**ABSTRACT**

Exoskeleton suits are innovative wearable robotic devices that have the potential to revolutionize various industries, including healthcare, rehabilitation, and industrial applications. These suits provide individuals with enhanced strength, mobility, and support. However, the design and customization process of exoskeleton suits often face challenges due to the complex nature of human anatomy and ergonomics.

In this project, we propose a novel approach to address these challenges by leveraging computer vision techniques for generating a 3D model of an exoskeleton suit. By utilizing computer vision, we aim to accurately capture the geometry, structure, and fit of the exoskeleton suit to facilitate customization and design improvements.

Our approach involves the integration of computer vision algorithms and technologies with the exoskeleton suit development process. This includes the use of cameras, depth sensors, and image processing techniques to capture detailed visual information of the wearer and the suit. By analyzing this visual data, we can extract important features and measurements necessary for creating a precise 3D model of the exoskeleton suit.

The computer vision algorithms play a crucial role in processing the captured visual data, identifying key components, and reconstructing the suit in three dimensions. Depth estimation algorithms, such as stereo vision or structured light methods, are utilized to estimate the depth information and accurately reconstruct the shape and contours of the exoskeleton suit. These algorithms work in conjunction with image processing techniques to enhance the quality of the captured data and eliminate noise or artifacts.

By generating a 3D model of the exoskeleton suit, we enable a comprehensive understanding of its design, fit, and functionality. This allows for customization based on individual user requirements, optimization of ergonomic factors, and analysis of biomechanics and motion dynamics.

Our proposed infrastructure combines the power of computer vision and IoT technologies to create an efficient and robust system. Through continuous monitoring and analysis of the exoskeleton suit, we ensure its optimal performance, comfort, and usability.

Initially focusing on the development of the infrastructure for exoskeleton suits, we aim to address factors such as reliability, cost, and user acceptance. By demonstrating the effectiveness of computer vision in generating accurate 3D models, we envision expanding our approach to large-scale farms and rural farmers, enhancing the future of exoskeleton suit technology in agriculture and other relevant industries.

In conclusion, this project aims to utilize computer vision techniques to generate precise 3D models of exoskeleton suits, enabling customization, optimization, and improved functionality. The integration of computer vision with exoskeleton suit development holds immense potential for advancements in healthcare, rehabilitation, and industrial sectors, transforming the way we enhance human capabilities and support physical activities.

**INTRODUCTION**

This report details the design and development of a novel approach for generating a 3D model of an exoskeleton suit using 2D images of a human. The primary objective of this project was to remove the background from the images and utilize computer vision techniques to extract features necessary for creating an accurate and detailed 3D model. The implementation was carried out using Python 3 within the Google Colab environment.

To accomplish the task, several libraries and frameworks were employed. PyTorch (version 1.4.0), a widely used deep learning framework, played a crucial role in performing advanced computer vision tasks, including feature extraction and model training. The Json library facilitated the handling of configuration and metadata information stored in JSON files.

For image processing operations, the PIL (Python Imaging Library) and skimage (scikit-image) libraries were utilized. PIL provided essential functionalities for image loading, preprocessing, and saving, while skimage offered a collection of algorithms for advanced image processing and analysis.

Key numerical computations and data manipulation were performed using the numpy library, which is fundamental for handling arrays and matrices. The cv2 (OpenCV) library emerged as a vital component of the project, as it provided a wide range of functions and algorithms specifically designed for computer vision tasks. It facilitated background removal, feature extraction, and other crucial image processing operations.

To monitor the progress of the 3D model generation process, the tqdm library was employed. It provided a visual progress bar, enhancing the user experience and allowing for easy tracking of the completion status.

The integration of these libraries and frameworks, along with the utilization of Python 3, empowered the implementation of a successful 3D model generation pipeline within the Google Colab environment. By leveraging the capabilities of PyTorch, json, PIL, skimage, numpy, cv2, tqdm, and Python 3, the code effectively removed the background from the 2D images, extracted relevant features, and transformed them into an accurate and detailed 3D model of the exoskeleton suit.

It is worth noting that the utilization of Google Colab as the coding environment offered collaborative coding capabilities and access to significant computing resources, which proved instrumental for resource-intensive tasks like 3D model generation.

In conclusion, this project demonstrated the effective utilization of the Google Colab environment and various libraries and frameworks, including PyTorch, json, PIL, skimage, numpy, cv2, tqdm, and Python 3, to generate a 3D model of an exoskeleton suit using 2D images. The implementation encompassed background removal, feature extraction, and other computer vision techniques, achieving the desired outcome without relying on a separate app.