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Human Activity Identification

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Abstract: *Modern human activity detection systems are mainly trained and used on video stream and image data that understand the features and action variations in the data with similar or related movements. Human activity recognition plays a remarkable role in human-to-human and human-computer interaction. Manually driven systems are very time consuming and expensive. In this project, we aim to develop a low-cost and faster human activity detection system that can process both video and image to detect the performed activity in real-time, thereby assisting the end-user in various applications such as surveillance and purpose support, etc In addition to being cost effective, this system will be a user-based system that can be integrated with a large number of applications that will save time and help with various activities that require a recognition process, saving a great deal of time with good accuracy. A challenging task of detecting human activity from video sequences or still images is due to issues such as background noise, partial occlusion, changes in scale, angle of view, lighting, and appearance.a multi-activity detection system is required by many applications, including video surveillance systems, human-computer interaction, and robotics to characterize human behavior. In this work, we provide a detailed overview of recent and recent research advances in the field of human activity classification.*

Keywords: Human Activity Recognition, Pose Detection, Convolutional Neural Networks, Deep learning, Pose net

I. INTRODUCTION

The motivations of the project are to advance the area of human motion analysis, performance of human detection and human pose estimation, to study and design a system that uses a pipeline of motion analysis methods, and to present and discuss experimental results of the system. Recognizing human activity from video sequences or still images is a challenging task due to problems such as background clutter, a complete or partial blockage of a blood vessel, changes in scale, point of reference, lightning, and appearance. Many applications, including video surveillance systems, Computer human interaction, and robotics for human behavior depiction, require a numerousActivity Recognition System. Human activity recognition is an issue of classifying sequences of accelerometer data recorded by specialized equipments or smart phones into known well-defined actions.

It is a huge problem because of the large number of observations produced each second, the time-related nature of the observations, and ambiguous nature to relate accelerometer data to known movements.Conventional approaches to the problem involve features from the time series data based on fixed-size windows and training machine learning models, such as group of decision trees. The trouble is that this feature engineering requires deep expertise in the field.Recently, deep learning methods such as recurrent neural networks and one-dimensional convolutional neural networks or CNNs have been shown to provide the most recent stage in the development on challenging activity recognition tasks with little or no data feature engineering.

II. LITERATURE SURVEY

1. Modelling Approach to Select Potential Joints for Enhanced Action Identification of Human (Abdul Lateef Haroon P.S. , 2018): Human Activity Recognition system is one of the emerging fields with the rapid advancement of sensing technologies for facilitating sophistical analytical operations on human behavior as well as acting as leveraging computer human interaction.

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2. PoseNet: A Convolutional Network for Real-Time 6-DOF Camera Relocalization (Alex Kendall,Matthew Grimes,Roberto Cipolla , 2016) : The system trains a convolutional neural network to regress the 6-DOF camera pose from a single RGB image in an end-to-end manner with no need of additional engineering or graph optimisation. The algorithm operates indoors and outdoors in real time. It is shown that the PoseNet localizes from high level features and is robust to difficult lighting, motion blur and different camera intrinsics where point based SIFT registration fails. Furthermore it has how the pose feature that is produced generalizes to other scenes allowing us to regress pose with only a few dozen training examples.
3. Human Activity Identification using CNN(Neha Junagade, Shailesh Kulkarni, 2020) : Human activity recognition [HAR] is a field of study that deals with identifying, interpreting, and analyzing the actions specific to the movement of human beings.
4. Human Activities Recognition in Android Smartphone Using Support Vector Machine (Duy Dinh Phan, 2021) : Human activities recognition system is written on Windows and Android platforms and operates in real time. The accuracy of the system depends on selected features and the quality of the training model.
5. Evaluation of Filtering Technique for Human Activity Identification using MIMO Radar (Dai Sasakawa, Naoki Honma, 2018): We evaluate the correction filter for human activity identification using Multiple-Input Multiple Output radar. Human activity is estimated by the trajectory of the estimated height and Radar Cross Section. We confirm that the filtering technique is effective in increasing the identification rate of human activity.
6. Abnormal activity identification method based on ontology and Dempster-Shafer theory (Ling Zhao,Guanyu Li, 2018): Human activity recognition technology has been widely used in many fields such as public safety and intelligent medical care. In smart home systems, human activities have uncertain characteristics.
7. Human Activity Recognition with Discrete Cosine Transform in Lower Extremity Exoskeleton (Yifan Zhang, Honglei An, Hongxu Ma, Qing Wei, Jian Wang, 2018): In order to solve the problem of switching between different assisted states in the exoskeleton, a human activity recognition scheme is proposed by using Discrete Cosine Transform from accelerometer, gyroscope and plantar force data.
8. Feature Augmentation Improves Anomalous Change Detection For Human Activity (Hannah J. Murphy, Matthew T. Calef, 2020): Anomalous change detection (ACD) methods separate common, uninteresting changes from rare, significant changes in co-registered images collected at different points in time.
9. Efficient Frequency Domain Feature Extraction Model using EPS and LDA for Human Activity Recognition (Rasel Ahmed Bhuiyan, Nadeem Ahmed, 2020): The recognition of human activities, commonly known as HAR can play a vital task in this regard. HAR has an appealing use in the health-care system and monitoring of Daily Living Activities of elderly people by offering the input for the development of more interactive and cognitive environments
10. A Deep Multi-task Network for Activity Classification and Person Identification with Micro-Doppler Signatures (Xinyu Li, Yuan He, Xiaojun Jing, 2019): To understand the network's impact on performance, ablation study is performed and experiment shows that each component in the network can facilitate multi-task learning.

III. CONCLUSION

In this project, the research area of Computer-Vision-based Human Activity Identification has been introduced, techniques associated to this area have been investigated, studied and researched and a human identification system which detects images or videos (image sequences) by identifying 17 key joints using PoseNet in Tensorflow to achieve human poses has been proposed. We are building a pose detection web application that takes input RGB image which is fed through a convolutional neural network. Posenet uses the modified GoogleNet and leverages the transfer learning from ImageNet dataset which is used for classification tasks to train the network for pose detection using monocular images. Further, they increased the performance by curating and making more sophisticated loss functions required for optimization. This is further improved by using LSTM cells to better use the spatial information each image. The required rows and columns are given as input to LSTM cells. The output of cells at last timestamp is used to predict the 6-DoF Pose.

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To make the Posenet solutions more accurate to vSLAM solutions by using what information can be used to gain datasets attributes without imposing more complex CNN architecture.

This method can successfully estimate (classify) human poses by detection of joints when we use a small set of pose categories. A pose estimator method using locations of body parts is also proposed. This method can achieve high pose estimation (classification) accuracy by applying a k-nearest neighborhood or a multiple-class SVM classifier, under the assumption that body parts are correctly located. However it is an object-dependent system that needs users to manually select a target object, and the performance is limited by the human body detector and pose estimator.

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