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Hand Gesture Recognition Using Machine Learning

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A B S T R A C T

In order to offer new possibilities to interact with machine and to design more natural and more intuitive interactions with computing machines, this research aims at the automatic interpretation of gestures based on computer vision. One such technique can be used for detecting and understanding various human gestures as it would make the human-machine communication effective.

This could make the conventional input devices like touchscreens, mouse pad, and keyboards redundant. In this project we will design a hand gesture recognition system which will perform defined task. Here we are using classroom as an application. Instead of classroom any other applications can be also used.
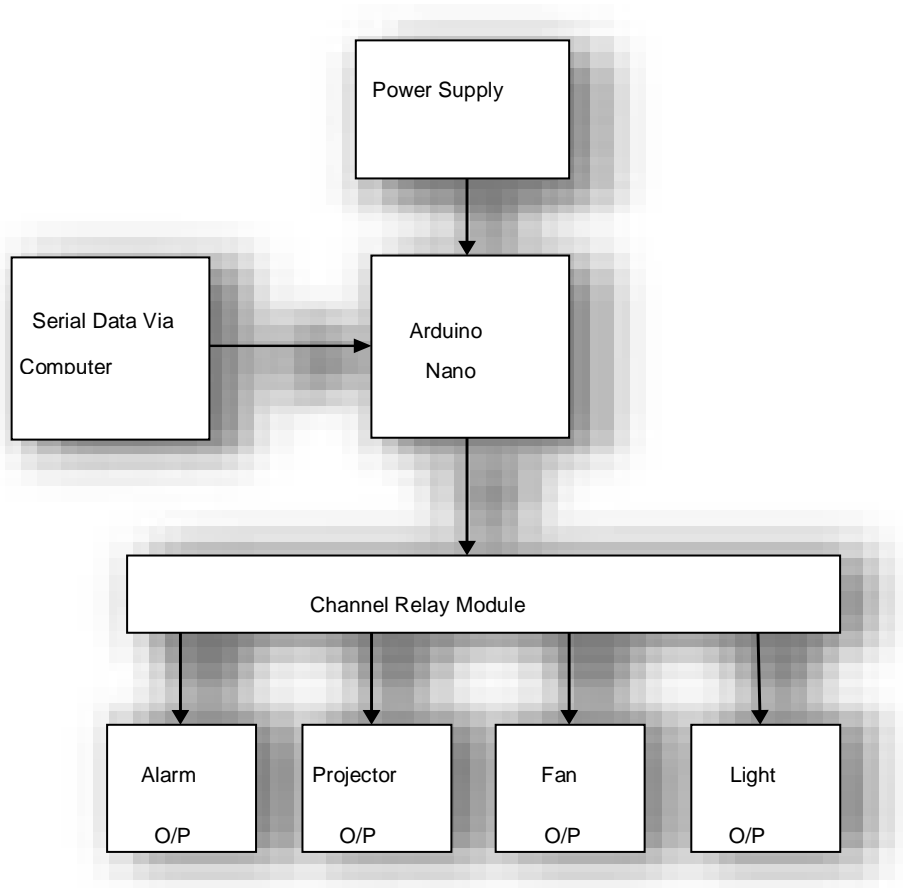
1 Introduction

Deep Learning is a fragment of a wide-ranging family of AI. It especially puts a light on the concept of a multilayer perceptron learning. A CNN commonly known as comp Net is a neural network class used in deep learning which is most applied to images and videos for their analysis. A CNN is a technique or a machine learning model that can be applied to images to make interpretable bymachines.

With the development of interaction between human and machines, the interaction between human and computer is becoming more and more frequent. Among them hand gestures are commonly used in this aspect. Recognition of hand gesture has been used in many fields such as UAV, somatosensory, game etc. In this regard it is of great significance to study on hand gesture recognition. Machine learning algorithms build a model based on sample data known as "training data" to make predictions or decisions without being explicitly programmed to do. The aim was to recognize hand gestures while maintaining accuracy and speed of system. The recognized hand gestures will be command tocomputer.

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2 BlockDiagram

```
                    ┌──────────────┐
                    │ Power Supply │
                    └──────────────┘
                            │
                            ▼
┌──────────────┐     ┌──────────────┐
│ Serial Data Via│──▶│   Arduino    │
│   Computer    │     │    Nano     │
└──────────────┘     └──────────────┘
                            │
                            ▼
        ┌──────────────────────────────────────┐
        │        Channel Relay Module          │
        └──────────────────────────────────────┘
             │        │        │        │
             ▼        ▼        ▼        ▼
        ┌──────┐ ┌────────┐ ┌──────┐ ┌──────┐
        │Alarm │ │Projector│ │ Fan │ │Light │
        │ O/P  │ │  O/P   │ │ O/P │ │ O/P  │
        └──────┘ └────────┘ └──────┘ └──────┘
```

The figure shows a block diagram of proposed system. The main aim of this proposed system is to detect hand gesture and give command to computer.

Then the system will perform the defined task. Work was carried out in two domains

    a)   Hardware b)Software

The result was generated in computer and sent serially through USB port and this result is given to Arduino board. In Arduino board some programming was performed and after that from 4 channel relay it was sent to all the four outputs of our system. Arduino Nano was powered via a mini USB connection. Nano is used because of 50% more memory and 200% RAM. 4 channel relay drives is used here to drive all the four outputs. Fore ease of operations we are using four outputs. In software part our system contained twoparts

    a) Image processing b) machine learning

One such programming language which offers this is MATLAB has limited number of libraries which is not sufficient and hence we used another language that is python which is open source and has many libraries. Two important we used to be a) open cv b) tensorflow

3 Software Algorithm FlowChart
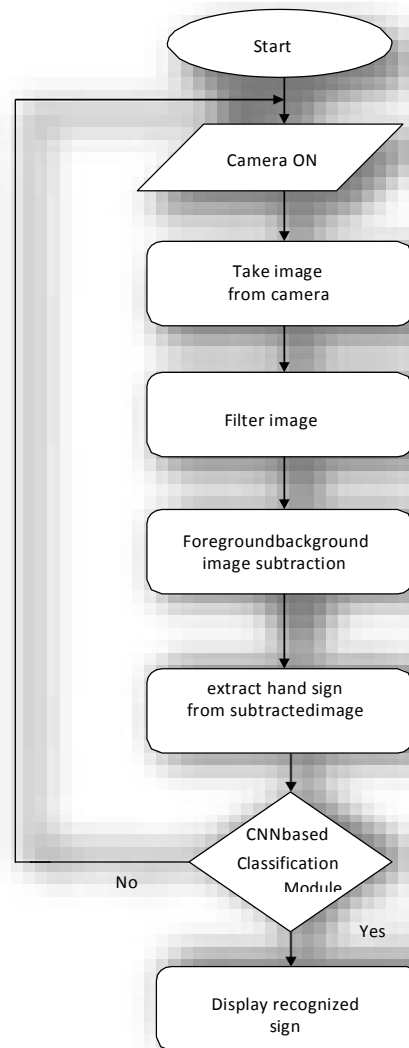
This was the algorithm carried out in proposed system. Here CNN is a deep learning algorithm which can take in an input image assign importance to various aspects/objects in the image and be able to differentiate from one from the other.

CNN is feed forward neutral network used to analyse visual images by processing data with grid like topology, it is also known as cornet.

4 Results

Our prototype was tested for different hand gestures. Different operations are performed for different hand gestures. Gained results are shown below and explained also.
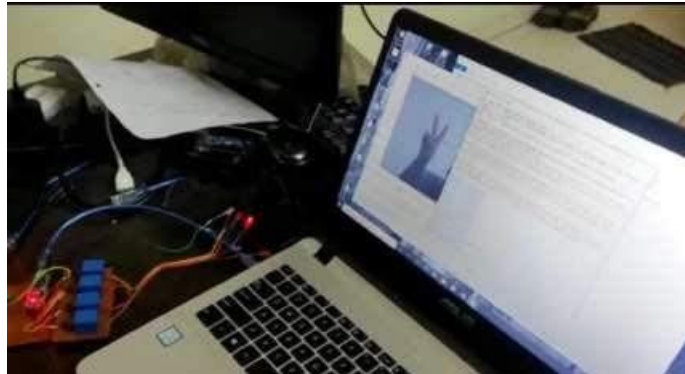

a) Handgesture

A)Results

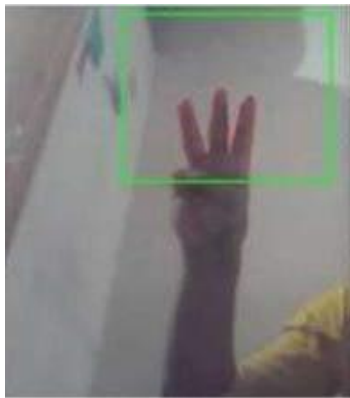Here first hand gesture is detected and result we got that LED 1 is ON.

b)Handgesture

B)Results

Here second hand gesture is detected and result we got that LED 2 is ON.

C)   Handgesture   **C) Results**

Here third hand gesture is detected and result we got that LED 3 is ON.

d)   Handgesture   D)Results

Here fourth hand gesture is detected and result we got that LED 4 is ON.

Like wise many more hand gestures are detected in above scenario. The again same gesture were performed for turning this LED

e)   Handgesture   E)Results

Here same hand gesture was shown in 1 and we observed that LED got off.

5 Future Scope

In future we can implement it with Raspberry Pi or a IoT to greater extent. We can also increase the distance of operation. One can also work on place of operation.

6 Conclusion

Finally hand gesture recognition system using machine learning approach was developed which proved to be healthier than other ones. It is giving excellent accuracy and high speed processing and made possible to detect large gestures.

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