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Smart Door Lock System Using Face Recognition

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Abstract: ***Currently, we're facing security issues in every aspect. So, we've to resolve these issues by using streamlined technology. In this project, we're using the Face recognition module to capture human images and to compare with stored database images.***
The most important of characteristic of any home security system is to discover the people who enter or leave the house. Instead of monitoring that through passwords or pins, unique faces can be made use of as they're one's biometric characteristic. We aim to make a smart door, which secures the gateway on the base of who we are. The goal of this project is to help users improve the door security of sensitive places by using face detection and recognition.
The proposed system consists of basically the following subsystems:
Face Detection, Face Recognition and also automatic door access control.
Keywords: Face Detection, Face Recognition, Authentication, Convolutional Neural Networks

I. INTRODUCTION

Biometrics is unique to an individual and is used in numerous systems that involve security. In the face recognition approach, a given face is compared with the faces stored in the database in order to identify the person. The aim is to search out a face in the database, which has the most similarity with the given face. The field of smart home technology has grown by hops and bounds over the last several ages.

As a result, there are a number of new products available that can add convenience and security to any home. Numerous people became aware of smart home devices with the introduction of the smart thermostat. Today, smart thermostats are only the beginning. Smart devices are helping people manage their schedules, their grocery lists, their home lighting, and indeed their home security. Ideally, all these devices will work together to make life a bit easier, and a bit safer, too. One group of smart home security devices that are gaining in popularity are smart door locks. Smart door locks are also seeing a bit of innovation lately, with some companies adding facial recognition capability. Facial recognition makes it possible to operate a door lock with nothing but your face.

II. LITERATURE REVIEW

Facial recognition is a way of relating or attesting an existent's identity using their face. Facial recognition systems can be used to identify people in prints, videos, or in real- time. Facial recognition is an order of biometric security. Other forms of biometric software include voice recognition, point recognition, and eye retina or iris recognition.

The technology is mainly used for security and law enforcement, still there is adding interest in other areas of use. For decades, for science society using the smart home isn't a new term. As there's an advance in technology there's a fast increase in the field of home security automation.

The control of smart systems for automatic door lock systems is done through Bluetooth, the internet, etc. Most of the laptops, tablets, mobiles have built-in accessories which in turn reduce the cost of the system, but it controls within the Bluetooth range. The system which is based on Machine Learning has only three building blocks i.e., Camera, Arduino Uno, Laptop.

III. SYSTEM ARCHITECTURE

A Convolutional Neural Network (ConvNet/ CNN) is a Deep Learning
algorithm which can take in an input image, assign significance (learnable weights and impulses) to varied aspects/ objects in the image and be fit to separate one from the other. The pre-processing needed in a ConvNet is much lower as compared to other classification algorithms.

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A. *Working*

There are various architectures of CNNs available which have been crucial in building algorithms which power and shall power AI as a whole in the foreseeable future. Some of them have been listed below

1) Inception
2) LeNet
3) AlexNet
4) VGGNet
5) Inception-Resnet V2
6) ResNet
7) MobileNet V2

We've used the MobileNet V2 for implementation purposes.

The MobileNetV2 architecture is based on an inverted residual structure where the input and output of the residual block are thin bottleneck layers contrary to traditional residual models which use expanded representations in the input an MobileNetV2 uses featherlight depth wise convolutions to filter features in the intermediate expansion level.

In MobileNetV2, there are two kinds of blocks. One is residual block with stride of 1. Another one is block with stride of 2 for downsizing.

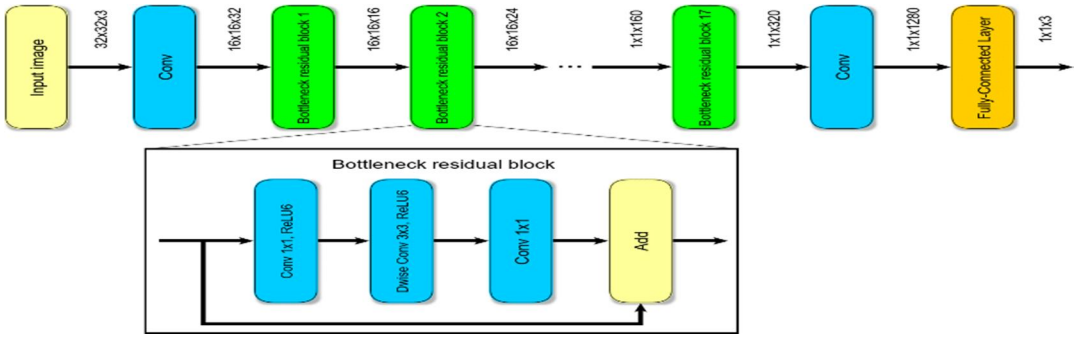
There are 3 layers for both types of blocks.

This time, the first level is 1 × 1 convolution with ReLU6.

The other level is the depth wise convolution.

The third level is another 1 × 1 convolution but without any non-linearity.

MobileNetV2 outperforms MobileNetV1 and ShuffleNet (1.5) with similar model size and computational cost.



IV. TECHNOLOGY USED

A. *Deep Learning*

Deep learning is a part of machine learning during which multi-layered neural networks modelled to figure just like the human brain — 'learn' from massive quantities of information. among every layer of the neural network, deep learning algorithms perform computations and make predictions constantly, increasingly learning and bit by bit up the accurateness of the end result over time. In the same approach that the human 10 brain absorbs and processes info getting into the body through the 5 senses, deep learning ingests info from multiple information sources and analyses it in real time. Deep learning drives several computer sciences (AI) operations and services that refine automation, playacting analytical and physical tasks while not human intervention. Deep learning technology lies behind everyday merchandise and services (similar as digital assistants, voice- enabled Television remotes, and Mastercard fraud spotting) still as rising technologies (similar as self- driving motor vehicles).

B. *TensorFlow*

Tensor Flow, created by Google, is an open-source deep learning framework. It may be accustomed to train Neural Network (NN) models and to predict results by using abundant Graphical Processing Unit (GPU) to collaborate, therefore, powerful algorithms for deep learning and NN may be can be. This framework also can be applied in many alternative areas like speech recognition, computer vision, robotics, and so on. Tensor Flow will generate data flow graphs for processing once graphs are composed of node groups.

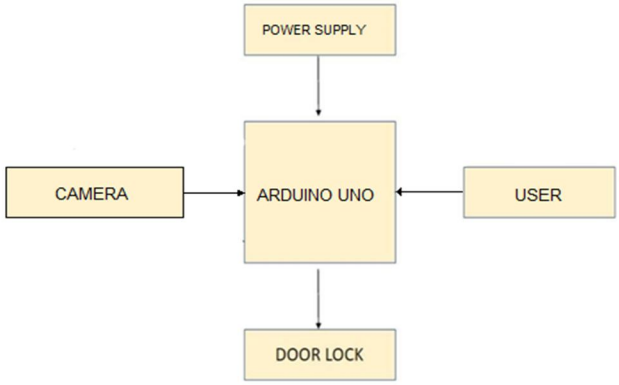
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C. Keras

Keras is an open-source library used for high-level NN. It provides API for NN programming written in Python. It may also be used with Tensor flow. Models of machine learning, NN, and deep learning are often created by using Keras. Dividing codes into parts make Keras easy to create and understand. The components of generating models usually contains neural layers, cost functions, optimizer, and activation functions. New defined functions or classes also can be simply developed by using Python.

V. DATAFLOW DIAGRAM

A data flow diagram is a graphical illustration of the "flow" of data through a data system, modelling its process aspects. A DFD is usually used as a preliminary step to make a summary of the system while not going into great detail, which can later be elaborated.



VI. FUTURE SCOPE

We will intend to try to develop a lot of sophisticated algorithms which is able to capture a lot of facial details as compared to the algorithms used nowadays. Also, we will try to work upon a feature which can try to verify whether or not the person standing ahead of the camera is in reality a person and not simply a picture of him. we are going to also attempt to implement these algorithms for Iris Recognition which is much more complicated and safer as compared to the entire face recognition.

VII. CONCLUSION

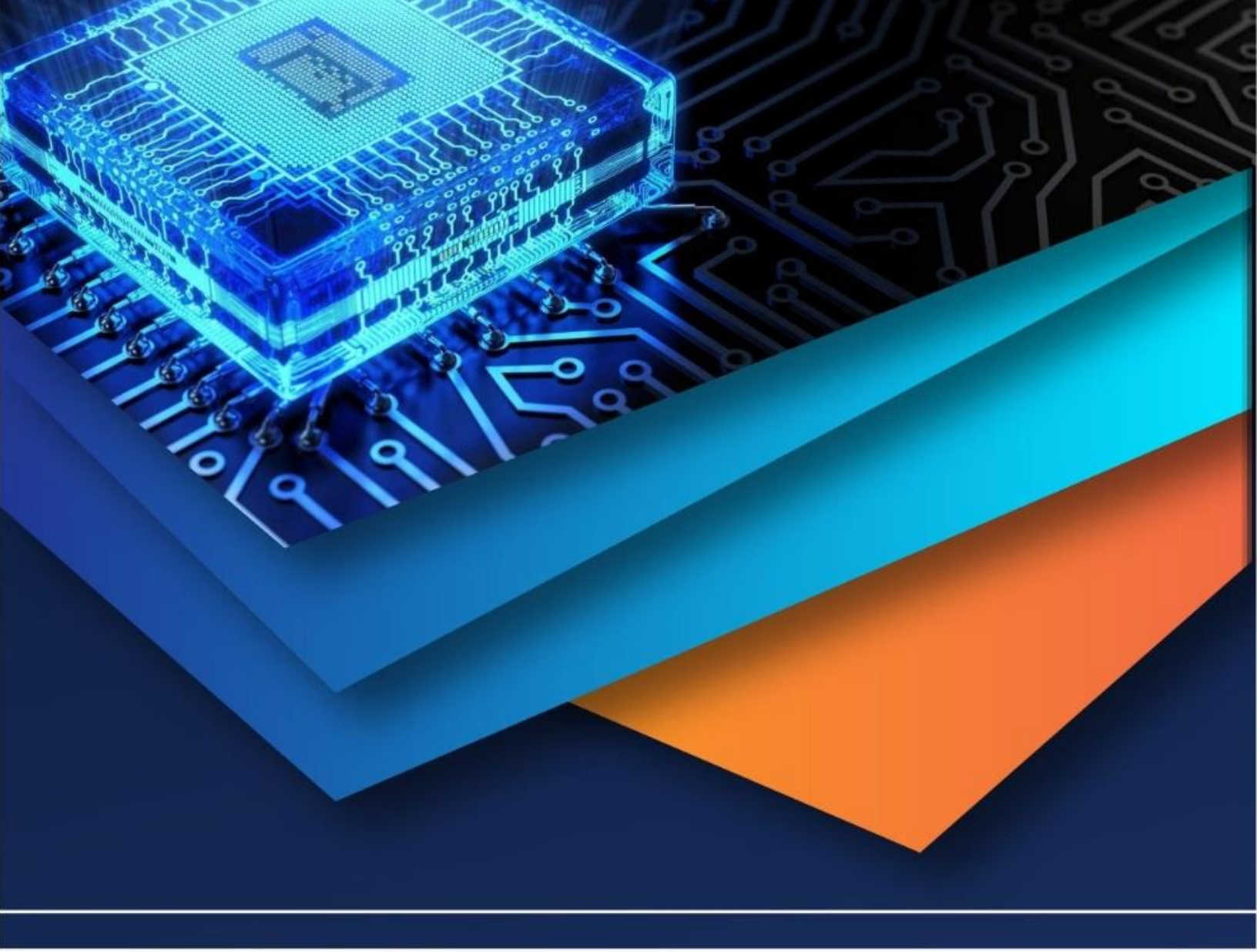
In this paper we've implemented a face recognition door lock system. Recognizing of faces is completed by using neural networks, which gets a high accuracy and can store in the database. For this testing, we've used one hundred fifty pictures only for per person. Computer vision is used within the IOT. For security purpose, we've implemented real time face detection by Deep Learning algorithms. Thus, this method is beneficial for getting into the building with none without any to go looking for keys and it comes with added security. hence the projected system is much simple to make and use.

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