iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 **Issue:** VI **Month of publication:** June 2023

DOI: https://doi.org/10.22214/ijraset.2023.53665

Hand Gesture Recognition and Cursor Control

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Abstract: Convolutional neural network in this process to overcome the issue, use the network AutoGesNet for the gesture recognition task that creating effective neural network architecture is challenging. To be more precise, we first combine and preprocess three sets of gesture recognition data. The AutoGesNet search space and general architecture are then designed. Additionally, we employ transfer learning and reinforcement learning techniques to automatically create the intricate AutoGesNet architecture. Finally, the searched neural network is adjusted and retrained for two alternative input sizes. The retrained model performs accurately on both our data set and the NUS Hand Posture Dataset II, according to experiments. network that performs wellin terms of recognition accuracy. We will contrast andmerge AutoGesNet in further work.
Keywords: AutoGesNet, NUS, neural network, Hand Posture Dataset, reinforcement learning

I. INTRODUCTION

As computing and technology evolved, the relationship between humans and computers is getting closer and closer. Traditional modes of human- computer interaction are through mechanical devices such as mice, keyboards, and touch screens. Along with language and expressions, gestures are one of the most common forms of human communication. Being able to use gestures to interact with your computer is even more convenient. Gesture recognition technology can be applied to many fields such as interactive games and autonomous driving, and has high research value. Template matching, feature extraction, and HMM are traditional gesturerecognition technologies that perform poorly incomplex situations. Recently, after Alex Net won his first prize in the ImageNet competition, the following convolutional neural networks (CNNs) have been proposed. B. VGG, ResNet, Google Net. These deep learning-based algorithms have greatly improved the accuracy of image recognition tasks. However, deeplearning algorithms are highly dependent on the choice of hyperparameters. These hyperparameters can be divided into two categories. One is related to deep neuralnetwork (DNN) training, such as learning speed andstack size, and the other is related to DNN architecture.

Fig1 hand gesture

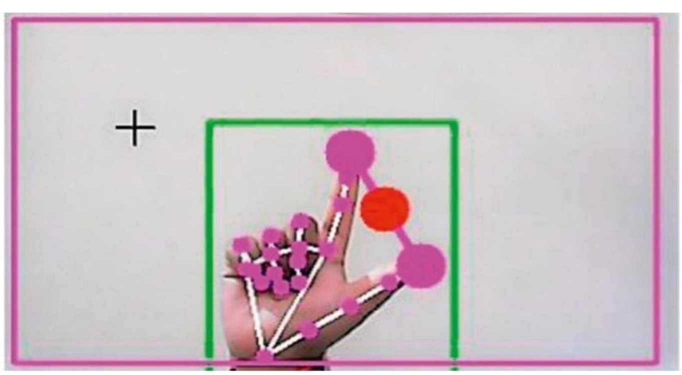

Fig2 volume control gesture

II. LITERATURE SURVEY

1) Hand gesture provides a means for human tointeract through a series of gestures. While handgesture plays a significant role in human–computerinteraction, it also breaks down the communicationbarrier and simplifies communication processbetween the general public and the hearing-impaired community. This paper outlines a convolutional neural network (CNN) integratedwith spatial pyramid pooling (SPP), dubbed CNN–SPP, for vision-based hand gesture recognition.SPP is discerned mitigating the problem found inconventional pooling by having multi-level pooling stacked together to extend the features being fed into a fully connected layer. Provided with inputs of varying sizes, SPP also yields a fixed-length feature representation. Extensive experiments have been conducted to scrutinize theCNN–SPP performance on two well-known American sign language (ASL) datasets and oneNUS hand gesture dataset. Our empirical resultsdisclose that CNN–SPP prevails over other deeplearning-driven instances.
2) Hand gestures are anintegral part of communication. In severalscenarios hand gestures play a vital role by virtueof them being the only means of communication. For example, hand signals by a traffic policeman, news reader on TV gesturing news for the deaf, signaling in airport for navigating aircrafts, playing games etc. So, there is a need for robust hand pose recognition (HPR) which can find utility in such applications. The existing state-of- the-art methods are challenged due to clutter in the background. We propose a deep learning framework to recognize hand gestures robustly. Specifically, we propose aconvolutional neural network (CNN) to identifyhand postures despite variation in hand sizes,spatial location in the image and clutter in thebackground. The advantage of our method is thatthere is no need for feature extraction. Without explicitly segmenting foreground the proposed CNN learns to recognize the hand poses even in presence of complex, varying background orillumination. We provide experimental resultsdemonstrating superior performance of the proposed algorithm on state-of-the-art datasets.
3) Many studies have shown effective hand detection methods, but these methods are probably too practical. Fortunately, convolutional neural network (CNN)-based approaches provide better, less fragile transformations and hand positions. However, the CNN approach is complex, can increase computation time, and ultimately reduces efficiency in speed-critical systems. we propose flat, fast, responsive, rotational and manual placement of his CNN website. It has been tested in two different fields of manual information material andshows equivalent and rapid performance compared toother state-of-the-art CNN-based hand recognition methods. Our evaluation shows that the proposed flatCNN network achieves 93.9% accuracy and a much fasterspeed than its competitors.[4] In recent years, gesture recognition algorithms based on deep learning have evolved rapidly, and more convolutional neural network models have been proposed. To address the difficulty of constructing suitable neural network architectures, this work provides a method to automatically generateconvolutional neural networks for gesture recognition tasks, calling the network AutoGesNet. Specifically, we first prepare by combining three gesture recognition data. Next, the AutoGesNet search space and general architecture are designed. In addition, we use transfer learning and reinforcement learning techniques to automatically create complex AutoGesNet architectures. Finally, the neural network we are looking for is tuned andretrained on two alternative input variables. Studies showthat retrained models succeed with over 99% success rate.

III. METHODOLOGY

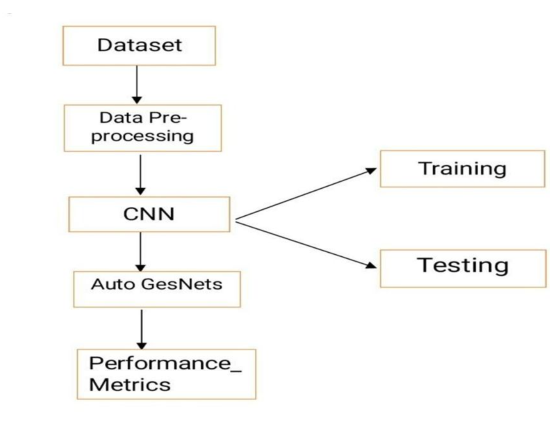

Fig3 flow diagram

A. Hand Contour Extraction

Edge detection algorithms are available, includingLaplacian edge detection, edge detection, and boundary detection. The OpenCV function cv FindContours () searches for contours in an image usingan ordered search edge detection algorithm. The key the edge detection technique has the advantagethat every contour detected in the image is stored in a table. This means that we can determine the shape of the hand by analyzing the outline of eachimage separately. Canny and Lapland edge detectors can identify the contours of an image, butthey don't give us access to every single one. As aresult, an edge was implemented in the proposed project boundary detection technique. We tend to be interested in picking out the contours of the hand part of the contour extraction method analysisof this form defines the hand movement. Small contours are probably noise and should be ignored.The assumption was this the hand contour is the largest contour in the image, which ignores any noise. If the shape of the face is larger than the handreview, this assumption may be wrong. To correctthis deficiency, the frame's front part must beremoved. Assumption the hand was the only moving object in the photo and that the face was relatively still in comparison hand This also meansthat subtraction from background can remove bothstationary pixels and faces from an image. within the urban districts. This is often done using the OpenCV function "Back groundSubtractorMOG2".

B. Gesture Recognition

The gesture recognition technology of theproposed design is a hybrid of two technologiesproposed by Yeo and Balazs. hand First, thecurvature errors of the contour must be calculated.Manual contour curvature errors were determinedusing OpenCVbuilt-infunction "cvConvexityDefects". The curvature errorparameters (start point, end point and depth point)are recorded a set of tables.

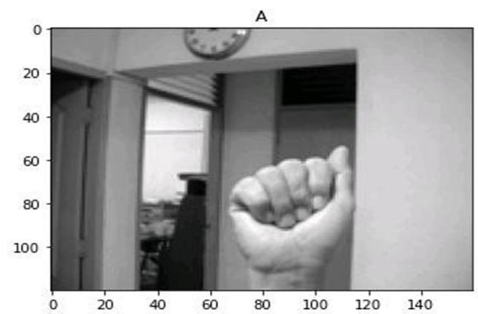

Fig 4. Hand detection

C. Hand Tracking

Hand gestures are used to control pointer movement. To succeed, you must first find the center of the palm find the hand the advantage of determining the shape of the center of the hands is that it is a simple and straightforward run. The shortest distance between a point inside the drawn circle and the contour was measured with a point, and thelargest distance is recorded as the center point. Handradius was calculated as the distance from the center of thehand to the outline of the hand. The center of the hand was determined for each successive frame, and the fingertip was known and used to track the hand using the hand center.

D. Cursor Control

Once hand gestures are detected, completely separatehand gestures must be associated with specific mouse actions the wind.

Fig 5. Accuracy graph

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue VI Jun 2023- Available at www.ijraset.com

IV. RESULT

The proposed virtual AI mouse system presents theconcept of using computer vision to facilitate human-computer interaction. Due to the limited number of data available, it is difficult to comparetests of virtual AI mouse systems. Gesture and fingertip detection were tested under different lighting conditions and also at different distances from the webcam to observe hand gesture and fingertip detection.

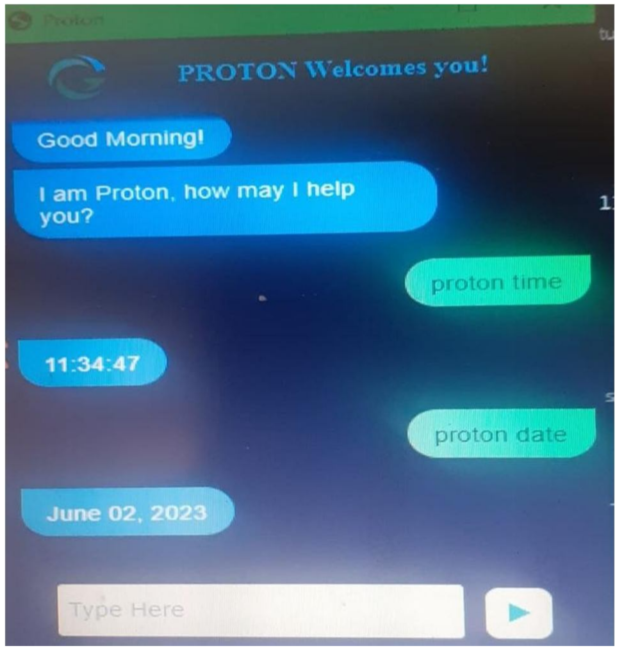

Fig 6. Voice Assistant

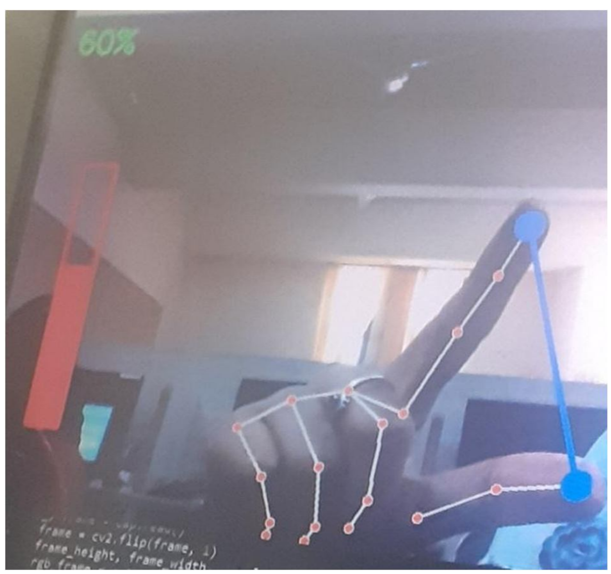

Fig 7. Volume control

V. CONCLUSION

In this study, the limitations of deep learning algorithms and traditional gesture recognition technologies were explored. To solve this problem, an "Auto ML" technique is proposed to automatically create his AutoGesNet for gesture recognition. We show that AutoGesNet is a kind of thin neural network that performs well in terms of recognition accuracy. To improve the model's performance on embedded devices, in later work he compared and integrated AutoGesNet and Shuffle Net, using MAC (memory access cost) in addition to FLOPs to quantify computational complexity.increase.

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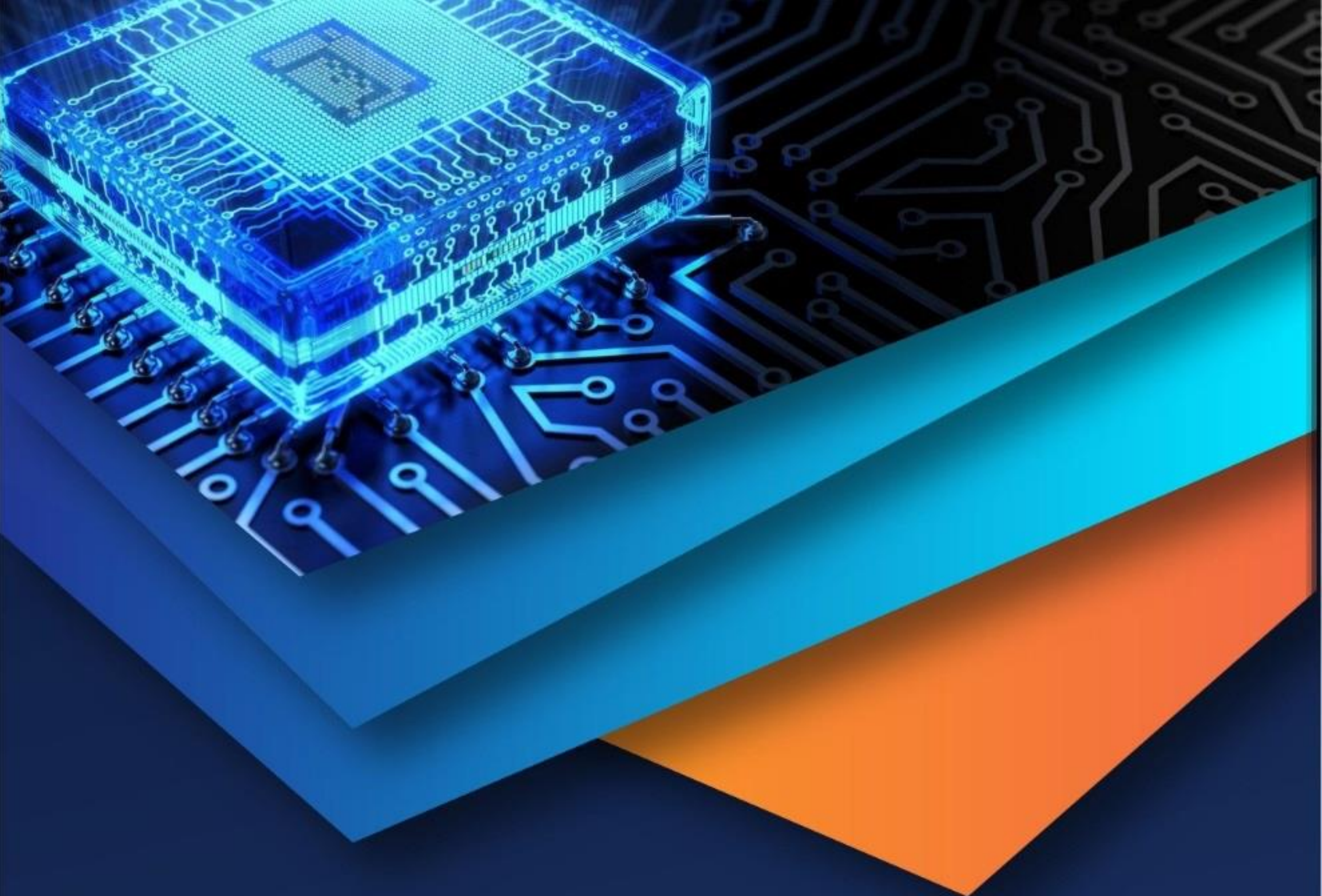

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