resolution, it serves as an indispensable tool for streamlined and effective Android app development.2. Firebase

2.CNN Model

Convolutional Neural Network (CNN) is an advanced artificial intelligence model specifically designed to analyze and understand visual data, such as images and videos. By employing specialized layers that perform operations like convolution and pooling, CNNs can effectively extract meaningful patterns and features from the input data at varying levels of complexity. With their remarkable ability to classify and identify visual elements, CNNs have revolutionized various fields including computer vision, autonomous driving, medical imaging, and more.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 5, May 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1105237 |

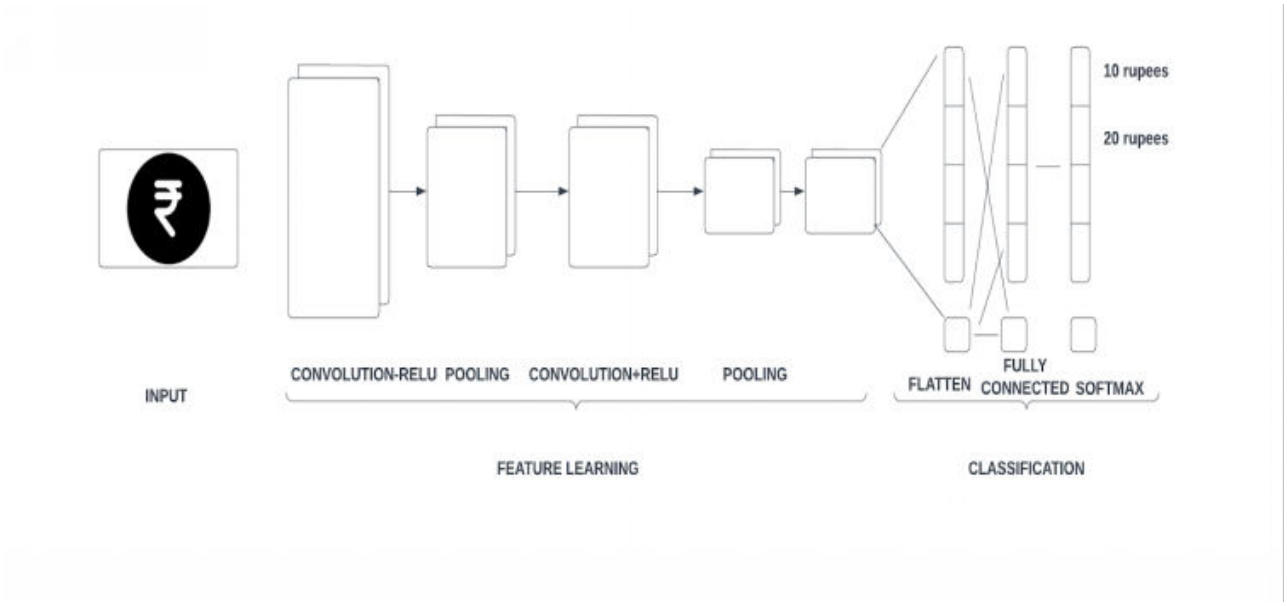

FIG 5.1

The implemented CNN model in the is a code simple convolutional neural network comprising three convolutional layers and three max-pooling layers. It is then followed by a fully connected (dense) layer. The purpose of this model is to classify images into two categories using sparse categorical cross-entropy loss and the Adam optimizer. To enhance its performance, the model incorporates data augmentation techniques such as random flipping, rotation, and zoom. These techniques help improve the model's ability to learn and generalize from the available data.The code provided is an implementation of a CNN model using the Keras API and TensorFlow backend. Its purpose is to classify Indian currency notes based on their features and characteristics.

The code provided is an implementation of a CNN model using the Keras API and TensorFlow backend. Its purpose is to classify Indian currency notes based on their features and characteristics.The images undergo preprocessing and normalization before being used to create a CNN model using the Keras Sequential API. The model comprises convolutional and pooling layers, followed by a flattening layer and a few dense layers. The model is then trained on the dataset using the fit method to optimize its performance.To enhance the model's performance, data augmentation techniques such as random flipping, rotation, and zooming are applied. These techniques help generate additional variations of the training data, which aids in training the model to be more robust and generalize better to unseen images.

After training the model, it is evaluated using the evaluate method, which calculates the accuracies and losses of both the training and validation datasets. The results are then used to plot graphs that illustrate the progress of the model's performance during the training process.

3.tflite

TensorFlow Lite (tflite) is a powerful toolset designed for running machine learning models on various devices. It offers support for multiple programming languages and is renowned for its exceptional performance. With tflite, you can easily tackle tasks like image or audio classification, text classification, pose estimation, and object detection. By utilizing the efficient Flat Buffers format, tflite ensures a compact code size and optimal execution speed, enabling fast inference. Each TensorFlow Lite model is accompanied by metadata containing both human-readable descriptions and machine-readable data essential for image classification. To leverage a machine learning model effectively, you begin by splitting your dataset into training and testing sets. Then, employing the CNN classification method, you generate a classified model.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 5, May 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1105237 |

4. FEATURES

- The app is user-friendly, with an intuitive interface for easy navigation and enjoyable user experience.
- Voice commands for Visually Impaired People.
- Multi-linguistic Support
- Lightweight Works on all Smartphones.

VI. RESULTS

Below are the images shared of the Application and the scanned Currencies

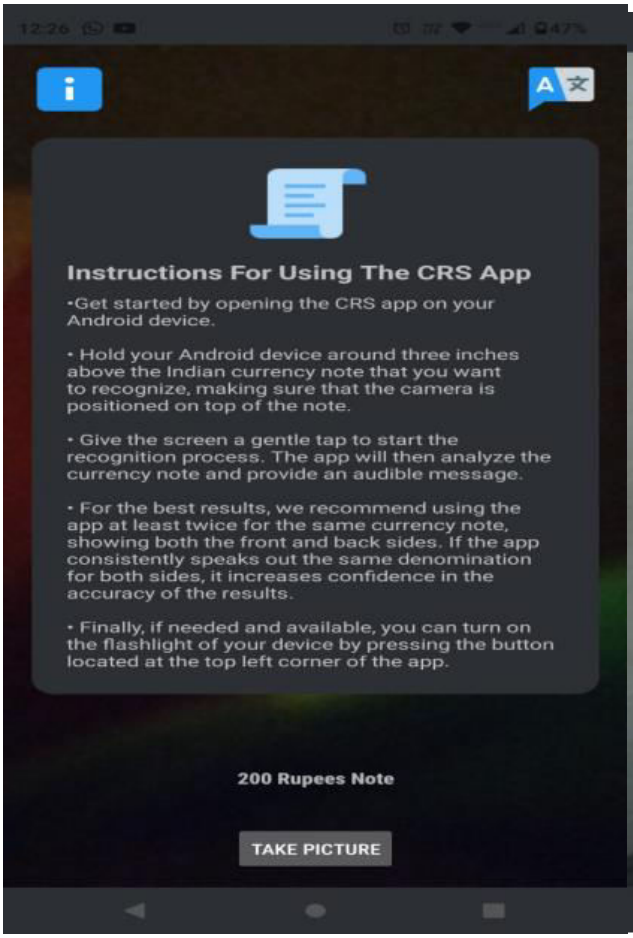

FIG:-6.1 INSTRUCTIONS

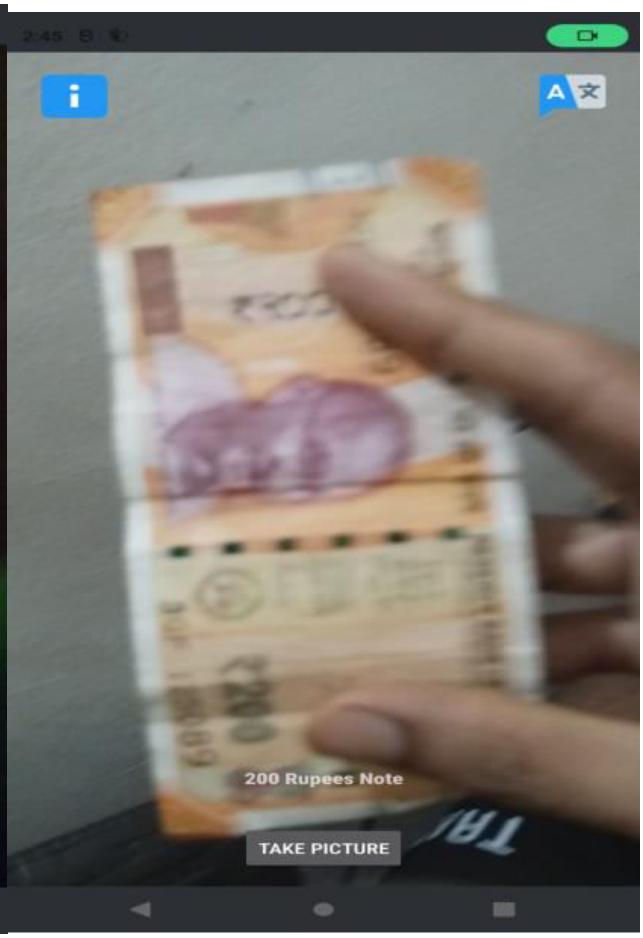

FIG:- 6.2 200RSDETETCTION

VII. PERFORMANCE AND EVALUATION

The performance of the application may vary depending on the quality and conditions of the provided image. The application generates a Confidence Score for each detection, which indicates the level of confidence in the identification result.

On average, the confidence score ranges from 85% to 90%. However, it's important to note that environmental factors, such as low light conditions, can affect the confidence score. Additionally, blurry images may result in lower accuracy and confidence in the identification process.

VIII.CONCLUSION

To summarize, the development of a Currency Detection Application has the potential to greatly benefit individuals with visual impairments. By utilizing a streamlined CNN model converted into a tflite format and integrated into an

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 5, May 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1105237 |

Android app, visually impaired individuals can efficiently identify currency. This technology holds promise in enhancing their independence and overall quality of life. With further advancements and improvements, this application can continue to make a positive impact on the lives of visually impaired individuals worldwide.

REFERENCES

[1] Vedasamhitha Abburu, Saumya Gupta, S. R. Rimitha,Manjunath Mulimani,Shashidhar G.Koolagudi,"Currency Recognition System Using Image Processing",2017 IEEE Tenth International Conference on Contemporary Computing, doi:10.1109/IC3.2017.8284300.

[2] Muhammad Sarfraza, "An intelligent paper currency recognition system", 2015, International Conference on Communication, Management and Information Technology (ICCMIT 2015).

[3] Ms. Rumi Ghosh, Mr. Rakesh Khare, "A Study on diverse Recognition Techniques for Indian CurrencyNote", 2013(JUNE) INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY, ISSN:2277-965

[4]] Simon Haykin, "Neural Networks: A comprehensive foundation", 2nd Edition, Prentice Hall, 1998. [5] Jianxin Wu, "Introduction to Convolutional NeuralNetworks", May 1, 2017.

[6] Van De Sande, K.E., Gevers, T., Snoek, C.G., 2010.Evaluating color descriptors for object and scene recognition. IEEE Trans. Pattern Anal. Mach. Intell. 32(9), 1582–15

INNO SPACE
SJIF Scientific Journal Impact Factor

Impact Factor: 8.379

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

www.ijircce.com

Scan to save the contact details