

Virtual and Remote Robotic Laboratory

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Abstract: *The Virtual Remote Robotic Laboratory (VRRL) represents a paradigm shift in scientific experimentation, offering researchers unprecedented access to remote laboratory facilities and robotic systems. This paper explores the design, implementation, and benefits of VRRL systems in enhancing access and collaboration in scientific research. VRRL leverages cloud computing, IoT technologies, and advanced user interfaces to enable researchers to remotely control and interact with robotic systems and laboratory equipment from anywhere with an internet connection. Through intuitive user interfaces, researchers can seamlessly navigate virtual environments, manipulate robots, monitor experiments in real-time, and analyze data, all without physical presence in the laboratory. Key features of VRRL include robust security protocols to protect sensitive data, flexible experimentation capabilities to accommodate diverse research needs, and collaboration tools to facilitate knowledge sharing and teamwork among researchers worldwide. By breaking geographical barriers and providing on-demand access to laboratory resources, VRRL empowers researchers to conduct experiments more efficiently, accelerate scientific discovery, and foster interdisciplinary collaboration*

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