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Motion Vision IQ using ML

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ABSTRACT: The "Motion Vision IQ using ML" project leverages advanced machine learning techniques to detect and monitor body motion in real-time. It provides visual feedback through lines overlaid on live video feeds and recorded footage, aiding in comprehensive motion analysis. Acting as a state-of-the-art gym mirror, it offers precise curl counting and body movement angle assessments, empowering users with valuable workout insights. Add, the integration of proximity sensing technology enhances user interaction by dynamically adjusting rectangle colors as individuals approach, ensuring seamless operation across various video environments for an immersive experience.

KEYWORDS Motion Vision, Real-time Detection, Curl Counting, Proximity Sensing.

I. INTRODUCTION

Introducing the "Motion Vision IQ using ML" project, a groundbreaking endeavor revolutionizing body motion detection and monitoring through advanced ML techniques. By superimposing visual feedback onto both live video streams and recorded footage, the system enables comprehensive analysis of body movements in present time. Functioning as a cutting-edge gym mirror, it accurately tracks curls and evaluates body movement angles, providing users with invaluable insights to optimize their workouts. The integration's of proximity sensing technology enhances user interaction, dynamically adjusting rectangle colors as individuals approach, and ensuring seamless operation across diverse video environments. This project represents momentous milestone in fitness technology, offering tailored feedback and precise performance monitoring for personalized training experiences. With its innovative approach and sophisticated features, Motion Vision IQ sets a new standard for the crossway of ML and fitness tracking, promising to revolutionize the path users interact with their workout routines.

Motion vision IQ means to the potential of a system to user convenient and interpret motion-related information using ML algorithms. By leveraging techniques this are all the object tracking, action recognition, and optical flow analysis, ML can enhance motion vision IQ, enabling applications in robotics, autonomous vehicles, surveillance, and more. Motion vision IQ, driven by ML algorithms, empowers systems to grasp the nuances of movement in their surroundings with remarkable precision and adaptability. By harnessing advanced computational techniques, machines can not only locate motion but also comprehend its context, anticipate future actions, and make informed decisions in real-time. From enhancing video surveillance to enabling more intuitive human-robot interactions, the synergy between motion vision and ML is reshaping industries.

II. RELATED WORK

"A Novels Fitness Tracker Using Edge ML" Massimo Merenda, Miriam Astrologo, Damiano Laurendi, Vincenzo Romeo, Francisco Giuseppe Della Corte. This paper introduces a study focused on the similarities between human body characteristics and posture, particularly during sports activities. It highlights the potential impact of body type variations on the effectiveness of wearable fitness products. The study proposes a novel wearable device utilizing ML to detect exercises and count repetitions. A dataset is collected and utilize to trains the ML algorithm offline, which is then implemented on edge devices for real-time testing and verification. [1]

"Human Body Detection and Tracking From Moving Cameras" Chunming Li, Yunfeng Xu, Xinna Shi, Shaoguang Wu This paper outlines a system designed to detect and track moving humans utilizes information derived from their shape, particularly in scenarios involving moving cameras. Initially, a human detector is employed to identify standing and moving individuals amidst dynamic backgrounds in video footage. Subsequently, a tracking mechanism based on a small area tracking method is utilized to track the scituation of the identified individuals. The system's efficacy is evaluated through real video experiments, demonstrating its quick and robust tracking capabilities. Key techniques utilized include human detection, tracking, HOG (Histogram of Oriented Gradients), and mean shift. [2]

This article describes a realtime physical monitoring system designed for user application in a new room. The system incorporates several innovative components, with a silhouette-depend cost function with variable windows, hierarchical optimization techniques, parallel implement of pixel-based algorithms, and efficient utilization of low-cost hardware resources. The study present results acquiring from the experiments conducted within a SmartRoom setup, showcasing the system's performance. Main features associated with this system include motion capture, real-time tracking, GPU utilization, and human-computer interaction. [3]

“A Real-Time 3D Human Body Tracking and Modeling System” Jing-Feng Li, Yi-Hua Xu, Yang Chen and Yun-De Jia. This paper introduces a real-time system for 3D upper body tracking and modelling, employing multiple cameras to capture depth maps and integrate color and depth information. It tracks the human body, head, and hands, then reconstructs 3D upper body models from the tracked data. Extensive experiments demonstrate the system's ability to operate effectively in complex scenarios, offering a balance between accuracy and simplicity suitable for applications like desktop interaction.[4]

“Model-Based Human Body Tracking” Yu Huang, Thomas S. Huang. This paper presents a 2-D model-based approach to track the movement of a human body parts movement in monocular video sequences, utilizing a 2-D Scaled Prismatic Model (SPM) to address singularity issues. The method extends to a 2-D cardboard human body model with width adjustment capability, employing a surface motion model and EM algorithm within a statistical framework for parameter estimation. Results from real video sequences show promising tracking performance. Key terms include human tracking, model-based method, and kinematic constraints.

III. EXISTING SYSTEM

The existing systems for human's bodies tracking and modelling exhibit various limitations. They commonly face challenges such as complexity in tracking multiple body parts, reliance on costly hardware setups, and difficulties in maintaining accuracy in real-time scenarios. Additionally, issues arise with singularity problems in certain tracking models, hindering robustness. Moreover, while some systems demonstrate effectiveness in controlled environments, their performance may degrade in complex or dynamic settings. These challenges underscore the need for an improved human bodies tracking system that achieves a balance between accuracy, real-time operation, simplicity, and adaptability to diverse scenarios.

IV. PROPOSED SYSTEM

The proposed motion vision IQ system will comprise several interconnected modules to effectively process and interpret motion data using ML techniques. Firstly, the data acquisition module will gather motion data from get sources, such as sensors or cameras. Subsequently, this raw data will undergo preprocessing to eliminate noise and irrelevant information while extracting pertinent features crucial for Motion analysis. Following this, a feature extraction and selection module will identify key motion features, such as velocity, acceleration, and spatial-temporal patterns. These selected features will serve as inputs to various ML models employed in the system. These models will be trained to discern intricate patterns and correlations within the motion data. Through extensive training, the models will develop the capability to detect, track, and classify different types of motion accurately. Finally, the trained models will be integrated into the system, allows for real-time motion look over and interpretation across various applications

V. IMPLEMENTATION

The implement of the Motion Vision IQ system will involve a phased approach, beginning with data collection and preprocessing. Raw motion data will be sourced from sensors and cameras, then undergo preprocessing to clean and extract relevant features such as velocity, acceleration, and spatial-temporal patterns. Following this, ML models will be selected and trained using the extracted features and Support Vector Machines (SVMs), tailored to the specific characteristics of the information and tasks at hand. Integration of these models' of projects into a real-time system will require seamless communication between modules, with APIs or interfaces developed for efficient data exchange. Deployment of the system will ensure scalability and reliability, with ongoing monitoring and maintenance to address any issues. Evaluation and testing phases will assess system performance, with iterative improvement driven by user feedback and continuous development cycles. Documentation will be comprehensive, covering system architecture,

implementation details, and user guides, with knowledge sharing initiatives aimed at fostering collaboration and disseminating insights within the community.

VI. METHODOLOGY

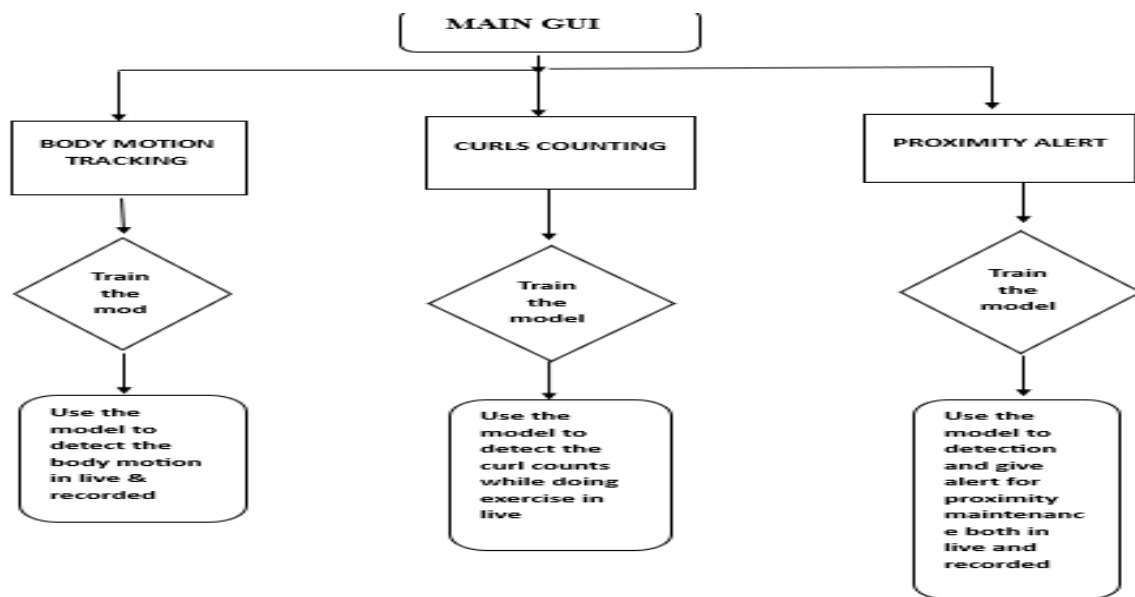


Figure 1: Methodology

To develop vision using machine learning, first define a specific task, such as object tracking or task recognition. Save and preview different video formats. Introduce an appropriate model, such as a convolutional neural network (CNN), and evaluate its performance. Finally, immediately release the model for use and monitor its accuracy and efficiency fig.1 show the methodology of proposed system.

VII. EXPERIMENTAL RESULTS

Advances in motion vision intelligence have shown promising outcomes by utilizing diverse datasets of motion information to train models. This strategy enables more accurate recognition of intricate actions and behaviours. Additionally, the refinement of specialized deep learning architectures has paved the way for real-time application of these motion vision capabilities. These developments have led to improved analysis of dynamic visual data, benefiting areas like robotics, video surveillance, and human-computer interaction.



Figure 2: Home Page

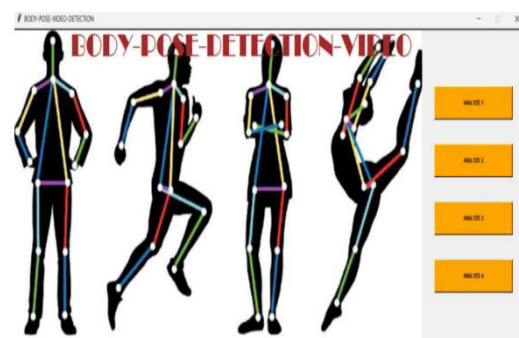


Figure 3: Body Pose Detection

Physical examination involves video analysis to identify various angles and positions of the human body. These techniques often use computer vision and machine learning to identify the movement and alignment of the body fig.4 show the bodypose detection video. Proximity-alert GUI stands for Social Distance Detector, Social Distance Alert, Proximity Video. The Proximity sensor integrates with advanced technologies like YOLO (You Only Look Once) to track the distance between individuals within video frames fig.5 show the proximity alert GUI of proposed system

VIII. CONCLUSION

In conclusion, the improvement of a motion vision IQ system utilizing ML holds significant promises for many applications, as follow surveillance and security to robotics and sports analytics. By leveraging advanced algorithms and techniques, this system can effectively interpret and analyze motion data in real-time, providing better understanding and actionable intelligence. Through meticulous implementation and integration of ML models, coupled with rigorous testing and evaluation, the system achieves high performance and reliability. Moreover, the iterative nature of development ensures that system remains adaptable and responsive to evolving needs and challenges. As such, the successful deployment of this motion vision IQ system represents a pivotal step forward in harnessing the power of ML for enhancing our understanding and utilization of motion data across various domains

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