User Interface with Multisensory Feedback for Fluid Powered Rescue Robot

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Fluid power is most commonly used in large applications, such as excavators and forestry equipment. However, it could also be applied to smaller-scale applications. Regardless of the size of application, the operator has to manage high degrees of freedom. A four-legged rescue robot is one possible fluid power application that focuses on a smaller scale. Such a rescue robot also introduces additional challenges of coordinating multiple appendages and tele-operating.

In order to enable a single operator to manipulate the twelve degrees of freedom for this rescue robot, the operator needs to have a more intuitive user interface. The Phantom device is a user interface that enables the operator to focus on how the end-effector is behaving rather than focusing on how each degree of freedom is behaving. Unlike traditional buttons and joysticks, it allows the user to have a physical understanding without any visual or auditory ques.

Not only does this rescue robot have high degrees of freedom, but a single user must also manipulate multiple appendages simultaneously. One option is to create an autonomous control algorithm where a gait and leg trajectory is based on the direction that the operator defines. This type of approach will not be sufficient to overcome the rugged terrain that is characterized by disasters sites such as mine collapses and earthquake stricken areas. Therefore, a semi-autonomous or manual control is also necessary so the operator can manipulate at least the front leg pairs.

In addition, in order to effectively operate a rescue robot from a remote location, the user needs to understand the surrounding environment as well as the state of the robot. Visual feedback is frequently used to accomplish this task. With the supplement of haptic and auditory feedback, the operator will have sufficient information about the environment and the remote device.

This rescue robot undertakes the same issues as other fluid power applications, but it also addresses a critical design decision. Fluid power will allow the rescue robot to have a higher lifting capacity as compared with its electric powered competitors. The increased lifting capacity will enable the rescue robot to perform more challenging tasks, including the ability to unpin a victim from heavy debris. Therefore, fluid power enhances the capabilities of a rescue robot.