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IOT Enabled Smart Mirror for Physically Challenged

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ABSTRACT: Technology has been improved to live people's life most easily. Developing an application in such a way that the technologies reach the human to live a sophisticated life. Smart Mirror is one of the best ways to bridge a gap between the human and technologies. Since each person use the Mirror in his daily life, the mirror provides a natural means of interaction through which the residents can control the household smart appliances and access personalized services. So building time management technique in mirror will be useful and an efficient one. Making the smart mirror helps the physically challenged people much by making them up to date with latest technologies and provide security to them. Existing smart mirror are meant to be an entertaining people and for business purpose. So we proposed to build a smart mirror in order to help the physically challenged people to secure them and the busy people to effectively manage their time in their daily routines.

I. INTRODUCTION

Effective time management is one of the most important factors for every person's life, especially if the person is physically challenged. By increasing the integration of technology in our lives helps us to maintain an efficient schedule. Keeping the event and the social media notification up to date is made easier through technology such as PC's, smart phones etc. But using these gadgets doesn't make us to use in busy life and also provide distractions that can interrupt anyone's routine. So concept of integrating those high-tech features in mirror helps user to effectively manage their time in their daily routine.

This high-tech feature helps the physically challenged people. They cannot move from one place to another often for their every need. So voice recognition will be very helpful by the way of controlling the Home appliances. Security option will make them to be safe in home where physically challenged need no other security appliances. In an emergency case, if they need to contact any one for help, just by voice commanding. Emergency alerting system using GSM benefits the users for up-to-date notification from mirrors.

The various technologies used in smart mirror are Artificial Intelligence, Deep learning, Cloud. Artificial intelligence has extended its intelligent conclusion retrieval is being achieved using Machine learning. It derives the conclusion based upon the collected data. Machine learning is latest technology of making the machine to learn the data and to bring the conclusion by making itself a decision. Deep learning is the growing technique of determining the conclusion with high accuracy. Deep learning is a kind of machine learning in which ML learns without being explicitly programming. Once the program is implemented it should react based on real time data in variable environment. But Deep learning uses convolutional learning and clustering learning to get deeper results what machine learning does. Deep learning uses layering concepts in which it contains input layer, output layer and the intermediate hidden layers.

Deep learning is a class of machine learning algorithms that multiple layers are cascaded of nonlinear processing units for feature extraction and transformation. Each successive layer uses the output from the previous layer as input;

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Learning is done in both supervised and unsupervised manners, learning the multiple levels of representations that correspond to different levels of abstraction. Layers that have been used in deep learning include hidden layers of artificial neural networks. Types of Deep learning models are: Unsupervised Pertained Networks (UPNs), Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Recursive Neural Networks. Convolution neural network, as a kind of depth learning model, can automatically learn and extract features from data. Its generalization ability is superior to traditional methods, and has been successfully applied to pattern classification, object detection and object recognition [1].

Here Conventional Neural network is used and Convolutional Neural Networks (CNN) has made great success on image and audio, which is the important component of deep learning [1]. Using the development of computer vision, pedestrian detection in the intelligent auxiliary driving, intelligent monitoring, pedestrian analysis and intelligent robot, and other fields have been widely used. Hinton and their students in the 2012 ILSVRC using convolution neural network got first place, and the classification task Top - 5 error rates is 15.3%, which is much better than the others [1]. CNN will learn to recognize patterns across space. So, as you say, a CNN will learn to recognize components of an image (e.g., lines, curves, etc.) and then learn to combine these components to recognize larger structures (e.g., faces, objects, etc.).

Recurrent Neural Network will similarly learn to recognize patterns across time. So a RNN that is trained to translate text might learn that "dog" should be translated differently if preceded by the word "hot". Cluster learning is a concept of collective learning network which predict and detect object based on collective data from various layers Test set accuracy comparison for a convolutional neural network (CNN) and a clustering learning (CL) network with 1 and 2 layers on the SVHN dataset [2].

And also the results in the CIFAR10 dataset in figure 2. As in the SVHN case, we compared results of accuracy in the test set for 4 cases: clustering learning with 1 layer (CL 1 layer), clustering learning with 2 layers (CL 2 layers), a 1-layer and a 2-layers convolutional neural network (convnet 11, 21) [2].

Table 1 : Deep learning Comparison

Layer		Best	Worst	References
1 layer	Convolutional Neural Network	57%	50%	[1]
	Clustering learning	52%	38%	[2]
2 layers	Convolutional Neural Network	70%	45%	[1]
	Clustering learning	40%	36%	[2]

From the table 1, we can conclude that convolution neural network is an efficient one.

In Existing system, the smart mirror is developed based on three objectives: [3]

1. To design a prototype Smart Mirror using Raspberry PI
2. To develop a voice recognition system to facilitate the implementation of Smart Mirror.
3. To carry out the testing process on Raspberry PI for usability evaluation to users.

But the security and home safety is not being implemented, [3] The author focused on developing smart mirror for smart life where bring an Human Technology interface and to meet the functional requirements. There are predefined available commands to enhance to user to use those commands to use smart mirror efficiently.[3]

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Touch less data acquisition is achieved [4] using Vision camera and Multispectral camera for emotional analysis. The Wise Mirror features an advanced sensing framework for unobtrusive acquisition of videos, images, and 3D scans of individuals standing in front of the mirror.

Multispectral cameras are used for analysis the skin tissues and microcirculation. In [4] the main objective is to promote a healthy lifestyle using smart mirror.

In the paper [5], the author proposed a Wise mirror that uses multisensory cardio-metabolic risk monitoring system. In this paper, mirror is built as a result of the FP7 funded SEMEOTICONS (Semeiotic Oriented Technology for Individuals Cardio metabolic risk self-assessment and Self-monitoring). In this, user can self-monitor their well-being status over time and to improve their lifestyle using latest technology.

In the paper [6], the author proposed a smart mirror to monitor the elder at the home, it collect the data like pulse, emotion, Blood pressure of them and collect those data in EC system, This system then process the data with the threshold limit set in the EC system, When a threshold limit exceed, and alert messages with the critical value of forwarded to the elder care taker via SMS

In the paper [7], the author developed a smart mirror that is an reflective interface, which displays the news feed, calendar, reminder features to the user. Author also proposed it with an face recognition system that identifies the user, Here no other features are being proposed.

In the paper [8], the author proposed an interactive mirror with Home aware, It consist of many interactive features like Load cell, RFID, webcam. The load cell is used to weigh the user and get his BMI, RFID is used to detect the garments worn by the user, and webcam is to perform the face recognition. Here no home automation and security features are being proposed.

In the paper [9], the author developed a smart mirror which consist of the Automated home control system, It uses the Relay module to control the appliances. No other security features and social media interaction is being proposed

In the paper [10], the author designed and developed a mirror that has an user identification module, Interactive games for the user and Activities tracking. It enhanced with the emotion detection. Here it is not implemented for any security features.

Table 2: Comparison for existing project with our proposal

S.No	Title	Output	Cons	References
1.	Smart mirror for smart life	Effective Voice user interface and interact using available commands, Home control system is implemented.	Security feature and Home safety is not being implemented. No social media activities	[3]
2.	A smart mirror to promote a healthy lifestyle	Reduce the socio-economic burden of chronic and widespread diseases, such as cardiovascular and metabolic diseases.	Security feature and Home safety is not being implemented, No voice user interface.	[4]
3.	Wise Mirror - a smart, multisensory cardio-metabolic risk monitoring system	Translate the semeiotic code of the human face into computational descriptors and measures, automatically extracted from videos, multispectral images	No social media activities. No Home control system.	[5]

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4.	Smart Mirror Health Management Services based on IoT Platform	Monitor the parent health (Pulse, Blood pressure, etc) , uses Elder care system which collects the data and notify their care taker via SMS to their Android phone.	No security provided to elder who are alone in the home, No entertainment features, Emergency call facilities not available	[6]
5.	Smart Mirror: A Reflective Interface to Maximize Productivity	Smart mirror for displaying the news feeds, Calendar, weather and it has face recognition using webcam	No security features and No Home control system.	[7]
6	Design and Development of Interactive Mirror for Aware Home	Smart mirror with face recognition, load sensors for measuring user's weight, Radio-frequency identification (RFID) reader and RFID tags for identifying the garment worn by the user	No security features and No Home control system.	[8]
7	Home Automated Smart Mirror as an Internet of Things (IoT) Implementation	Smart mirror has the Home automated system with home application control	No security features and no social media	[9]
8	FitMirror: A Smart Mirror For Positive Affect in Everyday User Morning Routines	Smart mirror has user identification, Interactive games, activities tracking, Emotion detection	No security and emergency features	[10]

From the table 2 , we conclude that the security features is not being implemented in smart mirror.

II. CONCLUSION

Our Project proposal is concentrated on combined effort for implementing the Home control, Home safe system, Security, User Friendly effective mirror, Entertainment, Emergency alert, involving in social media. This kind of combined concept is not being implemented till now. Objective of our proposal is to use all kind of effective technologies to help the end users and to be benefited mainly on time management.

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