IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Fitness Application

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Abstract: We all know from ancient period of time how yoga has impact on life. Yoga not only helps us in boosting or maintaining our physical health but also our mental health. Now-a-days as technology industry is growing so fast that we can see almost all fields is using automation. So computer field has given us the opportunity to create an application that can help people to perform yoga poses without need of joining any classes or gym. In this paper, we will discuss of how to create an fitness application with help of Deep Learning. Particularly, with help of CNN algorithm we can detect pose performed by user and estimate the accuracy of it. Hence, we shall discuss how to deploy such application and also the modules required.

Index Terms **– Yoga, CNN algorithm, Pose detection, Fitness application**

I. INTRODUCTION

As there is increase AI field due to automation people are also developing their interest in Deep learning. Deep learning is the core or subset of AI. Deep learning helps us in pose detection with the help of several algorithm. CNN is the main algorithm that helps us in pose estimation by processing image dataset. Now-a-days many enthusiasts are attracted towards pose detection because of its wide variety of applications and usefulness. Pose detection has effective role in health care industry as in our application we are using it as a personal AI trainer.

In this project paper, we are building an application that helps a person to perform or do yoga in front of camera and let application tell him whether he is doing it correctly or not. This will help him/her to perform well and prevent from getting injured. We will also discuss in brief how CNN works and all the required libraries or module. Here we will just discuss the basics to create a yoga AI based trainer.

II. CNN ALGORITHM

To start with how to build yoga application first we should atleast know what is CNN and how does it works? CNN stands for Convolutional Neural Network, which is a deep learning neural architecture, that is specifically used for recognizing objects and tasks that involves processing of pixel data.

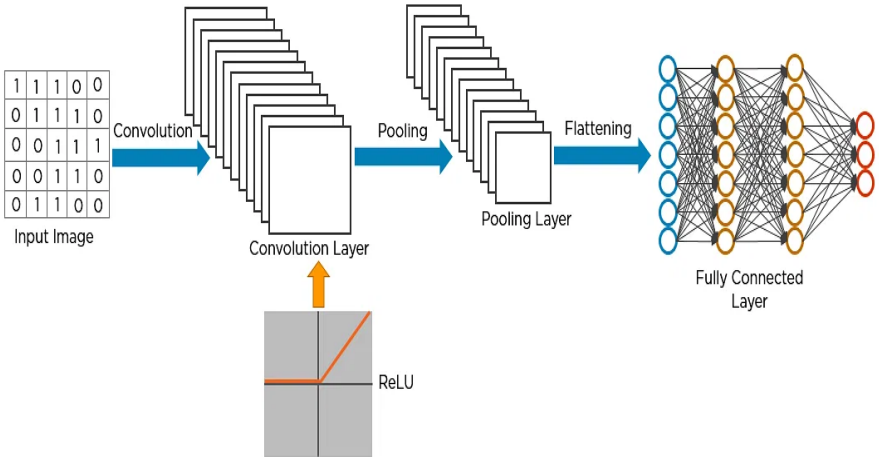

Fig.1 : CNN architecture

CNN consists of three layers as shown in Fig.1 and their significance is as follows:

1.Convolutional Layer:
It is the layer where computation part takes place. This process involves kernel or filter that extracts feature from image. This image is converted into numerical value in this layer, which allows CNN to recognize relevant patterns.

2.Pooling Layer:
Unlike convolutional layer, here also kernel sweeps input image, but here there is reduction in number of parameters in input. This reduces its complexity and increases efficiency of CNN.

3.Fully-Connected Layer:
In this layer, every node in current layer is connected to every other node in preceding layer so it is called as fully-connected layer. In this layer the image classification happens based on the features extracted in previous layer.

From convolutional layer to fully-connected layer the complexity increases which allows CNN to extract more complex features from image. It has multiple convolutional and pooling layer present based on the features to be extracted from image. In this way, we can use this algorithm in our project to find the accuracy how correctly the performer is performing.

III. RELATED WORK

Pose estimation in computer vision includes image segmentation and object detection. For pose detection we can use several libraries,few of them are discussed below:

1. Open Pose:
Open pose is free human joints detection library that works in real time, which detects key points for body, face, hands, and foot. It detects 135 key points in total on single input image. It is mainly used for 2D pose, 3D pose reconstruction and estimation, and unity plugin.

2. Pose detection:
Pose detection is open source library that can detect human body parts such as elbows, hips, wrists, knees, and others for either a single pose or multiple poses in the form of images or videos. Pose detection package offers three state-of-the-art model for running real time pose estimation:
MoveNet (detects 17 key points), BlazePose (detects 33 key points) and PoseNet (detects 17 key points)

3. Dense Pose:
Dense Pose is a free open-source library used for single as well as multiple pose estimation problems. It can map all human pixels of 2D RGB images to a 3D surface based model of the body in real-time.

IV. METHODOLOGY

For creating our application, we need to develop a deep learning model for pose detection which includes some basic steps as follows:

1. Data collection:
First we gather the required dataset from internet. For our application we can use YOLO or COCO dataset for human pose detection. But here we need atleast 5 yoga poses dataset.

2. Data preprocessing:
We prepare picture data for model input preprocessing is necessary. It removes missing data values and redundant values which can improves the accuracy and quality of dataset. After processing we get training and testing dataset in csv format.

3. Pose detection model:
To detect yoga pose we can use any of the libraries mentioned above in related work. A model should be created in such a way that pose should describe a set of skeletal landmark points i.e. landmarks defines the

various body parts. After creating model we will train it using csv file which was created during data preprocessing of the model.

4. Identification of Pose:
When a person will perform yoga pose in front of camera, model will compare it with the dataset that was provided during training. The position of skeletal landmarks can be used to differentiate between poses.

5. Estimation of accuracy:
It defines the time duration of yoga start and end, and also how accurately it is being performed.

V. System Working

After developing the application, now we will give a look how our application will actually work. Following is the overview of working or process to use it:

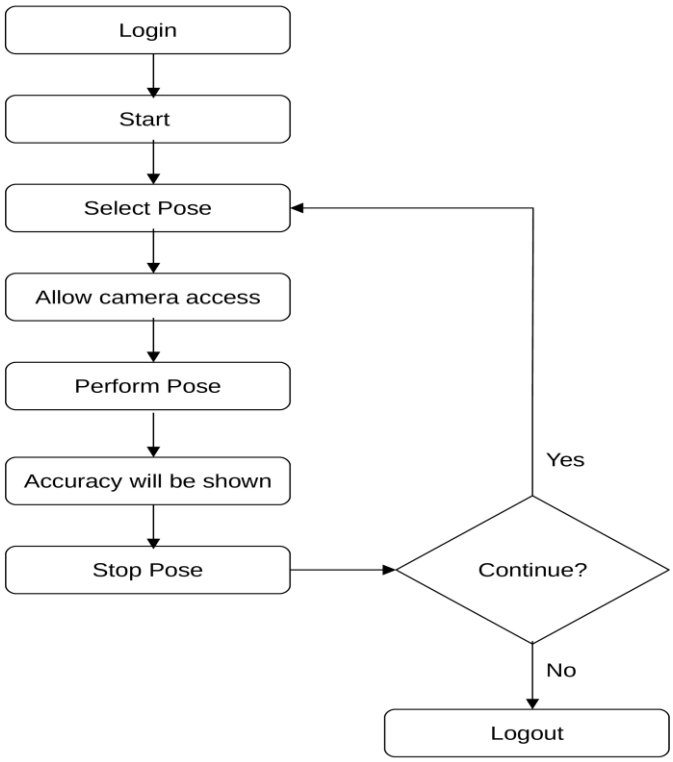

Fig.2 : System Working Design

Here first we need to login into the application and then we will get to the start page. On this page we need to select the pose and then a message will appear to allow access to camera. After that start performing selected yoga pose. While performing you will get pose accuracy and how long you performed. You can select another pose if you want to continue exercise otherwise you can logout.

VI. Conclusion

This application can be used by a yoga enthusiast to practice yoga without the need of instructor. User can practice yoga efficiently at their own pace with any number of attempts. This will help the user to perform yoga accurately by preventing injuries and keep track of daily exercise. In this paper, we have discussed the overview of our project and technology to be used.

VII. Acknowledgment

We would like to thank our Guide Prof. Dipti Aswar for helping us throughout the project and giving advices. Furthermore, we also thank our Head of Department, Prof. Ganesh Wayal, and Principal, Dr. R. S. Pawar. We would like to express gratitude and earnestly acknowledge out parents for supporting us.

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