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OBJECTORATOR – OBJECT INFORMATION GENERATOR

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Abstract - *Objectorator (Object Information Generator) mainly works in a domain of military selection and training process in such a way that it helps the passionate people who are willing to apply in a particular Post/Designation from military grade then they can perform a few self-attested task which can clear their path for a several region of recruitment areas. Mainly, Objectorator will help in recognizing the height of a person (through Height Recognizer) and will return the result in cms and along with that it'll help the person by showing a variety of vacancies he/she can fill out for. Most commonly, all grade selection process comprises of Height Criteria and Visual Standard Test with which a person is selected for further process. Since, as these data's are quite confidential as we are storing it in our database and hence don't want to suffer with any system vulnerabilities or threat, so to avoid certain security breaches we are going to utilize the Facial Recognition mainly known as Facial Recognizer in Objectorator. By using facial recognizer, we'll store those facial dataset into our database in such a way that, if any person who comes again for selection process during on-field then by facially recognizing them, we can extract their previous self-attested result and based on that we'll have a bit of improvement over Height Recognizer module. When a candidate clears his physical test and moves further with training process, then with our training module one can identify and knows the working of Arms & Ammunition scanned from Camera and this work will be assisted by Arms Recognizer.*

Key Words: **military training and selection, RCNN, HOG, Arms Recognizer, Canny edge**

1. INTRODUCTION *(Size 11 , cambria font)*

We have seen that the selection process in military is sometimes hectic as many candidate sometimes fall short due to height and they fails to recognize it in time and hence due to this one doesn't exactly know where they can apply for other than the designation they've opted for, hence to avoid such conditions, me and my team came up with a solution where we are going to develop a mobile application which will thoroughly let you scan your height and output the data in a tabular form which a certain level of UI which demonstrates where you can apply for and what will the further process. Once you qualify for certain areas, then you can opt for the 2nd task which is as mandatory as it has to be i.e. Visual Standard Test (This test will specifically let you know if you have any eye conditions, i.e. myopia, hyper metropia, or colour blindness). If someone who has been qualified for the prior test and have had cleared the height and colour blindness test, they can directly show up at the physical selection field where the main recruiter will carry on with the further task. To verify if the candidate is already a part of the system, Recruiter can easily scan his face through Facial Recognizer and can retrieve all the data so that further call can be taken and hence candidate and go for latter part. Eventually Height Recognizer is being develop in such a way that with a little error of 0.6-0.7% it can output the real life height data, Since Computer vision came too far now in a such that if we train our model with R-CNN or latter one then too we can extract good amount of result without losing any time and that too going to add up so much values to candidate's application. After complete selection process, one can do the training part itself with a little precaution and in presence of a single moderator, our Arms Recognizer model is being developed in such a way that if a person tries to scan any arms present in front of their camera, so that an augmented view of that particular arm can be shown on that user's mobile screen and along with that a how to handle it will also being displayed so that one can easily learn the way of handling it. We are also working on Assist Handler Model by which a mobile will tell user on how to handle it by live capturing their full body along with arm's body

2. LITREATUR SURVEY

In this paper presented by Haoyu Ren, Ze-Nian Li, they address the object detection problem by a proposed gradient feature, the Edge Histogram of Oriented Gradient (Edge-HOG). Edge HOG consists of several blocks arranged along a line or an arc, which is designed to describe the edge pattern. In addition, they propose a new feature extraction method, which extracts the structural information based on the gravity centers as complementary to traditional gradient histograms. As a result, the proposed Edge-HOG not only reflects the local shape information of objects, but also captures more significant appearance information. Experimental results show that the proposed approach significantly improves both the detection accuracy and the convergence speed compared to the traditional HOG feature. It also achieves performance competitive with some commonly-used methods on pedestrian detection and car detection tasks [1].

The camera application that can process the image to multiple processes is discussed in this work by Dr. C. N. Vanitha, V. N. Jeevaa, and S. Prajith Shriman. The existing system, which uses Google Lens to convert images into text, translate, navigate and search regarding the text, has a significant impact on our project. Two key modules, TEXT and IMAGE, are used to process the image. OCR, translation,

maps, and related images are all included in the TEXT module. Face emotions and picture recognition are included in the IMAGE module. Face emotion recognises a person's expression and shows their emotions, such as happiness or sadness. The image recognition module, on the other hand, analyses the entire image and classifies each object in text form. [2].

Within the paper conferred by Nazil Perveen, Shubhrata Gupta, and Kesari Verma, Facial Expression Recognition system, aids in modelling facial expression space for facial expression recognition via facial characteristic points and Gini index. The eyes, brows, and mouth are extracted from the input image because facial expression information is largely concentrated on facial expression information areas. When a face image is entered, feature extraction is carried out to aid in the detection of facial characteristic points. In order to identify one of the six fundamental face expressions, facial animation parameters are generated. Certain expressions, such as surprise, fear, and happiness, yield promising outcomes with the highest identification rate; nevertheless, emotions such as neutral, sad, and angry yield lower recognition rates. [3].

Within the paper conferred by I. M. Creusen, R. G. J. Wijnhoven, E. Herbschleb, and P.H.N. de With, the core processing is based on the Histogram of Oriented Gradients (HOG) algorithm, which is enhanced by integrating colour information in the feature vector. The introduction of colour boosts detection performance greatly. We compare the performance of a specific algorithm to that of HOG, and find that in most cases, HOG outperforms the specific method by tens of percent. They also suggest a new iterative SVM training paradigm for dealing with the wide range of background appearance. This saves memory and allows more information to be used in the background. [4].

Within the paper conferred by Dr. S. Revathy and Sakhayadeep Nath is to be able to comprehend any text in any language and convert it into any other preferred language in real-time.. To do so, they chose Android as my preferred platform because it is the most extensively used mobile OS on the planet. They also employed a number of open-source programmes to assist us in achieving our goal, including Tesseract Leptonica for image processing and google-API-translate to translate the identified text. We can identify text on paper or on a screen and translate it into any language we want. The accuracy of identifying handwritten text is poor, and more effort is needed. The suggested technology has the potential to be utilised by visually impaired people to recognise text from anywhere and have it read to them [5].

Within the paper conferred by Dong-seok Lee, Jong-soo Kim, Seok Chan Jeong and Soon-kak Kwon, an estimation method for human height is suggested using colour and depth information. Mask R-CNN uses colour images for deep learning to identify a human body and a human head individually. If colour photos aren't available because of the low light situation, the human body area is recovered by comparing the current frame in depth video to a previously saved backdrop depth image. The top of the human head is extracted as the top of the head, and the bottom of the human body is extracted as the bottom of the foot. The head top-depth depth value is adjusted to a pixel value that is very comparable to a nearby pixel. Computing a depth gradient between vertically adjacent pixels corrects the position of the body's bottom point. Using depth information, two head-top and foot-bottom points are translated into 3D real-world coordinates. By measuring a Euclidean distance, two real-world coordinates infer human height. The average of accumulated heights is used to rectify estimation mistakes for human height. [6].

3. PROPOSED SYSTEM

In Fig 1, we show the detailed system architecture. Objectorator is an Android app for the persons who wants to join defence force and for the armed forces which has a weapon recognizer, height estimator and face recognition algorithms. This hybrid approach facilitates the process of qualification of aspire person who wants to join defence forces and helps officer to recognize firearms. This would lead to quicker actions from the cadets as well as the military officers who would become aware about the qualifications to become an officer and to recognize unknown firearms. Whilst using Objectorator, the cadets can scan a picture of themselves and it immediately cross verifies the height of the cadet with the database which is done using height estimator.

As well as if a military officer first captures the photo of an unknown firearm. Then the photo passes through the weapon recognition phase. Now, this scanned photo is used and all the photos in the database are matched with the scanned image. If a match is found, the military officer knows all the details of the firearms.

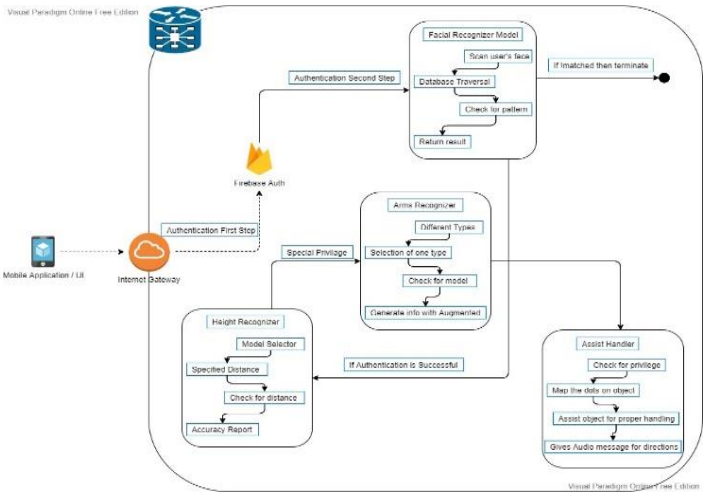

Fig. 1: System Architecture of Objectorator

Objectorator integrates various modules in order to facilitate the military system which detects the arms and measure the height of the soldiers.

A. User Authentication

Initially, the user will need to sign in for User authentication which verifies the identity of a user so that he/she can connect to our Firebase Real-time database. This will be integrated with face recognition so the user can login using their face.

B. Facial Recognition

The person's face and the required facial features pattern of the individual to be recognized are the starting points for the facial recognition procedure. The feature extraction process will predict the face landmark which further calculates face encodings. The model will then compare the face encodings with our data or user added data to recognize the face in the image.

C. Object Detection & Retrieval

Object Detection will be done using Edge HOG (Histogram of Oriented Gradients). This method identifies an image by the distribution of intensity gradients or edge directions.

Because the amplitude of gradients is large near edges and corners due to sudden changes in intensity, the x and y derivatives of a picture (Gradients) are important and we know that edges and corners pack in a lot more information about object shape than flat regions.

D. Height Recognizer

In height recognizer it calculates a person's height from a single image. It requires a reference point to anchor the equations. This reference point can be anything from shadow length, time of day, focal length, camera angle, etc. Currently we are working on using a visible height reference (A4 size paper) as a reference point. This would make the measurements became more precise (3-5% error).

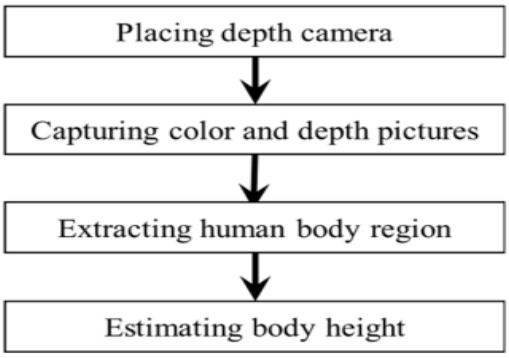

Fig.2: Flow of proposed Method

4. RESULT AND DISCUSSION

The feature vector is formed by combining these small connected sections, known as cells in histograms. It will be contrast-normalized by calculating an intensity measure across a larger section of the image, known as a block, and then using that value to normalise all cells within that block. This normalisation improves the invariance of the image to changes in light or shadowing. Figure 3 depicts the HOG extraction

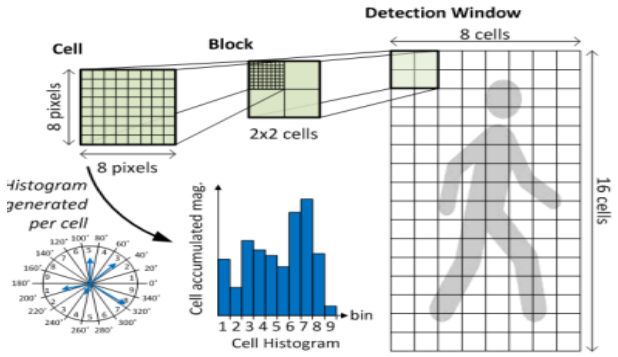

Fig.3: Detection window divided into blocks and cells producing an array of histogram per window

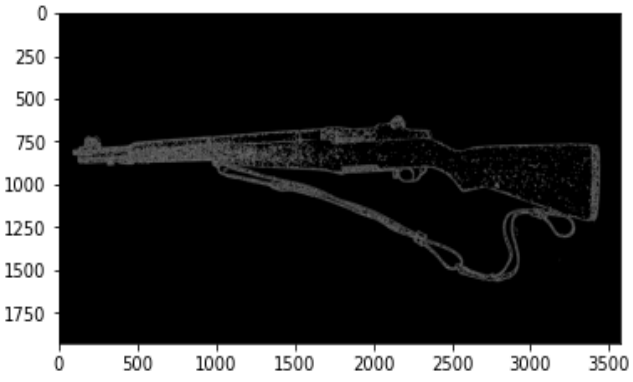

Fig.4: The result of how an image is processed.

The following snapshots are of Objectorator: actual output that the user saw.

The actual outputs seen by the user, as well as snapshots of the application. The screenshots below show several pages from our application. You must first log into the application before you can use it. After logging in, you must choose the module for which you need to know the needed function. You can only select one module at a time, and once you've done so, you must click the start button below. The application will open the camera after you press the start button.

The first module will open the camera and attempt to locate firearms in the acquired image, identify the firearm, and provide the user with the weapon's name, as illustrated in Fig 5.

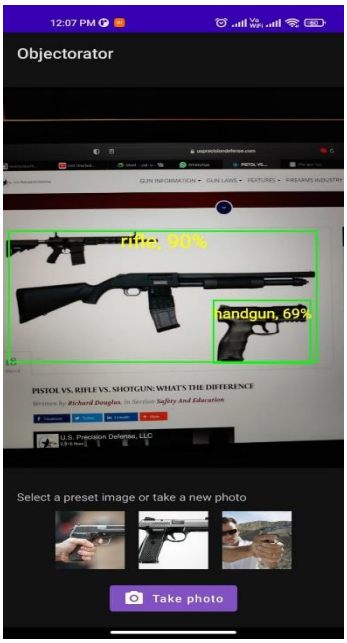

Fig.5: Detecting the firearms present in the image.

Second module is used to identify a person using facial recognition shown this is done by scanning the facial points and facial landmark model in order to extract the facial features of an individual shown in Fig 6

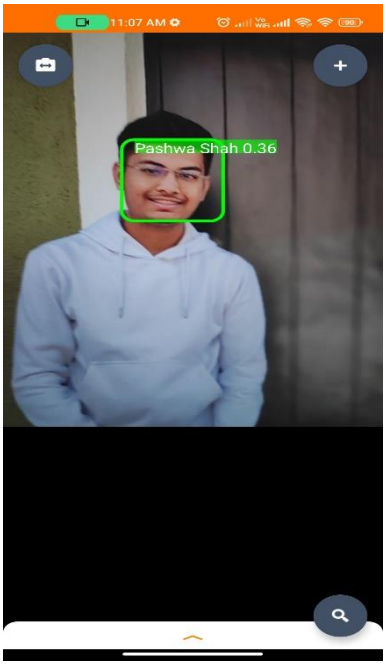

Fig.6: Real time facial Recognition

5. CONCLUSION

Military selection process is still being done physically and multiple times we've witnessed that a deserving candidate fails just because his height is just an inch shorter and someone who is visually impaired so in such a condition with help of Object orator, a person can do his pre self-assessment by which they'll know where they can apply for or their eligibility based on their height and visual standards. Along with that, Arms Recognizer will assist them to know about a weapon lying in front of their smartphone's camera and an augmented visual of the gun will be presented in front of them. Facial Recognizer is being utilized for the past entry records and for authentication purposes.

ACKNOWLEDGEMENT

I Rahul Jha along with my team members "Pashwa Shah & Karandeep Singh Padam" and our guide "Jitendre Saturwar" completed this project work which is being made to cater military assessment programme that will be helpful for youth preparing for it and teachers who are there to train students. During training period one can actually get some pre-requisites done without doing much work. All the work is done using OpenCV, Mediapipe, Android Studio for pure native application experience without any sluggish experience.

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