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I. Introduction

With the advancements that have been made in the field of vision-based control and real-time motion capture technology, there will be new possibilities for humans to interact with computers. The focus of this research is on the utilisation of a camera-based system that tracks the movements of the person's arm and is then replicated in real-time through a virtual arm. Such a method of communication with computers holds significant potential in several practical applications in fields regarding medical, rescue operations, and the handling of hazardous material, which all require precise and responsive robotic control as a necessity. By integrating computer vision techniques, limb tracking and learning algorithms, this study aims to enhance both accuracy and adaptability for different robotic and limb movement situations. The ability to map human motion accurately onto either a digital or robotic counterpart is a crucial aspect of this research. Another crucial addition for the future aspect of this research is the integration of haptic feedback, specifically through the use of gloves that will allow the user to sense when the virtual or robot arm is making contact with an object. The implementation of a feedback mechanism can have a significant improvement on the user's spatial awareness and overall control in comparison with traditional controllers, which can lead to a more intuitive and natural, almost symbiotic, relationship with robotic systems. To conduct this study, an interpretive philosophical approach will be taken, employing both deductive reasoning and experimental stages. A mixed methods approach will be adopted, combining both qualitative and quantitative data, which will be collected over a longitudinal time frame. A questionnaire will be used to gather feedback on the user experience, performance improvements and possible modifications for enhancing the system. The data collected through these questionnaires will provide valuable insight into the possible uses and effectiveness of vision-based control systems and where their application can have a significant improvement. The primary goal of this research is to evaluate the effectiveness of vision-based control systems to replicate real-time human arm movement with enhanced accuracy and greater responsiveness. With this leverage, computer vision and machine learning will be able to explore improvements in motion tracking, a greater reduction in latency, and overall user interaction. The findings of this research could have significant contributions to multiple fields, including assistive technology, automation, and virtual reality. These again demonstrate the practical benefits of vision-based motion control systems over traditional controller-based systems.

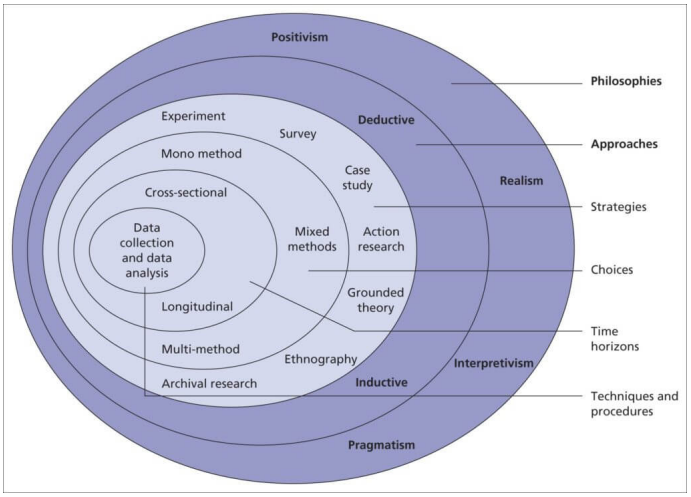

Fig. 1. Research Onion

References