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A REVIEW ON HAND GESTURE DETECTION AND CLASSIFICATION ACCURACY IMPROVEMENT IN ANN AND CLUSTERING SEGMENTATION HYBRID METHODS

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ABSTRACT **– Hand gesture recognition system received great attention in the recent few years because of its manifoldness applications and the ability to interact with machine efficiently through human computer interaction. In this paper a survey of recent hand gesture recognition systems is presented Key issues offhand gesture recognition system are presented with challenges of gesture system. Review methods of recent postures and gestures recognition system presented as well. Summary of research results of hand gesture methods, databases and comparison between main gesture recognition phases are also given. Advantages and drawbacks of the discussed systems are explained finally**.

KEYWORDS — Hand Posture, Hand Gesture, Human Computer Interaction (HCI), Segmentation, Feature Extraction, Classification Tools, Neural Networks

I. INTRODUCTION

Human activity recognition (HAR) technology is actively being implemented in a variety of industries, such as entertainment, healthcare, security, public safety, industry, and autonomous cars, in recent years due to the astonishing rise of smart gadgets [1]. As a result, numerous studies are being done on user actions and gesture detection systems that leverage signals from Bluetooth, Wi-Fi, and ultra-wide band (UWB) as well as vision cameras [2-4]. One of them has received attention as an input method in HCI: the hand gesture recognition system. It is used in non-contact appliance controllers, computer games, and virtual reality (VR) entertainment.

II. RESEARCH MOTIVATION

To solve the shortcomings of vision cameras and wearable technology, activity and gesture detection systems utilising wireless communication signals like Wi-Fi, Bluetooth, UWB, and ZigBee have been tested in various methods recently [5-7]. These wireless signals may record motions or gestures even when there are objects nearby because to characteristics like diffraction and penetration. However, a motion detection system based on a wireless signal might be severely hampered by elements like signal attenuation and multipath fading problems [8]. Furthermore, it lacks the distance resolution required to distinguish between motion and gesture due to its extremely low bandwidth.

In order to assure the resolution required to detect hand movement, a Wi-Fi device-based radar is recommended in [9-10] as a solution to this problem. The maximum bandwidth of the Wi-Fi standard and the requirement for additional antenna remain limitations though, Computers and other technological

devices have advanced to the point where they are now an essential part of modern life. This is plainly evident from practically every aspect of life, business, and society, not just from the computers we hold in our hands. However, the biggest issue with socialising has been brought on by computer use. Recent advancements in the area of human-computer interaction or HCI, can be seen in both the quality of interactions and the historical branching of the discipline.

People can easily interact with many apps and interfaces that have been developed using various HCI technologies nowadays. Additionally, it is possible to interact with such apps using speech or gestures when they are developed naturally. Hand gesture recognition (HGR), one of the most popular and commonly used techniques among the various human-computer interface types, is briefly covered in this article.

HGR can be considered an essential component of HCI because it fundamentally studiesthe numerous computer technologies developed for comprehending inputs supplied by humans. Systems that recognise hand gestures using vision-based methods and those that do not fall into two distinct types. Without the use of any wearable technology, vision-based [11] solutions employ one or more cameras to take pictures or videos of the user's hands using image sensors. Then, using an approach for extracting features based on images, the characteristics for hand motions are recovered. It's common to believe that an identification is accurate to a high degree.

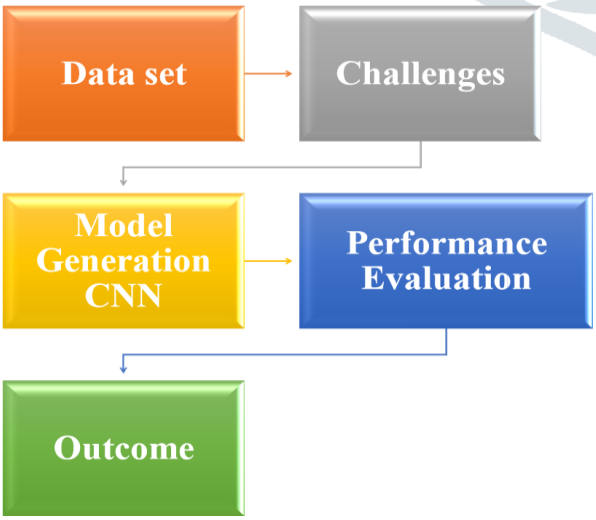

Fig.1.1 Block Diagram.

III. LITERATURE REVIEW

Mohammad Mahmudul Alamet.al [1] the proposed technique predicts the probability of finger class and finger placements in a single forward propagation using a single convolutional neural network. The ensemble of finger position is regressed from the fully convolutional network rather than the individual finger positions from the fully connected layer. The ultimate position of the fingertips is then regressed using the ensemble average. The processing speed ofthe pipeline is much faster because only one network is used throughout.

Gege Zhanget.al [2] Examine the downside of the baseline's multi-scale feature fusion component. Spatial Context Augmentation (SCA) is used to minimise feature map information loss at the highest level, taking into account that the information loss is caused by the reduction in the number of channels during feature pyramid creation. The head and the hand then have a relationship in space when the hand is raised. We suggest Multi-Branch Dilated Convolution (MBDC) to increase the receptive field and decrease false detection in light of this innovation. Extensive experimental findings on the hand-raising dataset demonstrate that our methodology performs better than a number of cutting-edge methods. Additionally, the PASCAL VOC, Cityscapes dataset is used to evaluate our method. On both datasets, the outcomes outperform those of other algorithms.

Ariel Caputoet.al [3] In this study, we introduce SFINGE 3D, a brand-new benchmark for measuring online gesture identification and detection. The dataset is made up of 72 continuous tracking trajectories that each contain three to five of the 13 segmented gestures from the dictionary and random hand movements that serve as noise. As it enables the analysis of online detection performance on heterogeneous gestures, characterised by static hand pose, global hand motions and finger articulation, the presented dataset captured with a head mounted Leap Motion device is particularly suitable for evaluating gesture detection methods in a realistic use case scenario.

Osama Mazharet.al [4**]** physical human-robot interaction library includes the proposed framework. The effective application of the ISO/TS 15066 safety requirements for "safety rated monitored stop" and "speed and separation monitoring" collaboration

modes is complemented by this integration. With the aid of a robotic manipulator, we conducted an extensive teaching by demonstration experiment to verify the effectiveness of the suggested framework.

IV. BACKGROUND OF EXISTING WORK

Similar constraints apply to vision-based recognition techniques like hand gesture and activity recognition. Various machine learning techniques have so far been applied to recognition tasks. Applying Hidden Markov Models (HMMs) [12], which are employed in dynamic contexts involving temporal information, is one strategy. Another popular classifier for recognition tasks is the easierto-implement k-Nearest Neighbours (k-NN) classifier. Another widely used and well-known classifier for gesture and action detection is the Support Vector Machine (SVM) [3, 13], which maps the non-linear input data to a higher dimension before linearly separating it.

Improved dense trajectories and super normal vector are more modern techniques for recognising challenges. In year 2012 ImageNet [14] competition, AlexNet outperformed all other conventional machine learning techniques with state-of-the-art classification accuracy. It was a significant development for vision-based recognition tasks and the turning point in the development of deep learning. The usage of CNNs dominates vision-based recognition methods today. Following their success with image recognition, they have also been investigated for jobs involving video analysis. Many studies have shown that deep CNNs can handle both action and hand gesture identification from video feeds.

There are many publicly accessible visionbased datasets, but none specifically designed for the task of recognising driver micro hand motions on a steering wheel. The Driver Micro Hand Gesture (DriverMHG) dataset, which meets the following requirements, was captured for this purpose.

- Large enough to train a Deep Neural Network
- Contains the desired labeled gestures
- The distribution of labeled gestures is balanced
- Has ‘none’ and ‘other’ action classes to enable continuous classification
- A driving simulator has been put up in order to record this dataset. Using this simulator, which includes a monitor, a Creative Blaster Senz3D camera with Intel RealSense SR300 technology, a Logitech G27 racing controller with a truck steering wheel in place of the controller's wheel, and the OpenDS driving simulator software, the dataset was collected from 25 volunteers (13 men and 12 women). The dataset is captured at a frame rate of 30 frames per second in synchronised RGB, infrared, and depth modalities with a resolution of 320 × 240 pixels.

V. PROBLEM STATEMENT

Computers are become an essential component of daily life. Therefore, enabling natural human-computer interaction (HCI) is crucial to bridging the gap between humans and computers [15]. Although there is increased interest in the creation of new HCI methodologies and technology, gestures have long been seen as a more organic, imaginative, and intuitive method of interacting. In this study, we develop a driver-centric HCI [16] system based on dynamic hand gesture recognition. This kind of system might be extremely important in the automotive industry, especially for safety-related issues. The following difficulties should be taken into consideration for this objective:

1) A suitable dataset must be collected. The gestures in the dataset should be natural and should not distract the driver while performing.

2) The created architecture should distinguish the other hand movements when the driver is not performing any gesture.

3) The architecture should be able to capture micro gestures which are occurring within very short time intervals at spatially constrained areas, with an acceptable accuracy.

4) The entire architecture should be designed considering the memory and power budget.

VI. CONCLUSION

An extensive overview of hand gesture recognition methods have been tried to provide through this paper. However, the user does not want to wear the device and be physically connected to the computer when using a hand posture or gesture-based interface. It seems that vision-based systems are the greatest option for gathering raw data if they could get over some of their challenges and drawbacks.

These methods have been grouped into three major sub-groups in this review: model learning algorithms, statistics, and feature extraction. Further

research in hand gesture recognition has a lot of intriguing directions. It still has a long way to go before this type of concept is reliable enough to be used in mainstream, commercial applications due to the field is not yet sufficiently developed. The development of better hardware for data collecting is crucial, and research has shown that the HMM technique for gesture recognition is more accurate than neural networks and instance-based models. A thorough overview of hand gesture recognition methods has been given by this survey.

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