

PALM – V²: A Passive Articulated Link Mechanism with Variable Viscosity

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Abstract—A new concept of passive articulated link mechanism shown in Fig.1 is proposed to assist surgeons in the strong magnetic field of open configuration MRI especially for neurosurgery. The core idea is experimentally validated with the device shown in Fig.2, which gives variable viscosity to cylinder rod motion by controlling valve opening extent attached to the cylinder as in Fig.3. Then a multiple degrees of freedom link mechanism is designed and simulated under several restrictions and constraints mainly concerned with space factors of the open configuration MRI and its FOV(Field Of View). Through this design and sequential simulation(Fig.4, Fig.5), It is concluded that the core idea could be extended to a multiple link mechanism suitable for neurosurgery.

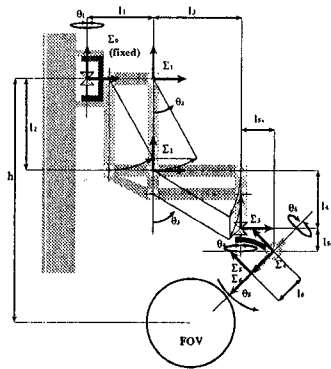


Fig. 1. a conceptual design—kinematic configuration and coordinates

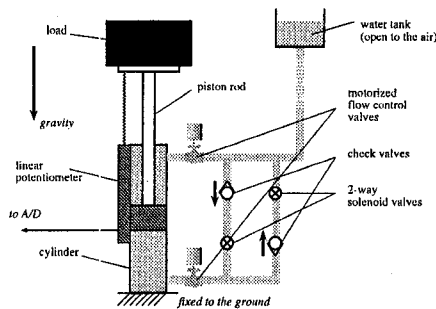


Fig. 2. 1DOF experimental device setup

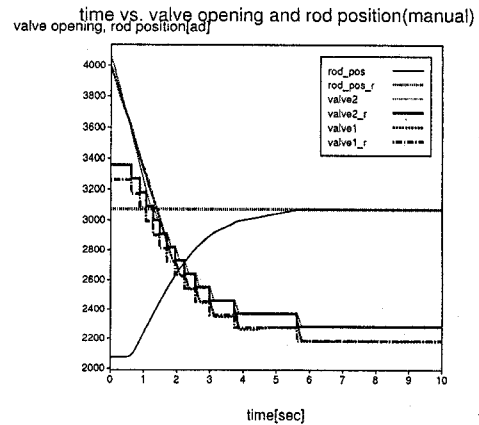


Fig. 3. time vs. position(valves, piston rod) by manual push down

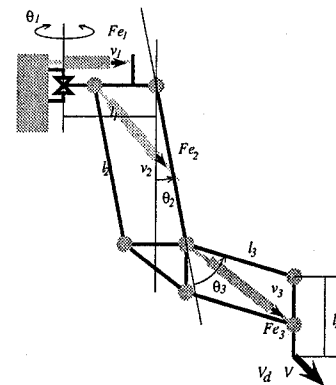


Fig. 4. reduced kinematics model

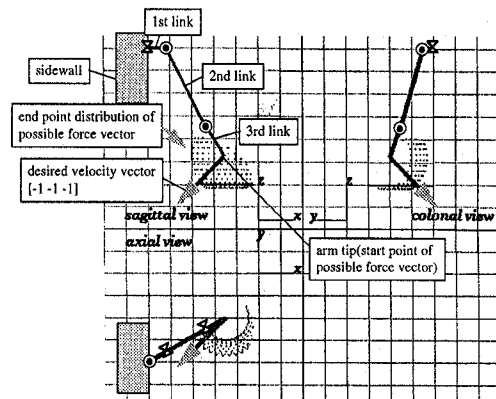


Fig. 5. possible force vector distribution

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