Intelligent and Secured Bag using Artificial Intelligence

Anjita Ranjit, Harshal Hajare, Prajwali Dhole, Rajani PK

Abstract: The Intelligent and Secured Bag is an application-specific design that can be useful for the security of important documents and valuable materials. The bag can carry out various features for daily use such as security check using face recognition. The system uses Artificial Intelligence for more effective results in terms of security in comparison with the existing system which uses fingerprint scanner. The Secured Bag consists of the facility of face recognition for advance security solution. The face recognition with Haar Cascade Classifier which is a machine learning object detection algorithm is used for the locking and unlocking of the bag which contributes in the intelligent part of the project. In order to reduce the forgetfulness of senior citizens and even professionals to pack the required items, RF-ID Technology will be used. It maintains the list of objects present in the bag. The RF-ID tags are attached to all the objects which is to be placed inside the bag. The RF-ID reader is used to read the tags which enters the bag. When any object will be missing from the bag, the message of the list of objects missing is send to the users mobile. For the security of the bag from thefts, magnetic lock is introduced. When the face of the person accessing the bag is not matched with the already existing database indicating that an unauthorized person is trying to open the bag, the lock will remain in the locked position. Thus, the person cannot access the bag. When the face of the person accessing the bag matches with the already existing database indicating that an authorized person is trying to open the bag, the lock will be unlocked and the person can access the bag. All the alert messages and the message of the list of items present and missing from the bag is sent to the owner using a GSM modem. The main advantage of using the Smart Bag is protection from thefts, also the owner of the bag gets informed about the theft and the items missing from the bag through GSM. Raspberry Pi will control all the distinguishable features. The smart bag can be used by almost all people including students, doctors, military people, aged people, etc. In general, it can be used in the daily life without the fear of something being stolen or missing from the bag.

Keywords: Face recognition, GSM Module, Haar Cascade Classifier, Magnetic lock, Raspberry Pi 3, RFID technology.

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I. INTRODUCTION

The Intelligent and Secured Bag is an application-specific design that can be useful for the security of important documents and valuable materials.

The bag can carry out various features for daily use such as security check using face recognition. The existing smart bag includes the feature of fingerprint scanner for the same. With the advancing technology, the feature of face recognition can be added. Facial recognition is a category of biometric software that maps an individual's facial features mathematically and stores the data as a faceprint. Haar Cascade Classifier which is a machine learning object detection algorithm typically extract facial features and compare them to a database to find the best match. In the current system, there is manual lock which is easily accessed by an unauthorized person. The safety of the items is compromised here. Using automatic lock system, the security of these items can be enhanced. A magnetic lock is a lock that uses an electric current to produce the magnetic force. Magnetic locks are considered one of the most secure locks as they are extremely reliable and rarely hacked.

In order to reduce the forgetfulness of senior citizens and even professionals to pack the required items, RF-ID Technology will be used. It maintains the list of objects present in the bag. The RF-ID tags are attached to all the objects which is to be placed inside the bag. The RF-ID reader is used to read the tags which enters the bag. When any object will be missing from the bag, the message of the list of objects missing is send to the users mobile. The figure 1.1 shows the different types of bags in which the project can be implemented.

II. METHODOLOGY

The overview of the proposed system is shown in figure 1. First, the detection of face is done with the help of camera. This captured image is used to compare with the already existing database. This database consists of 10 different images of 5 different people each. So, the images of the authorized people are stored in the database.

The face recognition is done using the "Haar Cascade classifier" which is a machine learning object detection algorithm. If the face matches with the images in the database, then the pulse is sent to the magnetic lock through the relay and the lock is opened. If the face does not match with the images in the database, then the magnetic lock remains locked and an alert message is sent to the authorized persons mobile through GSM module saying that an unauthorized person is accessing the bag.

Once the bag is opened, the scanning of the items present in the bag takes place with the help of RFID Reader and Tags.

The RFID Reader will only read those tags having the same serial number which was stored earlier. If the items in the bag matches with the already stored list, a message is sent to the user indicating the list of objects present in the bag. If there are any missing items in the bag after the scanning, an alert message of the list of things missing from the bag is sent to the users mobile.
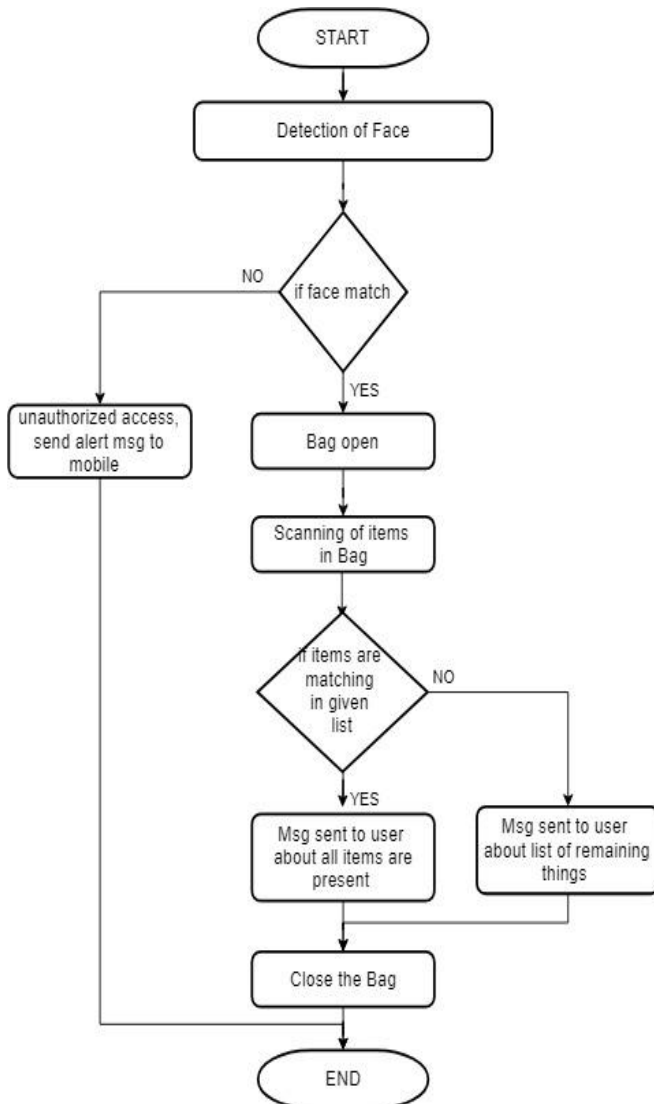

Fig 1. Process flow

The block diagram of the proposed system is illustrated in fig 2. The entities used for the completion of the system are Raspberry pi 3 Model B, GSM, RFID Receiver and RFID tags, Face recognition technique, magnetic lock.

First, the detection of face is done with the help of camera. This captured image is used to compare with the already existing database. Once the face matches, bag opens and the items to be stored inside the bag gets scanned. Message is sent to the mobile if an unauthorized person tries to access the bag using GSM module. If the scanned accessories get matched with the list fed to the Raspberry Pi, then a message is sent to the owner of the bag with the accessories kept inside the bag. In case the list of accessories doesn't match with the given list then the message is sent to the owner of the bag which includes the required list along with remaining things to be fed inside the bag.
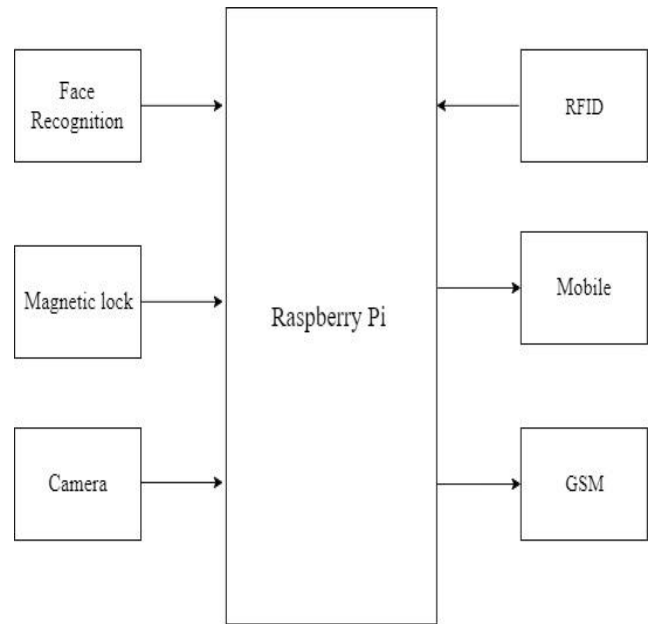

Fig 2. Block diagram

Block 1: Camera

Camera is used to capture pictures of the person accessing the bag. This image is then compared with the already existing database to verify whether the person accessing the bag is authorized or not using face recognition algorithm.

Block 2: RFID

RFID Reader and RFID tag is used to check the count of the object. Each object is given a particular RFID tag which is different for every object. The RFID reader scans this tag when the object is placed inside the bag. This gives us the information of which object is present in the bag and what is missing.

Block 3: Magnetic lock

A magnetic lock is a lock that uses an electric current to produce the magnetic force. When the authorized person accesses the bag, the raspberry pi sends a pulse to the magnetic lock. Using electromagnetism, the lock will be unlocked and the person will be able to access the bag.

Block 4: GSM

GSM is an open and digital cellular technology which os used for the transmission of the voice and data services of a mobile which operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands. The message and alert about the status of the bag is given to the authorized person with the help of GSM module.

III. RESULT

The camera captures the image of the person accessing the bag. If the person is someone who is authorized, the bag will unlocked and message is displayed.

As shown in figure 3, an authorised person, i.e. Prajwaali, is detected.
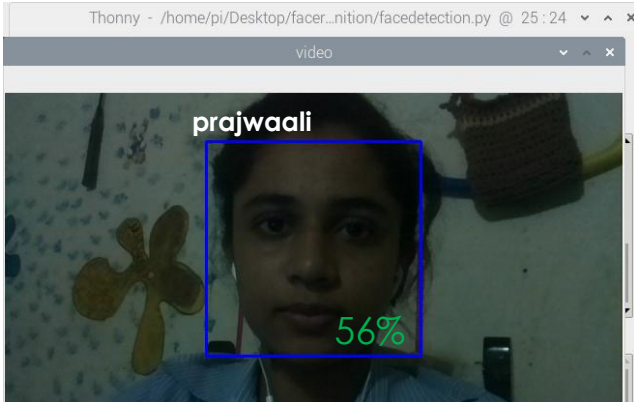
Fig 3. Face Recognition of Authorized Person

When the person is detected, a message that shows the name of the authorised person is displayed on the mobile through GSM as shown in figure 4.
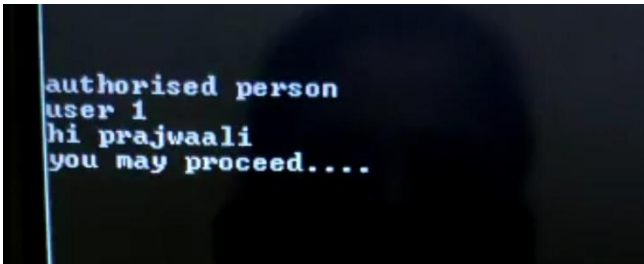

Fig 4. Message received when authorized person access

As the person is authorised, he/she can access the bag. In figure 5, the magnetic lock is unlocked and the bag is opened.
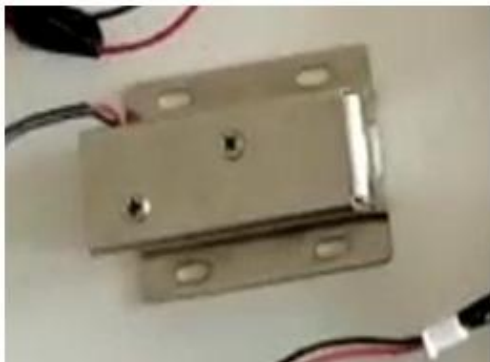

Fig 5. Image of lock unlocked

The camera captures the image of the person accessing the bag. If the person is someone who is unauthorized, the bag remains locked and message is displayed. As shown in figure 6, an unauthorised person, i.e. an unknown person is detected.
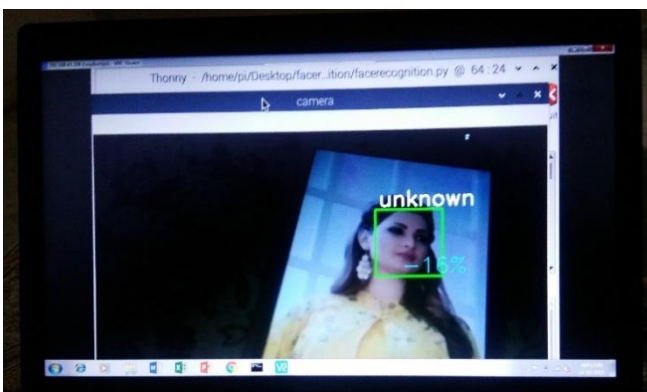

Fig 6. Face Recognition of Unauthorized Person

When an unknown person is detected, a message that it is unauthorised and is not accessable is displayed on the mobile through GSM asshown in figure 7.
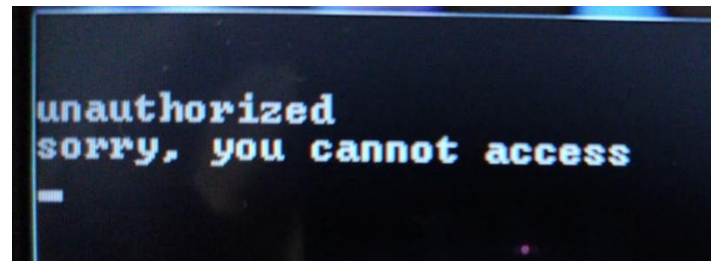

Fig 7. Message received when unauthorized person access

As the person is unauthorised, he/she cannot access the bag. In figure 8, the magnetic lock remain locked and the bag remains closed.

Fig 8. Image of lock which remains locked

The next of the system is to read the items which are added inside the bag. The items in the bag is monitored with the help of the RFID. Here the RFID tags are first read using the RFID Reader.

In the figure 9, the RFID tag is read by the RFID reader indicating that an object is added inside the bag.
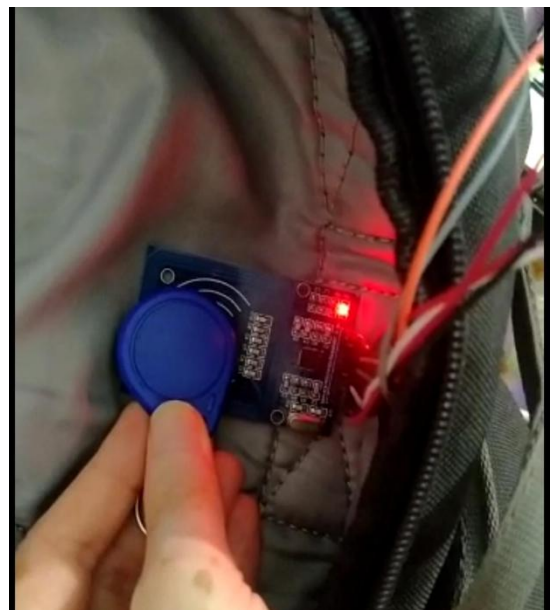

Fig 9. Image of RFID Reader reading RFID Tag

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All the items such as book, mobile phone, laptop, etc. which is to be placed in the bag are scanned by the RFID Reader using the RFID tag. Each object is assigned an unique RFID tag, In this way, one-by-one the list of all the objects are maintained.

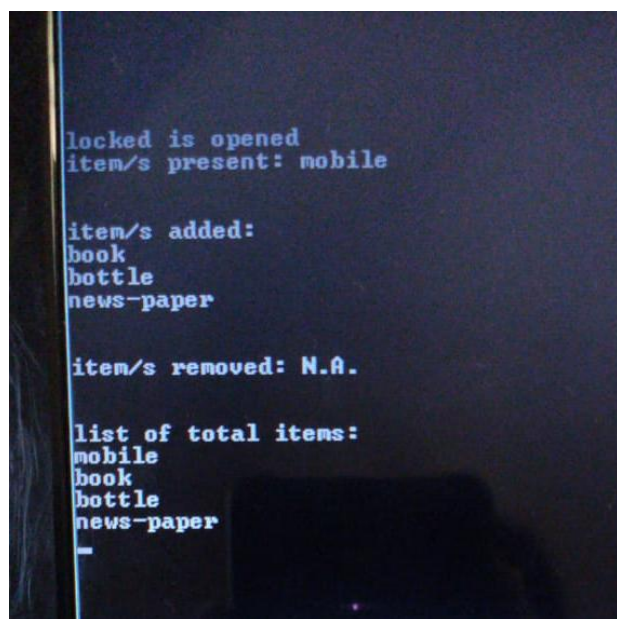Figure 10 shows the list of the items present in the bag.

Fig 10. List of Items present in the Bag

III.   CONCLUSION

The smart bag is an application-specific design that can be useful for the security of important documents and valuable materials. Senior citizens and professionals forget to carry their necessary accessories. Using the RFID technology, the list of the objects to be kept in the is maintained. Using magnetic lock system, the security of these items can be enhanced as it would be difficult to access the bag. Also, the feature of face recognition for the locking and unlocking of the bag is used.

Study of the existing technologies related to the Intelligent and Secured Bag is done, which concluded that using face recognition with Haar Cascade algorithm the system makes0 the bag more secured. The simulation of secured bag using face recognition algorithm in Python with OpenCV is done resulting in an intelligent solution of self-training the images in the database and applying accordingly. The implementation of magnetic lock for the locking and the unlocking of the bag is done.

The availability of the important documents and valuable materials in the bag is verified using RFID technology. Also, sending alert messages and the list of materials present and missing in the bag to the mobile using GSM module is possible.

IV.   FUTURE SCOPE

The material of the bag can be waterproof, dust free, etc. High level security can be provided using Iris recognition, voice recognition or OTP obtained on mobile can also be used. The bag can also use Artificial Intelligence and can move around with help of remote control and wheels.

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