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Video Analytics: A Quick Review

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Abstract : The general public is well aware of several applications in the field of video analytics. Video surveillance is one such instance; it has been practiced for around 50 years. The concept is straightforward in theory: strategically place cameras to allow human operators to regulate what takes on in a space, such as a room or a public area. Software for video analysis can make a significant contribution by giving users a way to efficiently handle large amounts of data. Typically, an operator is in charge of many cameras, and studies have shown that increasing the number of cameras that must be watched over has a negative impact on the operator's performance. To put it another way, even if there is a lot of technology accessible and it is producing signals, there is a bottleneck when it comes to processing those signals because of human error. This paper summarizes the implications of video analysis, its applications across various horizons, like traffic monitoring, medicine, education, behaviour analysis.

***IndexTerms* – Video analytics, video content analysis, behaviour analysis, data mining**

I. Introduction

The capacity to automatically analyze video to find and identify temporal and spatial occurrences is known as video content analysis (VCA), often referred to as video analysis or video analytics (VA). It has evolved from the fundamental principles of datamining which has used to analyze patterns of static data[13,14,15]. A variety of industries utilize these technological capabilities, including entertainment, health care, retail, automotive, transportation, home automation, flame and smoke detection, safety, and security. The methods can be implemented as hardware in specialist video processing units or as software on general-purpose computers. In VCA, a wide range of functions may be used. One of the more basic methods of motion detection that involves a fixed backdrop scene is video motion detection. Video tracking and ego motion analysis are more sophisticated features.

It is possible to construct additional functionality, such as video summary, identification, behavior analysis, or other types of situation awareness, based on the internal representation that VCA creates in the machine.

II. Literature Review

Abdelhafid Berroukham, Khalid Housni , et al., have examined a group of deep learning-based methods for detecting video anomalies, which are contrasted in terms of their algorithms and models. Additionally, they have divided cutting-edge techniques into various groups based on the strategy used to distinguish between typical and atypical events, as well as the underlying assumptions. They also provide publicly accessible datasets and evaluation metrics that have been used in previous works. Finally, they compare and evaluate the outcomes of different methodologies using various datasets.[1]

Armin Danesh Pazho, Christopher Neff, et al., create an end-to-end scalable, intelligent video surveillance system for the Internet of Things which is described as Ancilia. Ancilia utilizes cutting-edge artificial intelligence for applications in real-world surveillance while upholding moral considerations and completing complex cognitive tasks in real-time. In order to create safer and more secure communities, Ancilia intends to change the surveillance environment by introducing more efficient, intelligent, and equitable security to the sector without requiring people to give up their right to privacy.[2]

Zhiyang Zheng ,Xiaoqian Zhang, et al., suggests using a Siamese attention model (Siam-AM) fusion attention mechanism to watch and monitor cow legs automatically on sizable farms. The initial frame of motion picture data is used to extract the attributes of the cow's leg. In order to extract more features, the network is additionally given the search area in the next frames. The features are then given weights using an attention module. The initial frame's image attributes and various locations were analyzed for resemblance. The position of the cow's leg was assumed to be inferred from the image with the highest degree of resemblance. Finally, using the leg's location information, the proportional step size of the cow's front and back legs is determined.[3]

Christan Grygas Coogle , Sarah Nagro et al., looked at how three preschool instructors used naturalistic instruction that focused on children's speech and answers after receiving real-time technology-enhanced performance-based feedback and video analysis as part of a professional development package. We evaluated the effectiveness of the teachers' realistic education aimed at improving the kids' communication. The teacher training program was successful in improving how often teachers used naturalistic instruction that focused on children's communication. Children responded, and teachers improved the standard of realistic instruction aimed at improving kids' communication. After the intervention condition was removed, teachers continued to practice naturalistic education that focused on the communication of the students.[4]

K. Bobzin, M. Ote et al., develop a novel technique for high-speed video analysis of plasma jet stability. The size of the plasma jet core may be ascertained by examining the photos digitally using the method that is described. This jet size and the acquisition time are correlated, and a time-dependent signal of the plasma jet size is produced. This signal is evaluated by computing its coefficient of variation (cv) in order to assess the stability of the plasma jet. By evaluating the known difference in stability between a cascaded multi-cathode plasma generator and a single-cathode plasma generator, the approach is proven to work. A design of experiment involving a number of parameters is carried out for this objective. The frequency spectra are collected and afterwards analysed using the rapid Fourier transformation in order to pinpoint the origin of the plasma jet oscillations. A new single numerical parameter is developed to measure the impact of the fluctuations on the particle in-flight characteristics.[5]

Chiara Tacchino , Martina Impagliazzo et al., they have suggested a single common RGB camera serves as the foundation of the MIMAS (Markerless Infant Movement Analysis device), a straightforward and reasonably priced device for video analysis of infants' spontaneous movements in their natural surroundings. MIMAS does not use any body-mounted markers. To reduce illumination effects and improve the analysis's robustness, the original videos are converted into binarized sequences that focus on the baby's silhouette. These sequences are then coded using a large number of parameters (39) that relate to the spectral and spatial changes of the silhouette. In the Biobank, each baby's parameter vectors and any pertinent clinical data were kept.[6]

Xianye Ben, Yi Ren et al., have discussed the main distinctions between macro- and micro-expressions first emphasized in this survey paper, and then used these distinctions to inform our research survey of video-based micro-expression analysis in a cascaded structure, covering the neuropsychological basis, datasets, features, spotting algorithms, recognition algorithms, applications, and evaluation of cutting-edge approaches. The fundamental methods, cutting-edge innovations, and significant difficulties are covered and examined for each element. In addition, we present and make available a new dataset termed micro-and-macro expression warehouse (MMEW), which contains more video samples and more identified emotion types after taking into account the shortcomings of previous micro-expression datasets. Then, using CAS(ME)2 for detection and MMEW and SAMM for recognition, we compare representative techniques uniformly. Finally, a few prospective future areas for study are examined and described.[7]

Alexander T. Peebles, Maddy M. Carroll, et al presented a technique for gathering continuous kinematic data in 2D utilizing a low-cost camera and an automated marker tracking application that is available for free. Comparing 2D video analysis to 3D motion capture for determining sagittal-plane running kinematics allowed us to assess the validity of this approach. Twenty healthy subjects ran for one minute on a treadmill while lower extremity kinematics were recorded concurrently in 3D using a motion capture system and in 2D using a single digital camera, both at 120 Hz. Using both the 3D and 2D kinematic data, knee, ankle, and foot angle at contact, peak knee flexion, knee flexion excursion, and knee-ankle flexion vector coding variability were calculated. They were then compared using intraclass correlation coefficients and Bland-Altman plots.[8]

Darek Sokol Randell, Mario Pasquale Rotundo, et al., undertook a study to ascertain if potential concussive events (PCEs) are evaluated in elite hurling in accordance with management criteria set out by the league. The efficacy of the present concussion training programs is the secondary goal. Throughout the inter-county hurling seasons and finals in 2018 and 2019, investigators employed a video analysis method to pinpoint PCEs. Using previously approved techniques, the decision to return to play (RTP) and indicators of concussion were assessed.[9]

Yang Jia, Weiguang Chen et al., proposed a method for measuring turbulence parameter based on video is provided. A number of irregular flow conditions with sudden changes in velocity might be thought of as turbulence. The optical flow approach is used to first extract the instantaneous turbulent velocity field from the real-time video, and then large eddy simulation and sub-grid scale (SGS) models are used to determine the turbulence kinetic energy (TKE) and dissipation rate based on the velocity field data. The dissipation rate is determined using the imagorinsky model, gradient model, and dimensional analysis, three separate techniques. The outcomes of several approaches are contrasted.[10]

Chieko Fujii, Narishige Wakizaka, et al., in this study aimed to identify the safety and repeatability problems that might occur during TUG tests. 7 hospitalized patients with PD (4 men, 3 women) made up the population, along with 1 healthy control. They made use of a cutting-edge robot called the Yorisoi (snuggling nursing robot), Motion Analyzer software, and video capturing. Both when patients utilized the robot to walk and when they walked in sync to a spoken rhythm supplied by the physiotherapist, saw the identical motions. When the therapist made no interventions, the TUG periods lasted the longest. In the TUG test, the typical PD patient had gait festination after turning and gait freezing upon approaching the reflecting cone marker. As a result, the patient had trouble utilizing the reflective marker.

Pria Sukamto, Ispandi ,et al., highlighted how to create CCTV videos that can be proven using certain techniques to create the video as forensic data, that can be proven so that it can be developed into data containing crimes that can be used as evidence. With the NIST technique, it can be demonstrated that this method is the proper method in video analysis, allowing for use of the video as evidence and data forensics. The goal of this study is to determine the best way for CCTV video analysis, allowing for use of the video as evidence on forensic data.

III. Conclusion

The technique of obtaining valuable information from video footage is known as video analytics or video analysis. It can involve counting the number of people in a film or recognizing certain items or persons. Computer vision, a branch of artificial intelligence that deals with the analysis of digital pictures and videos, is used in modern video analytics. One of the most crucial computer vision challenges has been real-time object detection in video streams. The most widely used object detection algorithms for video data are Mask R-CNN, YOLOv3, YOLOR, and YOLOv7. They can be pre-trained using sizable image datasets like MS COCO or customized training using video data that has been acquired.

Hence Real-time object detection and tracking software is available for trained classes of things like cars, people, traffic signals, etc. It is possible to do object counting and rule-based analysis using more sophisticated video analytics tools, for instance to count individuals in crowded locations.

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