Astonix: Developing an Intuitive Gesture-Controlled Interface for High-Precision Robotic Manipulation in Hazardous Environments

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Many current robotic control systems use either traditional joysticks or complicated code, which makes it harder for robots to respond quickly and accurately in high-stakes situations like remote surgery or disaster relief. The objective of this research was to create "Astonix," a human-centered interface that employs a wearable sensor glove to convert natural hand gestures into immediate robotic actions. The process included putting accelerometers and gyroscopes into a glove that could be worn to record the position of the hand. A software bridge was made to handle these signals and send them to a robotic platform using a low-latency serial protocol. A custom filtering algorithm was used to fix the common problem of signal noise and packet loss, making sure that movement was smooth and 1:1. Testing was done to see how fast and accurately tasks could be done with the new controllers compared to the old ones. The results showed that the learning curves for operators went down a lot and the accuracy went up a lot when doing delicate manipulation tasks. This study shows that gesture-based, intuitive control can make high-precision robotics more accessible and safer for important humanitarian uses.

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