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DESIGN AND DEVELOPMENT OF VINE ROBOT FOR THE EXPLORATION OF MARS AND TITAN.

Abstract

Our aim is to explore the difficult and unreachable terrains like tunnels, holes and cluttered environment as well as underwater explorations with the help of Vine robots technology. Normally, robots due to their big size and inflexible design, can't explore under the surface or in narrow spaces. Robots tend to get subjected to major wear and tear while exploring tough terrains. The vine robot is a type of soft robot, which by elongation from its tip, can fit into small places, move easily in water, doesn't fall after reaching a dead end and can move without friction. All of these benefits, and more, can be used in the study and exploration of extra-terrestrial bodies like Mars which has multiple caves and Titan which has multiple crevices and sand. Thermoplastic Polyurethane or TPU coated Nylon is an ideal choice for making vine robots due to its impregnable character, light weight, water resistance, flex-resistance, toughness, flexibility, durability and resistance to abrasions like oils and lubricants. Some similar alternatives can be Polyurethane (PU) coated polyester or nylon which has life expectancy longer than other fabric materials. Another such desirable material is Teflon coated nylon which has extended life. The velocity of the vine robot could be controlled based on air pressure and tensile strength of material. Power source for the rover will be the Multi-Mission Radioisotope Thermoelectric Generator. The vine robot will be coiled up in a cylindrical base. On applying desired air pressure, it will extend itself forward using the principle of eversion, to examine things with its sensors and camera, attached to the front end tip. Upon the need to retrieve back, the air pressure in the tube of the robot will decrease making it deflated and can be pulled back into a coil by the mechanical system in a cylindrical base. Due to the flexibility of material and the controlled increasing air pressure in the tube, it can trace its path through the tunnel accordingly. The camera mounted on the front tip will be able to detect both visible wavelength as well as infrared wavelengths. With the help of vine robot technology we will solve the problems which are faced by the modern day hard robot and take space exploration to another level. This paper outlines the initial development and technical operations in the use of vine robots in space.