Survey of 'Nivritti': survey of face recognition technologies/methods

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Abstract - *Nivritti is a software web application which will provide a Digital Platform to solve the Pension Problem of India using Image Recognition Technology. Nivritti will provide services to verify the Jeevan Pramaan Certificate, the Pension to Bank Service & a special SEVA Service(For the Physically Challenged). With its easy-to-use UI UX, the Pension Seekers will now be able to collect their Pension with very few steps & procedures to follow saving their time & effort.*

***Key Words*: HTML, CSS & Bootstrap, Javascript, Python Script, KERAS, TensorFlow, OpenCV, NumPy**

1. INTRODUCTION

Receiving Pension has always been a tedious process involving long waiting hours, delay and lack of transparency in the activity of the system. 'Nivritti' is an application developed for the Pensioners of India which will reduce the effect of this exhausting process. This web app will solve the issues of the Pensioner by providing the service of online verification process using face recognition techniques for the Jeevan pramaan(Life Certificate for Pensioners) & transferring the pension amount from the Pensioners pension account to their savings account. This Web App is specifically built for the use of the senior citizens (especially the government employees) who want to reduce the effect of receiving their necessary pension. Basically this system which not only improves transparency behind the procedure but also picks out the mismanagement while making it a feasible process uses the Face Recognition Technology to enable the Pension for the Pension Seeker..

1.1 Need for Nivritti

It is quite evident that our Pension System has been a Subject of concern for the past few decades. The main reason being the lack of Transparency in carrying out the process of issuing the Life Certificate as well as the Transactions involved in Receiving the Pension Amount. Here is the list of Some Major Issues faced by the Pension Seekers:-

There has been a significant amount of increase in corruption as Sometimes the Pension Seeker has to Bribe the Treasury Department Officials to get their Jeevan Pramaan approved.

Standing in long queues to receive the Pension Amount leading to Exhaustion.

Threat of theft and delay in receiving pension along with lack of coordination from system.

Nivritti solves all the above problems by using the Modern day Technology of Face Recognition. It not only simplifies the process but also increases the Transparency in the system. Hence, as the world is getting Digital it is much necessary to make the Government Schemes and Policies to go Digital. This will not only reduce the Corruption but also increase the Revenue of the Government.

1.2 Existing methods used for face recognition

Methods used till now gave high accuracy , however the drawback was the amount of data required for training purposes(which becomes even a greater issue when they need to be uploaded to a server). Also, predictions made by these processes were time-consuming. The main reason behind our work is to come up with a way that can do the recognition task in as few images as possible and to make the system deployable. Few methods are described below:

DeepFace has been trained on a huge dataset of people from various places. It uses 3D alignment steps to capture facial features. After the alignment step it assumes portions of the face to be fixed at certain pixel levels. Thus it builds its neural net according to this assumption ,as a result of which it requires less convolutional layers.

DeepID method becomes more generalized by increasing the classes it needs to classify faces into. Along with deep Convnets, it focuses on high level extraction of over-complete features.

Face net optimizes the embedding process. With a small batch of images ,it builds its initial model , which can be reused without training when more batches of images are

available. It makes use of triplet loss training method along with L2 normalization for face embedding.

Open Face is the only method that is capable of detecting the pose of head from an image along facial features and direction of gaze of eyes. Thus this can also be used for emotion detection as well.

FARAC implementation using Dlib face alignment and feature extraction for face recognition. It refers to the FARAC methodologies to get the desired output. It has the potential to provide satisfactory accuracy ,while requiring a small number of images.

Face recognition using Dlib uses CNN built using dlib's state-of-the-art face recognition built with deep learning. The model has an accuracy of 99.38% on the Labeled Faces in the Wild benchmark.

1.3 About existing methodologies

As the system might be deployed onto the server and made available to the public ,it must be able to do face recognition with as minimum images as possible . Doing so will reduce the intense processing at local server side and also make our system faster. Various methods used for face recognition have their own advantages and disadvantages ,and hence choice of method suitable for our purpose depends on various factors. As mentioned before , no. of images required should be as minimum as possible. Another such factor is amount of processing power required, the minimum it is, lesser is the load at local server side. This will also allow us to do more at local server side ,thus reducing overall system cost.

2. Literature Survey

Finding of the survey are as follows:-

Table:

Survey of existing face recognition technologies			
Year	Title	Methodologies/ technologies	Result/ accurracy
2013	Image based face detection and recognition. State of art.	SVM(support vector machine) using HOG(Histogram of Oriented Gradients), Adaboost	Data-set : Face collection with plain green background Mean accuracy - 90.88%
2014	DeepFace: Closing the Gap to Human-Level Performance in Face	2D & 3D Alignment, frontalization, DNN architecture and training, normalization,	Data-set: SFC, LFW Mean accuracy -
	Verification	verification metrics	94.30 - 97.35 %
2014	Deep Learning Face Representation from Predicting 10,000 Classes	Deep ConvNets with 2D & 3D convolutional kernels, Grouping network, normalization, parallel processing	Data-set: LFW Mean accuracy - 97.24 %
2016	OpenFace: an open source facial behavior analysis toolkit	Facial landmark detection, Head pose estimation, Face alignment and appearance extraction, Dimensionality reduction, feature fusion and person normalisation	Data-set: LFPW, Helen Mean accuracy - 83.24 %
2016	FAREC - CNN Based Efficient Face Recognition Technique Using Dlib	CNN, Bayesian network. Kernel based algorithms, local receptive Fields	Data-set: Face recognition Grand challenge Mean accuracy: 96 %
2019	ArcFace: Additive Angular Margin Loss for Deep Face Recognition	DCNN, Additive Angular Margin Loss, Minimum Hyper-spherical Energy(MHE)	Data-set: LFW, CFP-FP, AgeDB-30 Mean accuracy: 97.43 %
2019	Face Recognition using FaceNet (Survey, Performance Test, and Comparison)	VGGFace2, PCA, MTCNN, GPU(graphical processing unit) and TPU(tensorflow processing unit) for parallel computing	Data-set: Yale, AT&T, JAFFE Mean accuracy : 98.9 %

3. CONCLUSION

Various existing methods of face recognition were mentioned above in this survey paper. The implementation of these models varies from either being implemented using CPU or GPU. The models are highly trained over a large dataset but there still exist pros and cons based on Hardware implementation or the quality/quantity of the input image being used. Thus the deployment of these models requires testing beforehand to make it convenient for users.

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