Relaxify: AI-Based Real-Time Employee Health Monitoring and Exercise Guidance System Using Computer Vision

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Abstract*—Modern workplace environments demand employees to work for prolonged hours in front of computers, often resulting in sedentary lifestyles and physical health problems such as neck stiffness, shoulder pain, fatigue, and posture-related disorders. These health concerns not only reduce employee productivity but also increase long-term medical risks and absenteeism in organizations. Traditional health monitoring solutions rely heavily on wearable devices or manual exercise reminders, which may not always be convenient or consistently followed by employees. This paper presents Relaxify, an AI-based real-time employee health monitoring and exercise guidance system designed specifically for workplace environments. The proposed system utilizes computer vision techniques through a webcam to automatically detect employee presence and guide them to perform office-friendly stretching exercises. The system focuses primarily on neck and shoulder exercises to reduce muscle strain caused by prolonged sitting. Using pose estimation and movement detection algorithms, the system monitors exercise performance, accurately counts repetitions, and stores participation data for tracking employee wellness progress over time. The system operates as desktop software, enabling easy deployment without additional hardware or wearable sensors. Automated reminders and exercise monitoring encourage employees to maintain healthy work habits. Experimental implementation demonstrates reliable real-time exercise detection and counting performance under normal office conditions. The system contributes toward smart workplace wellness solutions by providing a non-intrusive and cost-effective monitoring approach. Future improvements may include posture correction mechanisms, additional exercise modules, and integration with organizational health dashboards for large-scale monitoring.

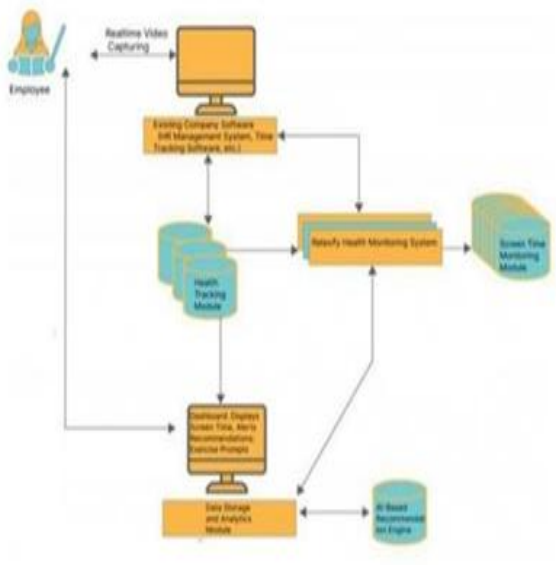
I. INTRODUCTION

In recent years, workplace environments have undergone rapid digital transformation, resulting in employees spending extended hours working on computers. Continuous sitting and minimal physical movement contribute to musculoskeletal disorders, reduced physical fitness, and mental fatigue. Common issues such as neck pain, shoulder stiffness, eye strain, and poor posture significantly impact employee productivity and overall well-being. Organizations increasingly recognize the importance of employee wellness programs; however, implementing effective monitoring and engagement strategies remains challenging. Existing solutions often involve wearable fitness trackers or periodic manual exercise reminders, which may not always be feasible or widely adopted. Advancements in Artificial Intelligence and Computer Vision have opened new opportunities for automated activity monitoring systems capable of analyzing human movement in real time using cameras. These technologies can be leveraged to promote healthy workplace habits without requiring intrusive devices or additional hardware. This paper proposes Relaxify, a smart desktop-based employee health monitoring system that automatically detects employees using a webcam and guides them through short exercise sessions. The system also counts repetitions and stores exercise participation data for monitoring progress. The goal is to provide a seamless wellness solution that integrates naturally into the employee's work environment.

II. LITERATURE REVIEW / RELATED WORK

Several studies have focused on wearable sensor-based and IoT-enabled health monitoring systems. Wearable technologies measure vital parameters such as heart rate and activity levels but require continuous device usage, which may cause inconvenience. IoT-based systems enable remote monitoring using connected sensors and cloud platforms; however, they depend heavily on hardware deployment and network reliability. Some research also explores posture detection systems using computer vision to monitor sitting behavior. Despite these advancements, limited work has focused on automated workplace exercise monitoring using webcam-based systems. Existing solutions primarily emphasize health data collection rather than promoting physical activity during working hours. Therefore, there exists a gap in systems that provide real-time exercise guidance, detection, and monitoring specifically tailored for office employees, which the proposed system aims to address.

Counting Module The system analyzes movement patterns to determine correct exercise completion and counts repetitions automatically. 5 Data Storage Module Exercise participation data is recorded locally for performance tracking and analysis. 6 Desktop Application Implementation The system runs as desktop software developed using Python, ensuring compatibility with office systems



SYSTEM ARCHITECTURE

III. PROBLEM STATEMENT

Employees who work continuously at desks often experience physical discomfort due to prolonged sitting and limited movement. Current workplace wellness solutions rely on manual reminders or wearable devices that may not always be practical or consistently used. There is a need for an automated, low-cost system capable of monitoring employees and encouraging physical activity without requiring additional hardware. The proposed system addresses this gap by providing webcam-based exercise guidance, detection, repetition counting, and data storage through desktop software.

IV. PROPOSED SYSTEM/ METHODOLOGY

The Relaxify system operates through multiple modules designed to provide automated monitoring and exercise guidance. 1 Employee Detection Module The webcam continuously monitors workspace presence. Once an employee is detected, the system activates monitoring and prompts exercises at scheduled intervals. 2 Exercise Guidance Module The software provides visual and textual instructions guiding users through neck and shoulder stretching exercises suitable for office environments. 3 Pose Detection Module Computer vision algorithms detect body landmarks such as shoulders, neck, and head positions using pose estimation techniques. 4 Exercise

V. ADVANTAGES AND PROPOSED

The proposed Relaxify system provides multiple advantages over traditional workplace health monitoring solutions by offering an automated and non-intrusive approach to employee wellness monitoring. 1 Non-Intrusive Monitoring Unlike wearable sensor systems that require employees to continuously wear devices, the proposed system operates using an existing webcam setup, making monitoring seamless and comfortable without disturbing employees' workflow. 2 Cost-Effective Deployment The system does not require specialized hardware installations. Organizations can deploy the software using existing desktop systems, significantly reducing implementation costs. 3 Real-Time Exercise Guidance Employees receive instant guidance and feedback while performing exercises, ensuring correct movement execution and encouraging participation. 4

Automated Exercise Counting Manual exercise tracking is replaced by automated repetition counting, ensuring accuracy and reducing user effort. 5 Data Recording and Progress Monitoring The system stores participation records, allowing organizations or individuals to analyze employee engagement in wellness activities over time. 6 Easy Integration in Workplace Environment As desktop software, the system integrates naturally into daily office routines without requiring infrastructure modifications. 7 Encourages Healthy

Work Habits Regular exercise reminders reduce health risks such as muscle stiffness and posture-related issues, thereby improving employee productivity. 8 Scalability The system can be expanded to support multiple exercises, departments, or entire organizations with minimal modification.

VI. CHALLENGES AND LIMITATIONS

Despite its benefits, the proposed system has several challenges and limitations that must be considered for real-world deployment. The performance of the computer vision–based system is highly dependent on lighting and environmental conditions, as poor illumination or shadows can significantly reduce detection accuracy. Camera positioning also plays a crucial role; improper webcam placement may result in incorrect body landmark detection, which can affect exercise recognition. At present, the system supports only neck and shoulder exercises, and incorporating more complex exercises would require additional algorithm training and refinement. Continuous webcam monitoring may raise privacy concerns among employees if proper policies and data protection measures are not clearly defined and implemented. Moreover, real-time video processing demands sufficient computational resources, and low-end systems may experience performance delays. Variations in user movement, body size, clothing style, or speed can also slightly impact detection accuracy. Additionally, unlike wearable health-monitoring systems, the current solution does not track medical or physiological parameters such as heart rate or oxygen levels.

VII. CONCLUSION

The proposed Relaxify system successfully demonstrates how computer vision and artificial intelligence can be utilized to promote employee wellness in workplace environments. By enabling automated employee detection, exercise guidance, and repetition counting through webcam-based monitoring, the system eliminates the need for wearable devices or manual supervision. The implementation shows that real-time monitoring can encourage employees to take short exercise breaks during working hours, potentially reducing long-term musculoskeletal health problems associated with sedentary lifestyles. The data storage feature further allows monitoring participation trends, enabling organizations to promote wellness initiatives effectively. The system proves to be a practical, cost-effective, and easily deployable solution suitable for modern workplaces. While certain limitations such as lighting dependency and privacy concerns remain, they can be addressed through future enhancements and organizational policies. Overall, the proposed solution contributes toward developing intelligent workplace wellness systems and demonstrates the potential of AI-based monitoring solutions in improving employee productivity and well-being

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