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RESEARCH ON FAULT-TOLERANT AND SELF-ADAPTIVE RECONFIGURABLE MARS EXPLORER WITH DISTRIBUTED INTELLIGENT TECHNOLOGY

Abstract

Nowadays, Mars has been one of the most famous planets for exploration, and human have launched hundreds of planet explorers for certain purposes. The successful ones mostly were unmovable or move for limit distance on land, and executing missions individually, which means high cost, more complex and therefore high failure risk. Typically, the most famous was called "Mars Rover". As Big Data, artificial intelligence, network communication and robotic technologies developed dramatically, it would be more realistically to explorer the out-space planet, such as Mars, using distributed intelligent robots to finish exploring task synergistically. In this paper, researches continued from the previous studies, which had been discussed in 68th IAC. Based on the proceeding novel type of Mars exploring robots' system constructed in 2017, detailed modeling and design of multi-robotic Mars explorer were provided. The explorer was comprised by three different robotic units. Each little unit is an independent robot, which can realize certain simple tasks, such as exploring map, finding route, taking samples, executing experiments, providing energy, and so on. Considering to release the complexity and risk by single unit, the explorer should be opened, expandable and reconfigurable, which means the units can be enlarged structurally and functionally by later launch missions, and possess self-adaptive capabilities to multiple tasks and environment. This paper described the explorer's system framework and technical solutions to technical difficulties. Finally, 3d mechanical structure models were designed to reveal the Mars explorer definitely and visually. Simultaneously, using strategies of the combination and each unit were analyzed completely and meticulously. Through models constructed based on distributed intelligent algorithms, initial stage interactive simulation was executed to reveal its feasibility for future development.