Quadruped Robot Model Assisting With Searching and Rescuing People in Landslide-Stricken Areas

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In Vietnam, landslides occur frequently and cause great damage to traffic infrastructures and human lives. Follow-up search and rescue campaigns risk the lives of rescue personnel and civilians. To tackle this problem, we raised a solution of creating a quadruped Robot that is capable of moving in landslide-stricken areas and integrated functionalities that assist rescue operations. We researched nature's characteristics - Golden Retriever's legs and stand height ratios, platypus' feet and Arapaima Gigas fish's scales - for the production of our own quadruped model and the unique webbed feet design. We calculated the oscillation of the quadruped Robot's center of gravity during movements and torque requirements for servo selection. Later, we integrated the Inverse Kinematics problem, together with the end-effector trajectory problem for motion programming. During experimentation while the Robot stood on mud with 50 percent water composition, pressure applied on each webbed foot decreased by 25 times compared to traditional rounded foot design. Additionally, scales in the feet's web allow them to not be pierced by small sharp rocks or debris. The novel feet design together with the spring suspension yielded greater efficiency in all 8 gaits of movements, climbing 10-20 degrees of hard surface slopes and walking on soft mattresses. The Robot can feedback soil hardness data for determination of the Robot's feet placement. Live video and GPS data can be effectively transmitted from 10-30 meters. We hope that this project can contribute to safer and more efficient landslide rescue operations not only in Vietnam but also in the world. Keywords: Kinematics, Quadruped Robot, Rescue Robot.

Awards Won:
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