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# IoT and AI Based E-Passport Authentication

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**ABSTRACT:** The present passport authentication in airports is the potential for human error and identity fraud. The current system relies heavily on manual verification of passport information by immigration officers, which can be time consuming and prone to errors. Moreover, physical passport documents can be easily counterfeited or tampered with, leading to security breaches and identity fraud. An e-passport, also known as an electronic passport, is a travel document that contains a small electronic chip embedded in the cover, which stores and transmits the passport holder's personal information. The system will use combination of facial recognition and RFID technology. The RFID technology will be used to store and transmit passport information securely. The system includes a database to store the information about the passport holder. The weight of the luggage is checked, if it is more than the limit a buzzer is beeped else the weight of the luggage is displayed. The RFID card of the user is scanned, if it is valid then the face of the user is detected and recognized using algorithm. If both processes are valid then the details of the user which is stored in the databased will be displayed in the website using IoT. If the user card and face is not matched or if the face detected is unknown then the unauthorized person face image is captured and the photo is mailed to the concern mail ID. E-passport authentication is an essential part of the modern travel experience. With the rise of globalization and increased international mobility, it is crucial to have efficient and secure ways to verify the identities of travellers. The use of artificial intelligence (AI) and internet of things (IoT) technologies has opened up new possibilities for enhancing e-passport authentication.

**KEYWORDS:** Authentication, e-passport, face recognition, IoT, RFID.

## I. INTRODUCTION

RFID is a technique which makes use of the principle of electromagnetic fields for transferring the data from an electronic tag usually known as the RFID tag. The RFID technology is used in various applications such as monitoring the attendance in schools, industries etc, in shopping malls for pricing purpose and in metro. In order to save the time involved in manual technique of verifying RFID cards are used which are contactless based on the type of readers. RFID module comprises of two units that is the tag and the reader. The card is provided to the passport holder which is swiped against the reader and the contents of the card is verified. The e-Passport provides the legitimate possessor with significant advantages by offering a more advanced method of verifying identity. It authenticates the passport, if it is valid and belongs to the individual named on it, without putting privacy at risk.

## II. LITERATURE REVIEW

Vignesh et al [1] In this paper explains about the cutting-edge framework. The predominate risks in this framework is extra documentation and less security. The proposed system makes use of an eager card which has the name, date of birth, ethnicity and UID range for identify confirmation. The passenger's locations the cardboard into the cardboard peristerite UID is perused and later on checked. The advantages of the proposed framework is less documentation work, visa obstacle data is predicted appropriately, no compelling motive to deliver each one of the files .The proposed system eliminates the drawback of documentation overall performance of e- passport is increased.

Ayesha Sarwar et al [2] In the proposed study, biometric verification of passports is done using RFID. The study aims at increasing the security and privacy of a passport holder. It stores data electronically therefore avoiding forging of data and can also avoid illegal entry of travellers. They make use of an antenna, transponder and a transceiver which in turn uses radio waves to communicate with each other. When a transponder enters the zone, the RFID reader captures the information and sends it to the computer or any other host device.

Al-Ajeely [3] In this paper, verification of passport was done using Internet of things (IOT). The proposed system uses fingerprint as the biometric data for the verification. The fingerprint recognition was done by using fingerprint

sensors which used to detect the fingerprints based on the level of surface. The fingerprint sensor used in this model was able to store memory of the fingerprints of about 3000 templates. This model was able to avoid forgery and manual work associated with verification of passport. It also updated the traveller's information constantly in the system.

Kumar et al [4] This model makes use of RFID chip which is integrated on the cover of passport This electronic passport provides privacy and eliminates the security risks. It can eliminate the problems of mismatched computer records and stolen identities. This study aims to find out to what extent the integration of biometric identification information into passports will improve their robustness against identity theft. Biometrics can never be forged as everybody will have unique identities like fingerprints, iris etc.

Nirmala.Mel et al [5] The proposed system focuses in avoiding the forgery and also the involvement of humans in passport verification. The e- passport is embed with RFID tag fingerprint sensor and also involves gsm for OTP. The system strengthens the security and aids in avoiding the fraud. The RFID tag works on the principle of electromagnetic fields for the transferring of the data from an electronic tag to identify an object or a person by means of Storing information electronically. As the passenger swipes the RFID tag that is read by the RFID reader and sends a signal to the board. The board identifies the ID of passenger. The gsm and the fingerprint sensor are used for identification and authenticates the details.

Deepthi M and dr U Eranna [6] In this study RFID, IOT and Cloud Technology was used for the purpose of identification and verification of a traveller. It was able to produce real time passport monitoring system that can be accessed by other parties. The traveller is given an RFID card that is integrated into the passport. The RFID card can process information just by modulating and demodulating the radio frequency. The details of the traveller are fed into the computer and a unique number is given to each traveller which is being imprinted on the RFID card. The reader reads the data and sends the information wirelessly using IOT and the receiver receives the information and sends the data to the microcontroller which compares the data and matches it with the right data.

Hussain et al [7] In this paper they are trying to secure biometric- RFID systems in organization based on problems like information of owner is not secure enough, RFID system doesn't give the authorization of the user as they are not sure that the authorized user is the one using the RFID card. And also, to rectify problems like duplication and cloning of RFID card. They are trying to prevent and protect by providing security to the authorization system. In the proposed system they have used PUF- physical unclonable function along with AES advanced encryption system. Further they have used digital watermark in the database to prevent cloning of the card. after issuing card the user has to register their biometrics using mobile device or built-in sensor. They encrypt this using hash value. And then they verify data and hash present in server and when they both match, they proceed to next level. The system also needed the use of PRNG a random number to prevent attacking like digital pickpocketing etc. The proposed system gives security by using, steganography, biometrics, cryptography, and RFID also prevent leakage of sensitive information.

Khan and Junaid Moinuddin [8] In this paper, they have done the passport authentication using RFID technology and biometric information that is fingerprint. Here the person is provided with the RFID card issued by the authorities which consists of the information of the card holder. When the person enters the airport, he needs to present the RFID card where the RFID card reader reads the card, stores the information. In next step the person's fingerprint and verified with the one which stored in database and if it is valid then the person is let inside the airport.

Wimalasiri et al [9] this paper is based on RFID, encryption, signature verification, feature-matching, facial verification. This paper is trying to enhance and strengthen the existing security system of electronic passport. The proposed system methodology includes the first step by issuing passport for first time which includes data collection like user image, signature, name, gender, nationality DOB profession and other required details. The next step is facial image watermarking, this uses four-digit number to embed on the image to enhance security.

Also, next they generate RFID tag using AES algorithm. After generating tags, the required information will be saved in the database. the next step is passport verification which consists of collection of required details and storing them next is verifying the stored RFID information followed by image verification of face which is followed by signature verification. and they also recalculate the watermark and verify it from the database. The conclusion of this paper was they were able to achieve multi stage authentication system by meeting all the expected results.



V.Ravali et al [10] The proposed system mainly concentrates on the issues of paper passport booklets. The main issues are lack of privacy and the provision to reveal the identity to anybody with the physical access to the passport, also the risk of duplicating the passport led to frauds. The system uses RFID card, FID reader, FID module. The principle of this prototype enables details of the passport holder to be stored in the RFID card which is read by RFID reader for identification purpose. The module of RFID contains transmitter, receive recontrol unit and an antenna. The system can be implemented in real time systems like attendance record in company, industries etc.

SnehalHonade et al [11] The proposed system focuses on defining the technique of implementing the program in the system for generating a valid and the electronic identification. The electronic document consists of an attachment which is an electronic mark from the user. This document is also attached with a digital signature. The - passport can be seen as a legal form of authentication. This digital signature and mark are decrypted by an approving machine. This smart card provides easily handled for biometric data user public key and also the account. The system is embedded in RFID chip which makes use of cryptographic functionality. The main principle of this system is to acquire the details of the passenger through RFID and authenticate the person.

Verheul and eric R [12] Here in this paper, they have used RDE technology for the passport validation. This RDE technology works on three protocol that is Basic Access Control, Passive Authentication, Passive Authentication. Here the MRZ information of the card holder is read using MRZ reader and the information is shared with the authorities. After validating the information, a key is generated to the user which is compared with the key generated to the authorities. If it is matching then the person let inside the airport for future process.

[13] In this paper, they have used multiple biometric information like face recognition, iris recognition, palm print recognition, finger print recognition and the website are developed using ASP.NET. Initially the biometric information of the passport holder is verified with the biometric with is stored during issuing the passport. If it matches then then the passport holder should login to the website and should enter all the personal credentials like passport ID, name, DOB, phone number etc. Then this information is validated by the authorities. After verifying all the information, the passport holder is let inside the airport

Kumar et al [14] In this paper, they have discussed that along with biometric information even we can use RFID card in future. Some of the biometrics that can be used are eye, palm, finger print, iris, face etc which can be used for verification of the person. This biometric information which is stored during issuing the passport is compared at the time of travel. Along with this even RFID card can be used for verification.

Battaglia et al [15] This paper makes use of Face Recognition which is a multifactor authentication system for biometric identification with an encrypted RFID tag. It contains dual stage cascading classifier. This model avoids centralized database which is riskier and stores the sensitive data in the RFID. This model also minimizes the False Acceptance and False Rejection rate. The accuracy and speed are improvised and it works in almost real time. The overall cost and architectural complexity are also greatly reduced. The system is fully scalable as adding or removing a traveller from the data does not require any additional calculations or changes in the algorithm. This system also works faster with very low-resolution cameras which further decreases the cost of this model

Arulogun et al [16] In this paper, they have used the RFID technology for the student attendance. Every student is provided with the RFID card which contains his/her information. When he/her comes to school the RFID reader reads each student card. The information of the scanned student is share with the in charge. This is to ensure that he/she has come to the school and to provide attendance.

Kumar et al [17] This paper discusses about the different biometric e-passport design analysis such as face, palm print, fingerprint, and iris etc. It also gives cryptographic analysis of these different biometric e-passport. They are integrating the RFID tag in the passport which is capable of cryptographic functionality. In face recognition, it is commonly used to identify the unique features like eyes, nose, hair, mouth, etc. In face identification, the system first captures the face of the person and then compares it with the photo in the gallery. The type of comparisons made depends on matching algorithm and biometric used. Later the system gives the ordering of identities.

Bogari et al [18] in this paper they are using attach process modelling system to prevent risk by using a comprehensive risk strategy while using RFID card. This paper provides a brief information about the generations of e-passport which have used different mechanisms like passive and active authentication, basic access control,

biometric in the first generation and second generation consists of, chip authentication, basic access control, terminal authentication biometric- face, fingerprint, iris print. this paper provides all the vulnerabilities which are both technical and non-technical factors in first and second generation. so, this paper acts as reference point for developing comprehensive risk management strategies. they have provided a systematic attack tree which includes data leak, origin authentication and spoofing for data leak they used random and static UID by reverse engineering and tracing. And for spoofing the replay technique for reader and chip. And for origin authentication they used replay to relay method

Belgouchi et al [19]: In this paper they have addressed issues like personal biometrics tracking by cross-matching database of biometrics. And a crucial problem like this need's attention. they have presented the different mechanisms that exist. they have stored the finger print as DG3 information bio code which prevents stealing of data. After some time, the bio code will be regenerated with different random number following same steps mentioned above. They have also mentioned about the issues arising from this like key management. The bio code must be seeded before the process. from this they have concluded that it is very difficult to recover the original finger print code.

Sinha and Anshuman [20] The paper proposed discusses the idea of using optical character recognition for encoding the data such as the holder's name, date of birth and other identifying information. Discusses about the threats in the use of epassport which are forging, non- repudiations scheming eaves dropping, illicit verification, imposter, cloning. Makes use of three kinds of authentication that are passive authentication, active authentication and chip authentication. In passive authentication the hash of every data group is solved and stored in secured passport chip and hash verification is done the active authentication makes use of public key. The chip authentication is used in second generation e- passports. The system makes use of different algorithm

m Choi et al [21] : this paper is aiming for reducing demands and security weakness that occurs in electronic passport. they suggest a method for security based on authorization technique and safe key distribution. they have increased stability by using hash lock on reverse of a one-direction hash function to detect damaged electronic passport. They have also executed a kill tag method to block illegal information on server. First the reader has to authenticate the electronic passport by using previously registered key and produce new key and also has a meta-ID sent to the reader by passport using secret key. Now it compares the key sent by reader with the hash value and the meta-ID and provide the personal ID if they both match. Also, they have used super encryption to prevent wiretapping of e-passport.

Chawla et al [22] In this paper, they came up with the RFID technology for the verification of the person. Initially the person is provided with the RFID card issued by the authorities which consists of the information of the card holder. When the person enters the airport, he needs to present the RFID card where the RFID card reader reads the card, stores the information and compares the information which is previously stored in the database. If the information does not match then buzzer is beeped to alert the authorities.

### **III. PROPOSED METHODOLOGY**

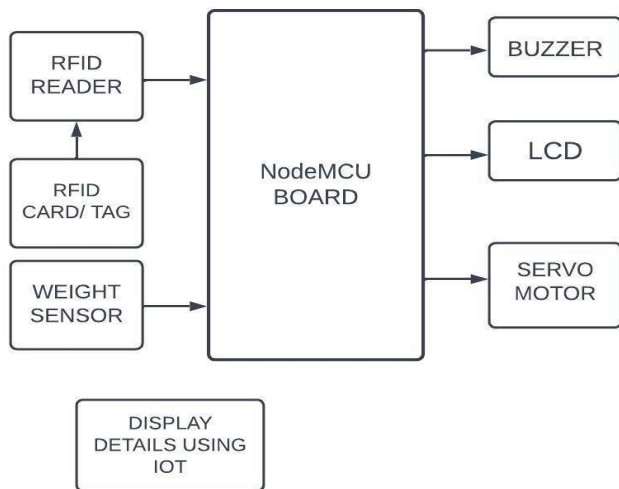


Figure 1 BLOCK DIAGRAM OF HARDWARE

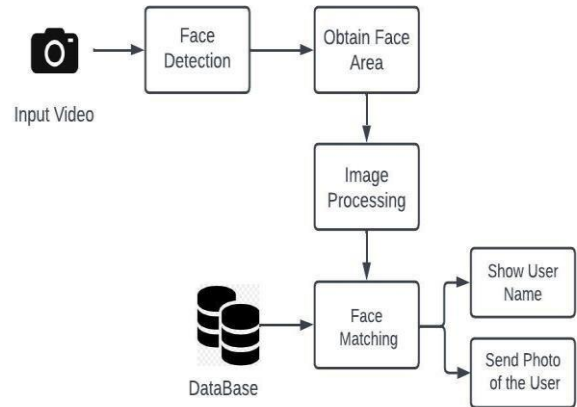


Figure 2 BLOCK DIAGRAM OF FACE RECOGNITION

ESP8266 is used as microcontroller board. In which WIFI module is inbuilt. The Weight Sensor is used to check the weight of the bag and if the weight is exceeding the limit then it is indicated by the buzzer. The RFID card is read by the RFID reader, the unique code is stored in the database and the face of the passport bearer is captured using camera and stored in the database. The data is now compared with the database that is stored prior. This comparison process is done using image processing. If the passport bearer is valid then his details are displayed on the webpage and he is sent inside by opening the gates and green led is made to glow. If the passport bearer details doesn't match with the database, then an alert message is sent to the concerned authorities, the photo of the invalid person that is taken in the 2nd verification processes is sent to the concerned authorities. The gates are made to remain closed.

#### IV.RESULT

In this paper, IoT and AI is used to authenticate the passport in two levels. This two way authentication process not only enhance the security but also it avoid the unauthorized people to travel across the country. Since the e-passport is the biometric passport it is highly impossible to forgery it. Even though some unauthorized person tries to enter the airport then card is not validated and if he try proxy then the face will not be matched with the database picture and immediately the alert message is sent along with the person's image.

##### (I). CASE 1:AUTHORIZED PERSON

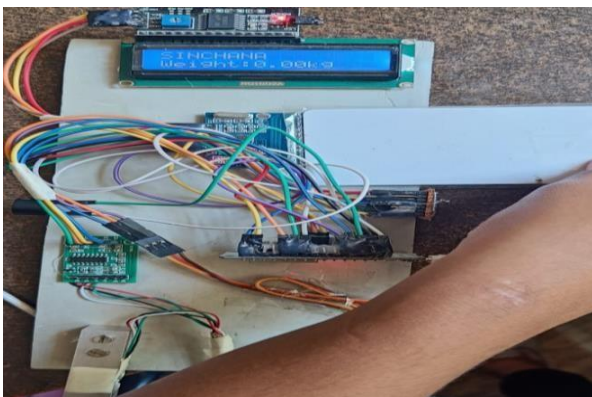


Figure 3:User card is scanned

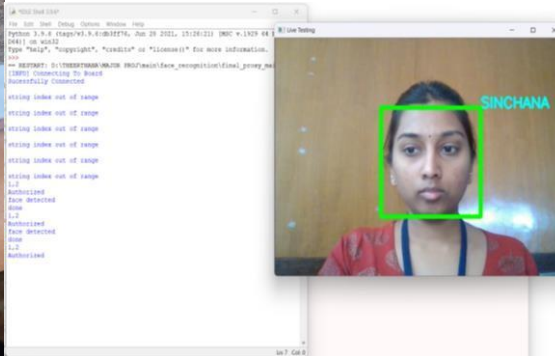


Figure 4:Face of the user is detected

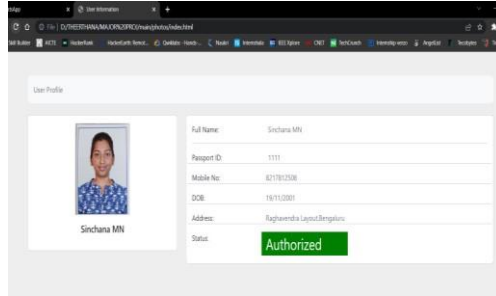


Figure 5: Details of the user is displayed

CASE 2: PROXY

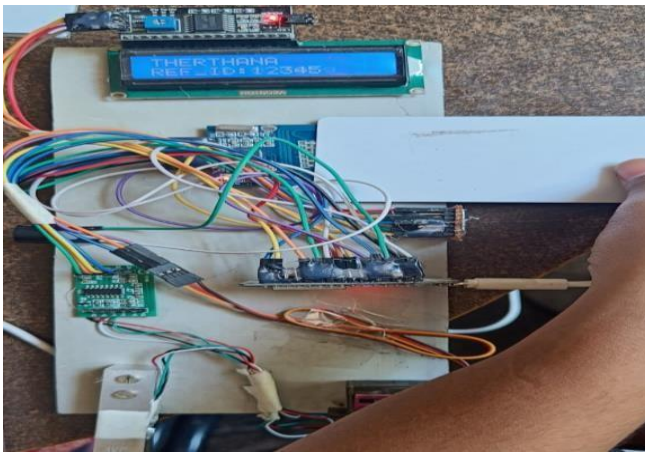


Figure 6: User card is scanned



Figure 7: Face of other person is detected

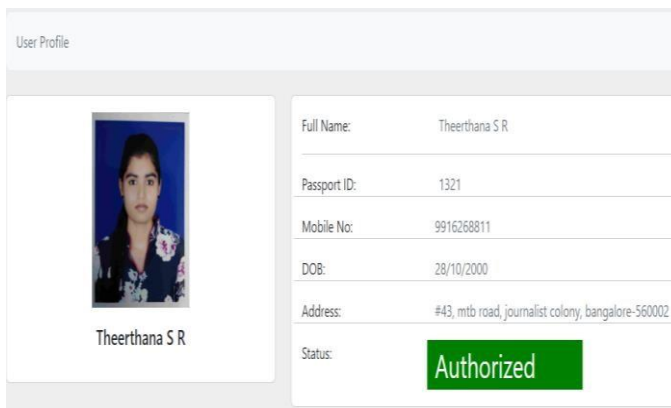


Figure 8: Scanned user card details are displayed

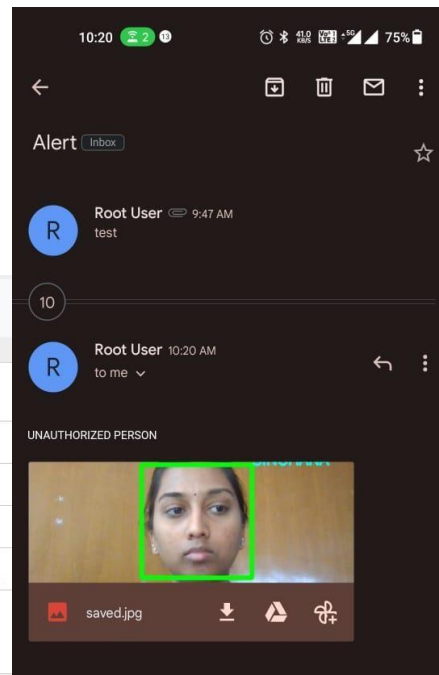
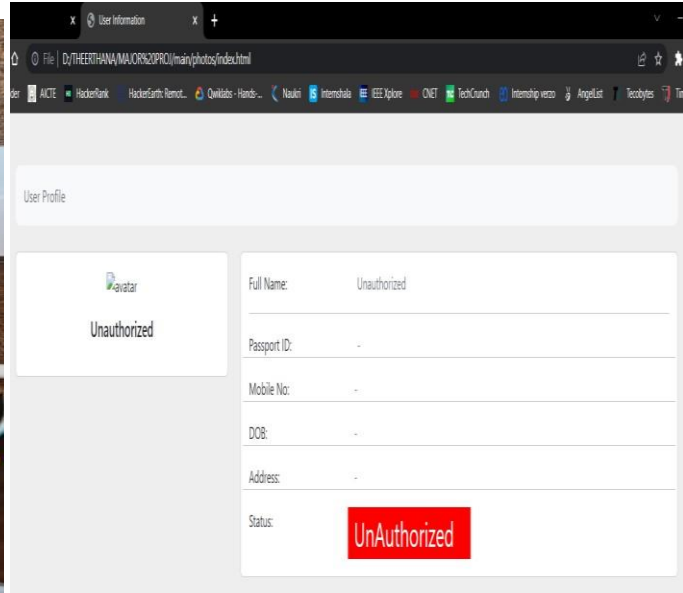


Figure 9: Photo of unauthorized person is sent to the concerned mail ID



**CASE 3: UNAUTHORIZED PERSON**



**Figure 10: Unauthorized card user is scanned**

**Figure 11:Unauthorized details is displayed**

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