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Smart Hybrid Wireless EV Charging Station Powered by Solar Energy and Grid Backup

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ABSTRACT: Face recognition is emerging as an active research area with numerous commercial and law enforcement applications.Although existing methods perform well under certain conditions, the illumination changes, occlusions and recognition time are still challenging problems

Its automatically identifying a person from a digital image or video freame.one of the way to do this is by comparing selected facial features from the image and a facial database.The goal for Face Analysis for Commercial Entities(FACE),the novel framework for automatic authentication of biometric face images that we present in this project, is to address the existing challenges and to advance biometric identity management for real-world commercial applications. Its limits the Illumination and pose variations.Face recognition has made significant advances in thelast decade, but robust commercial applications are still lacking.Current authentication/identification applications are limited to controlled settings, e.g., limited pose and illumination changes,with the user usually aware of being screened and collaborating in the process. Among others, pose and illumination changes are limited. To address challenges from looser restrictions, this paper proposes a novel framework for real-world face recognition in uncontrolled settings named Face Analysis for Commercial Entities(FACE).

KEYWORDS: smart hybrid ev charging, solar powered charging station, wireless ev charging, grid backup ev charger, renewable energy ev infrastructure, smart ev charging system, sustainable mobility solution

I. INTRODUCTION

1.OVERVIEW OF THE PROJECT

Face recognition has made significant advances in the time of last decade, but robust commercial applications are still lacking.Current authentication/identification applications are limited tocontrolled settings, e.g., limited pose and illumination changes,with the user usually aware of being screened and collaborating in the process. Among others, pose and illumination changes are limited.To address challenges from looser restrictions, this paper proposes a novel framework for real-world face recognition in uncontrolled settings named Face Analysis for Commercial Entities.Its robustness comes from normalization ("correction")strategies to address pose and illumination variations. In addition,two separate image quality indices quantitatively assess pose and illumination changes for each biometric query, before submitting it to the classifier. Samples with poor quality are possibly discarded or undergo a manual classification or, when possible, trigger a new capture.

Research interest in Face Recognition has grown significantly in recent years as a result of following facts:

1. The increase in emphasis on civilian/commercial research projects.
2. The increasing need for surveillance related projects due to trafficking,terrorist activities.., etc.
3. The reemergence of neural network emphasis classifiers with emphasis on real time computation and adaptation.
4. The availability of real time hardware.

2. ROLE OF FACE RECOGNITION

Within today's environment of increased importance of security and identification and authentication methods have developed into a key technology in various areas: entrance control in buildings; access control for computers in general or for automatic teller machines in particular; day-to-day affairs like withdrawing money from a bank account or dealing with the post office; or in the prominent field of criminal investigations.Such requirements for reliable personal identification in

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computerized access control has resulted in increased interest in biometrics.Biometric identification is the technique of automatically identifying or verifying an individual by a physical characteristics or personal.

The term "Automatically" means the biometric identification system must identify or verify a human characteristics or trait with little or no interversion from the user. Biometric technology was developed for use in high-level security systems and law enforcement markets. The key element of biometric technology is its ability to identify a human being and enforce security.Biometric characteristics and traits are divided into behavioral or physical **categ**ories.Behavioral biometrics encompasses such behaviors as signature and typing rhythms.Physical biometric systems use theeye,finger,hand,voice and face for identification. A biometric based system which has been developed by recognition system environment.

The side and top view of a hand positioned in a controlled capture box are used to generate a set of geometric features. Capturing data takes less than two seconds and the data can be stored efficiently in a 9-byte feature vector. This system can store up to 20000 different hands. Another well-known biometric measure is that of fingerprints. Various institutions around the world have carried out research in the field.Finger print systems are unobstrusive and relatively cheap to buy.They are used in banks and to control entrance to restricted access areas.

Finger prints are unique for each human being.It has been observed that the iris

of the eye,like Fingerprints,display patterns and textures unique to each human and that it remains stable over decades of life.Speech recognition also offers one of the most natural and less obtrusive biometric measures, where a user is identified through his or her spoken words.While appropriate for bank transactions and entry into secure areas,such technologies have the disadvantage that they are intrusive both physically and socially.

They require the user to position their body relative to the sensor, then pause for a second to declare himself or herself. This pause and declare interaction is unlikely to change because of the fine-grain spatial sensing required. Moreover, since people can not recognize people using this sort of data, these types of identification do not have a place in normal human interactions and social structures.

II. LITERATURE REVIEW

ANALYTIC METHODS

For analytic approaches, distances and angles between feature points on the face, shapes of facial features, or local features, e.g. intensity values extracted from facial features or components are usually applied for face recognition.The main advantage of analytic approaches is to allow a flexible deformation at the key feature points so that pose changes can be compensated.In both template and geometric feature based analytic methods are implemented and compared.for template based method,favial regions are matched with template of eyes,nose and mouth respectively and similarly scores of each facial feature are simply added into a global score for Face Recognition.For geometrical feature based methods,eyes,mouths and nose facial features are firstly detected.

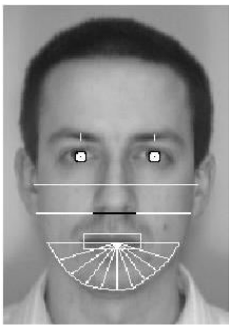

Figure Geometric Features used for face Recognition

Figure shows how these geometry features are measured, e.g. the chin shape is represented by the distance between the edge of the chin and the centre of the mouth. However, the experimental results favour the template matching approach. A graph structure, called Dynamic Link Architecture , is proposed by Lades et al, to represent face images. In this system, an elastic graph matching process is used to learn the representing graph of face images. Once faces are represented by appropriate graphs, Gabor

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features extracted from graph nodes, named Gabor jets, are then used for face recognition. Figure shows two example face images overlaid.

The task of Recognizing faces has attracted much attention both from neuroscientists and from computer vision scientists.This chapter gives a literature survey on state of the art of 2D based face recognition algorithms.Various Approaches for 2D face recognition have been proposed in the literature,which can be classified into three categories: analytic (feature based),holistic(global) and hybrid methods. While analytic approaches compare the salient facial features or components detected from the face, holistic approaches make use of the information derived from the whole face pattern. By combining both local and global features, hybrid methods attempt to produce a more complete representation of facial images.

3.1 ALGORITHM USED IN EXISTING METHOD

The below algorithm is used in the existing method of face recognition system.

3.1.1 CORRELATON MATCHING

The Correlation based analysis;A direct matching between the face recognition is attempted.To do that,the face images are superimposed and displacements and correlations of the rotations of the relavent sections are calculated. The maximum level of the correlation factor interpreted as the matching sections of the images.In other words the correlation value is the resemblance factor between the two images.

The suggested algorithm requires 5 steps:

1.Segmentation of the image.
2.Determination of the ridge Orientation.
3.RP Detection.
4.Normalization of the images.

Calculation of the correlation around the RP reduces time cost dramatically.Another important factor is the determination of digital signatures using correlation.They must give the determination between two images.In addition the algorithm requires lesser storage for the template,by storing only the important factor of the image rather then the whole image-when compared to the conventional approaches.Since the algorithm accomplishes its target with minimum number of preprocessing steps,the error level is lesser.And it is fast due to its basic nature and confinement of the analysis into a new area.The algorithm performs better than the minutiae based approaches.

3.2 ALGORITHM USED IN PROPOSED METHOD

The below algorithm is used in the existing method of face recognition system.

3.2.1 NEAREST NEIGHBOR

A soft nearest neighbor ensemble method, which can effectively exploit the outputs of the SOM topological space, is also proposed to identify the unlabeled subjects. Experiments show that the proposed method exhibits high robust performance against the partial occlusions and variant expressions.Recently, it has partially tackled the previous problems using a local probabilistic method, where the subspace of each individual is learned and represented by a separate Gaussian distribution. This paper extends his work by proposing an alternative way of representing the face subspace with self-organizing maps.One of the main motivations of such an extension is that, even when the sample size is too small to faithfully represent the underlying distribution(e.g., when not enough or even no virtual samples are generated),the SOM algorithm can still extract all the significant information of local facial features due to the algorithm's unsupervised and nonparametric characteristic, while eliminating possible faults like noise, outliers, or missing values.

In this way, the compact and robust representation of the subspace can be reliably learned. Furthermore, a soft nearest neighbor ensemble method, which can efficiently exploit the outputs of the SOM topological space, is also proposed to identify the unlabeled subjects.

The interest into face recognition is mainly focused on the identification requirements for secure information systems, multimedia systems, and cognitive sciences. Interest is still on the rise, since face recognition is also seen as an important part of next-generation smart environments.

Capture and processing of user biometric data for use by system in subsequent authentication operations.Capture and processing of user biometric data in order to render an authentication decision based on the outcome of a matching process of the stored to current template(verification 1:1 identification 1:N).The quality of the training images can be

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modeled by creating an average face template out of all the face images whose quality is considered as reference.The cross-correlation with an.

IV. FACE ARCHITECTURE

The below figure shows the face architecture of face recognition system and it describes the blocks.

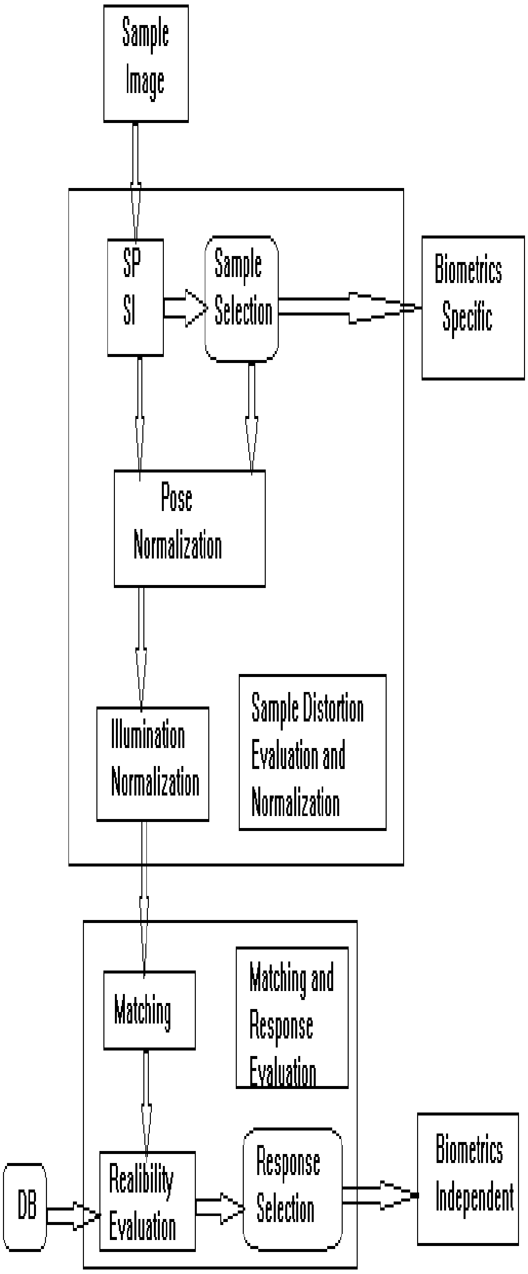

Figure: Face Architecture

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V. FACE STEPS

The following figure shows the face steps of Face Recognition System.Here we are using FERET database.

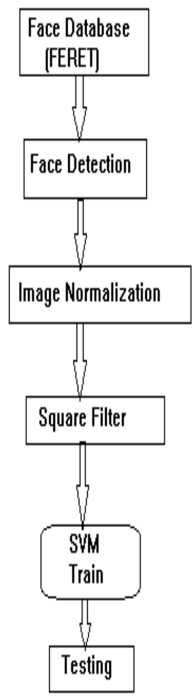

Figure Face Steps

5.1 FACE DETECTION

The first step in a face-recognition-based application is the detection of one or more faces within an image.In our FACE,the face and its characteristic points ("landmarks") are located through the approach presented in,namely,the extended Active Shape Model algorithm. The latter is used to locate features in frontal views of upright faces. It first submits the image to a global face detector,which extracts all regions of interest from an image that includes at least one face. Images that lackfaces are discarded.ROI are individually fed to STASM algorithm,which searches for relevant landmarks by minimizing a global distance between candidate image points and their homologues using a general model (shape model), which is precomputed ("learned") over a wide set of training images.

The algorithm locates 68 interest points. The precision of the location procedure depends on the amount of face distortion.In the section presenting experimental results, we will discuss how the precision in the detection of relevant points influences the accuracy of recognition. These points are exploited for normalization, i.e., to render the face image using a canonical pose and illumination representation.Let us note that STASM may be not a solution fits all.However, it is among the few ones that are accessible as open source and can be handled without too much effort. This is a critical point, since solving such problems is out of the scope for this paper.

The quality indices proposed and implemented,such as the one based on symmetry, which work even with an inaccurate point location, aim at handling such situations by asking for a new capture/selection of a different sample ("identity management") or for user validation in the specific case of tagging .

To the extent that STASM helps its use seems justified. In addition, we tested two further implementations of ASM, namely, ASM Library and Open ASM . The obtained results were in favor of using STASM.We also trained it on sample images from the image sets used. It is further worth noticing that, if one obtains good results with an imprecise location technique, the whole system, which is our challenge,can only get better with a better location module.Fig.in Section V-D shows the results of the tested implementations of AMS on different samples. More sophisticated methods, if and when become available, could be easily substituted due to the flexible FACE architecture and would yield even better performances. An example is the approach recently presented by Belhumeur et al. in,which is based on consensus of exemplars. This technique seems to be extremely precise, even with images captured in particularly adverse conditions.

Nowadays some applications of Face Recognition don't require face detection.In some cases, face images stored in the data bases are already normalized.There is a standard image input format, so there is no need for a detection step. An example of this could be a criminal data base. There, the law enforcement agency stores faces of people with a criminal report. If there is new subject and the police has his or her passport photograph, face detection is not necessary. However, the conventional input image of computer vision systems are not that suitable. They can contain many items or faces.

In these cases face detection is mandatory. It's also unavoidable if we want to develop an automated face tracking system.For example,video surveillance systems try to include face detection, tracking and recognizing.So, it's reasonable to assume face detection as part of the more ample face recognition problem.

5.2 IMAGE NORMALIZATION

Image normalization refers here to pose and illumination changes. Many approaches for image normalization, to achieve invariance to data capture conditions and to allow biometrics to operate in uncontrolled settings, have been proposed and explored.We start with pose changes, which may induce greater variability in the appearance of a single individual than that holding among different individuals.Although such differences do not hinder the human ability to recognize a person,they can heavily degrade the performances of an automatic recognition system.The frontal image of a face in nonfrontal pose can be reconstructed from a single image, by exploiting affine transformations.

The limit of this method is the use of only three face vertical stripes, identified through eye centers, to compute the suitable transformation. This might not be sufficient for a satisfying result. A higher number of regions (patches) are exploited in,under the assumption that there exists a linear mapping between subregions (patches) of nonfrontal and frontal images of the same subject. This includes a training phase where the system estimates a mapping among each single pose and the frontal pose through a suitable Gaussian process regression. During testing, the pose is first estimated, and then,the appropriate GPR is applied.

One limitation of this approach is that only anticipated poses, i.e., those from a predetermined discrete set, can be reliably mapped to a frontal one. Moreover,this requires a computationally expensive training phase. One frontal and one profile image have been shown to recoverboth 3-D shape and texture information.While exploiting a 3-D model facilitates recovering a frontal pose, the involved computational cost is prohibitive for large-scale applications.Illumination normalization, the other type of image normalization that we are concerned with, is discussed next.They define a new extension to the edge map technique, the line edge map, where face contours are extracted and combined in segments, which are then organized as lines. The resulting feature vectors are compared using a modified Hausdorff distance; prefiltering is then applied before engaging in proper authentication.

5.3 TRAINING

Training images are mapped into a lower dimension using the SOM network and the weight matrix of each image stored in the training database. During recognition trained images are reconstructed using weight matrices and recognition is through untrained test images using Euclidean distance as the similarity measure.

5.4 TESTING

During the testing phase, each input vector is compared with all nodes of the SOM, and the best match is found based on minimum Euclidean distance, as given in DATABASE.The final output of the system based on its recognition, displays if the test image is "present" or "not present" in the image database.

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VI. POSE AND ILLUMINATION

6.1 POSE

Pose variation and illumination are the two main problems face by face recognition researchers. The vast majority of face recognition methods are based on frontal face images. These set of images can provide a solid research base.It can be mentioned that maybe the 90% of papers referenced on this work use these kind of databases. Image representation methods, dimension reduction algorithms, basic recognition techniques, illumination invariant methods and many other subjects are well tested using frontal faces.

On the other hand, recognition algorithms must implement the constraints of the recognition applications. Many of them, like video surveillance,video security systems or augmented reality home entertainment systems take input data from uncontrolled environment. The uncontrolled environment constraint involves several obstacles for face recognition: The aforementioned problem of lighting is one of them. Pose variation is another one.There are several approaches used to face pose variations. Most of them have already been detailed, so this section won't go over them again. However,it's worth mentioning the most relevant approaches to pose problem solutions.

Multi-image based approach: These methods require multiple images for training.The idea behind this approach is to make templates of all the possible pose variations.So,when an input image must be classified, it is aligned to the images corresponding to a single pose.This process is repeated for each stored pose,until the correct one is detected. The restrictions of such methods are firstly,that many images are needed for each person. Secondly, this systems perform a pure texture mapping, so expression and illumination variations are an added issue.

6.2 ILLUMINATION

Many algorithms rely on color information to recognize faces. Features are extracted from color images, although some of them may be gray-scale.The color that we perceive from a given surface depends not only on the surface's nature, but also on the light upon it. In fact, color derives from the perception of our light receptors of the spectrum of light - distribution of light energy versus wavelength.

There can be relevant illumination variations on images taken under uncontrolled environment.That said, the chromacity is an essential factor in face recognition. The intensity of the color in a pixel can vary greatly depending on the lighting conditions.Is not only the sole value of the pixels what varies with light changes.The relation or variations between pixels may also vary. As many feature extraction methods relay on color/intensity variability measures between pixels to obtain relevant data, they show an important dependency on lighting changes. Keep in mind that, not only light sources can vary, but also light intensities may increase or decrease, new light sources added.

Entire face regions be obscured or in shadow, and also feature extraction can become impossible because of solarization. The big problem is that two faces of the same subject but with illumination variations may show more differences between them than compared to another subject. Summing up, illumination is one of the big challenges of automated face recognition systems.Thus,there is much literature on the subject. However, it has been demonstrated that humans can generalize representations of a face under radically different illumination conditions, although human recognition of faces is sensitive to illumination direction.

VII. MEASUREMENT

A way to measure the quality of a FACE probe is to consider the amount of "effort" that would be needed to correct for pose and illumination distortions in the image, with larger corrections yielding lower quality ("distortion") indices.The normalization procedure aims at recovering a frontal pose of the face presented in the input image, starting from the points located using the STASM approach in , as sketched previously.The distribution of such points on the face is a good starting point to evaluate the degree of distortion that needs to be corrected by the pose normalization .The index for pose quality is given by the linear combination of three parts, which are, respectively, inversely proportional to roll, yaw, and pitch, i.e., the considered distortion components.

In general, these three components vary jointly. The pose variations are such that a good distortion index, however, can be derived using independent weights for each component.We notice here that an accurate measure of the rotation angles to quantify such distortions is beyond our goals.We are rather interested in an estimation of the influence of pose distortion on recognition.Towards that end, the intuitive approximations used are good enough for our purpose and easy to derive. The same parameters also drive subsequent processing, e.g., face normalization.Roll is approximated as the

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angle θ between the line passing through the centers of the eyes and the x axis .We define the contribution of the roll to the pose distortion asess.The higher the roll is, the worse is the distortion.

We measure the left distance dl and right distance dr between the external corner of each eye and the nose tip. Such distances tend to be equal in a frontal pose; otherwise, one of them increases at the expense of the other. The yaw component of the pose distortion is thus defined as:

$$yaw = max(dl, dr) - min(dl, dr)/max(dl, dr)$$

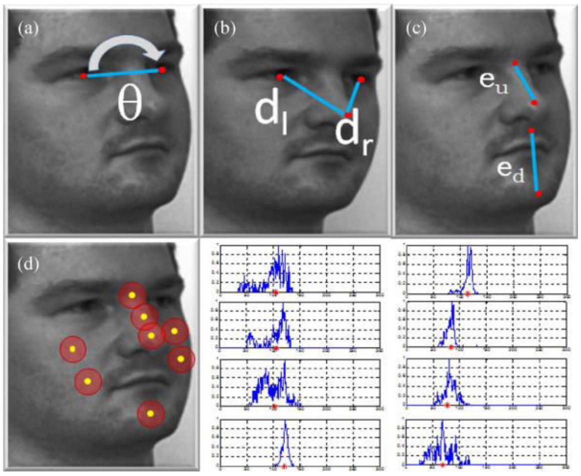
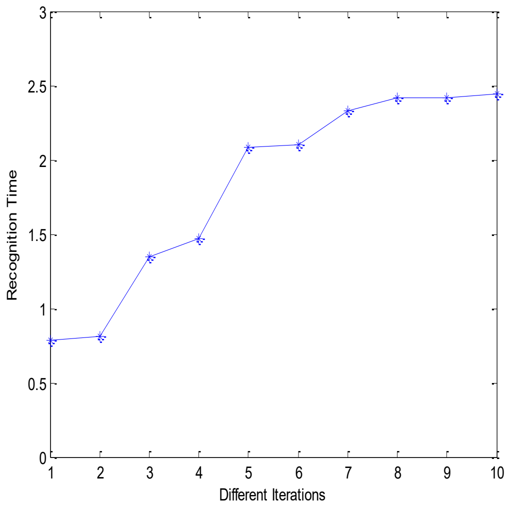


Figure Feature points used to compute pose and illumination distortion measures.

All three factors range from 0 (almost no distortion) to 1(worst situation, corresponding to higher distortion). The SP index is defined as a weighted linear combination of values computed from them as follows:

$$SP = \alpha \cdot (1 - roll) + \beta \cdot (1 - yaw) + \gamma \cdot (1 - pitch) \ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Recognition Rate



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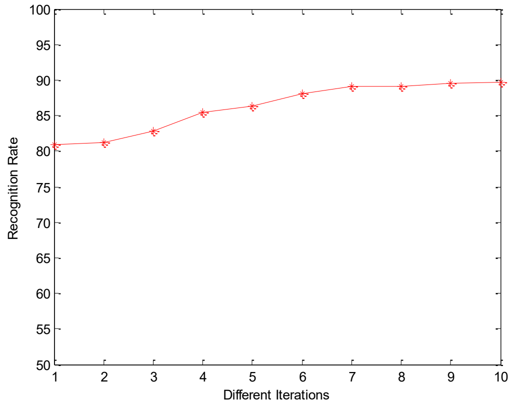
Recognition time



VIII. CONCLUSION

The approach is definitely robust, simple, and easy and fast to implement compared to other algorith It provides a practical solution to the recognition problem. This paper has described FACE, a new framework for face analysis including classification. FACE improves accuracy performance compared to state-of-the-art methods, for uncontrolled settings when the image acquisition conditions are not optimal. This is typical of applications such as photo tagging over social networks like Facebook or cataloguing of celebrities' images in a magazine editorial office. FACE has access to multiple gallery instances for each subject and does not require expensive training to learn the face space, using instead straightforward correlation of local regions after proper pose and illumination normalization. FACE also has access to pose and illumination image quality indices, respectively,which can be used to *a* priori discard images whose quality is not sufficient to guarantee an accurate recognition response.

An intelligent system should have an ability to learn or have ability to adapt over time. When an image is sufficiently close to the face space but not a known face, the system mad it as an unknown face. Computer stores the unknown face's pattern vector of the cosponding image. Further these types of vector are cluster in the space, the presence of new but unknown

face is postulated.Experimental results show that FACE outperforms competing methods, with asignificant increment in accuracy versus the next ranked methods.The improvement depends on the complexity of the data set at hand but is always worth of consideration.

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