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Modelling and Investigation on Bouncing Mechanism of a Sphere Robot

(Conference Paper)

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Abstract

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Spherical rolling mechanisms (SRMs) exhibit a number of advantages with respect to wheeled and legged mechanisms. In fact if the SRM is combined with the power of bouncing mechanism, it will produce an exciting phenomena that can be contributed to applications such as security surveillance, search and rescue. There is not much research done in both fields, especially in the bouncing mechanism. In fact to the best of authors' knowledge no of research has been done on integrating both mechanism to produce a spherical system that is capable of rolling and bouncing, which can produce a very significant mobile robot. Therefore, this research deals with the modeling and development of a bouncing spherical robot using computational intelligent technique, i.e. Particle Swarm Optimization technique (PSO). A 3D virtual prototype of a spherical robot was developed in Visual Nastran as a platform for input and out data acquisition. Different simulations environment have been created, such as the free fall bouncing, shooting up and projectile type of environment to investigate the bouncing profile affected by different forces. The data obtained were then used for system identification using PSO technique with mean square error (MSE) of 0.0004%. The transfer function representing the bouncing mechanism of the sphere robot was then obtained. Next, the prototype of the sphere robot with bouncing capability was developed. Open loop tests have been conducted and the results show that the hardware developed can produce the bouncing mechanism at its promising capability. Future works need to be conducted to re-visit the hardware, particularly on the body of the sphere robot such that maximum bouncing can be achieved.

Author keywords

Bouncing Ball Particle Swarm Optimization Spherical Robot

Indexed keywords

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