SIMULATED MARS ROVER MODEL COMPETITION – DOZEN AND PLUS ONE MARCH ON MARS

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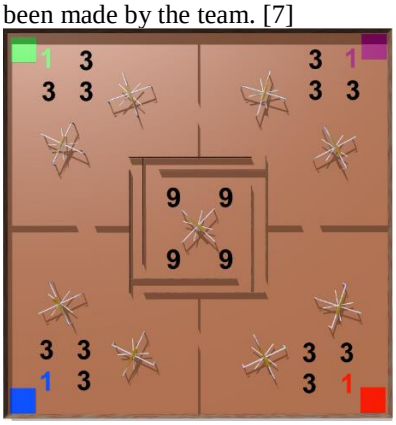
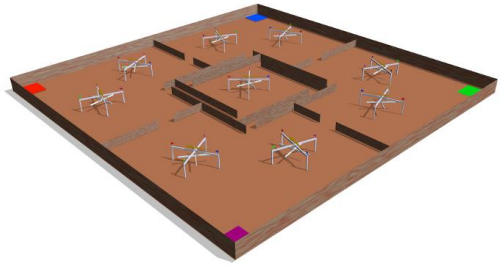
Introduction: The Competition of Applied Engineering Sciences – working name is Magyarok a Marson (Hungarians on Mars) – has been in process for more than dozen years and always gives something new exciting robotic competition about Space Technology. We presented our previous works (Sipos, Vizi 2009-2017) [1,2,3,4,5,6,7] at the 40th-48th LPSC and at several conferences in Hungary, e.g. at H-SPACE 2016 and 2017 where we described shortly the ten years of the Competition [8].

2017: The tasks for the 2017 year was a remote ('hand moving follower' sensors) and self-controlled contest to deploy ball shaped small robots, to reach several different high score positions, to pass rotating gates, to set their own color marks as a sign that the measurement has been made by the team. [7]

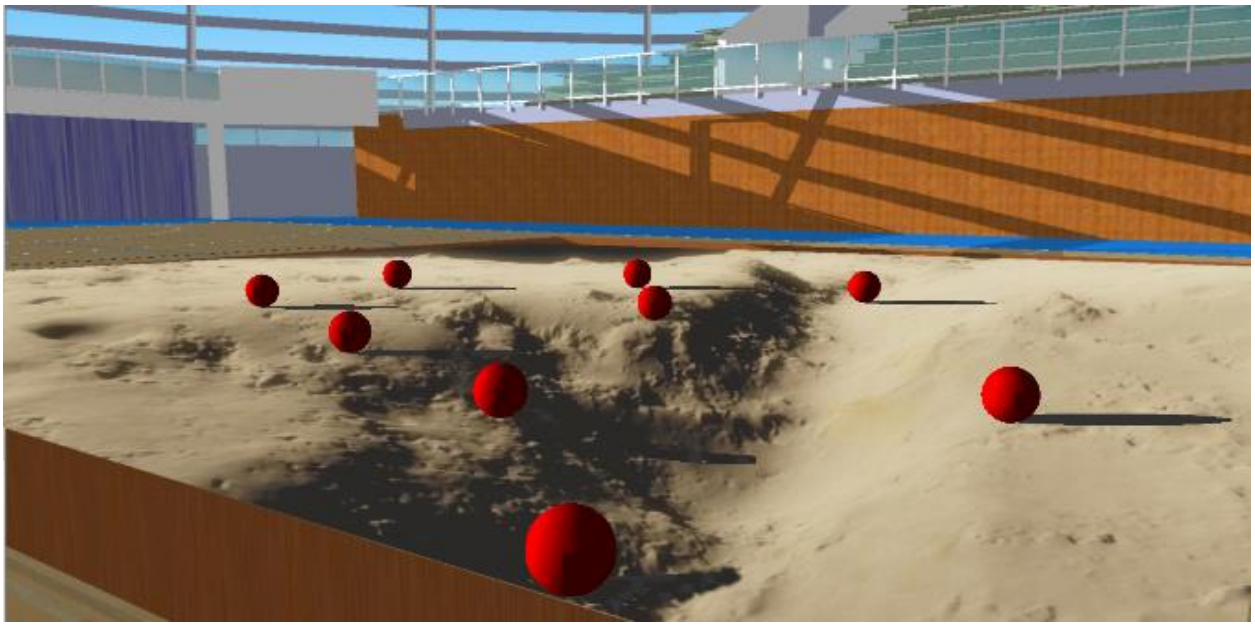




Competitors used to drive the spherical robot for example balance transfer pendulum driving, center of gravity relocation, multiplied gyroscopes and some of the groups combined those possibilities together. In case of simple pendulum hinge driving the turning of the robot was harder. But if the pendulum itself was a gyroscope – which had enough weight to become a pendulum – the turning of the robot became more effective. The spherical robot was able to turn in standing position with the gyroscopic drive and was able to move along a curved path with the pendulum hinge drive.

The following crossed eye stereo pair pictures show the finished spherical ball robot solutions.

Teams used Wi-Fi, Bluetooth and model airplane and mixed versions. Balls earned from rat balls and from Earth balls or made by lathe machine.



The simulated place of the competition. On the floor of the Sports Hall of the University is a possible layout of plotting board with target balloons. Closest balloon is one of the special balloons hanging on extreme place which can be reached only with a robotic arm only.

2018: Back to the Mars! The first serial of the contest started on a simulated Mars environment. With a small amount of competitors (seven) there was enough time to complete the race. In the second serial there were several teams signed in (12-22), the available time reduced and we put four of them in one time on the stage with tournament knockout rounds. After a dozen years we are going back to the Mars with the next idea.

Mars surface: We put the environment back to a simulated Mars surface dashboard in the year 2018 with slopes, valleys, hills and canyons with cliffs throughout an obstacle course. The possibility to build this sand table comes from the higher level of sponsorship given us enough sources this year. The difficulty of the competition is gradually increasing on the board, like in every year. A beginner can solve easily one part of the race, but the winner must solve harder challenges. The slopes and turns between cliffs give the hardness of this race. *Targets on path* will be nine balloons and it is necessary to bursts the balloons with a needle during passing the full path. Some balloons in the path will be exposed in extreme difficult places and they can only be reached with robot arm with 3 or 6 degrees of freedom in order to choose the smartest competitor. Some targets can only be reached by lateral movements through narrow gaps. *Plotting board* will be built from extruded polystyrene (XPS) foam which can be easily formed to different shapes necessary to construct lowlands, slopes, rocks, valleys, cliffs etc. *The venue* of the competition is the University of Miskolc, Miskolc, Hungary as in both previous years.

Conclusion: Efficiency and growing popularity help to emerge the Contest into promoted events. This support is given not only by private companies but in one time together by Universities and governmental organizations. The powerful sources give opportunities to organize a bigger and more complex contest in order to train engineer students with more modern skills than ever. One of the leaders earned the prize of Hungarian Astronautical Society about dissemination of knowledge because of the success of the contest. But the most significant contribution come from enthusiastic competitors and from the founder of Simulated Mars Rover Competition.

References: [1] SIPOS,A., VIZI,P.G.: LPSC40 #2519 ; http://www.lpi.usra.edu/meetings/lpsc2009/pdf/2519.pdf [2] LPSC41 #2649 ; http://www.lpi.usra.edu/meetings/lpsc2010/pdf/2649.pdf [3] LPSC42 #2014 ; http://www.lpi.usra.edu/meetings/lpsc2011/pdf/2014.pdf [4] LPSC 44 #2850 ; http://www.lpi.usra.edu/meetings/lpsc2013/eposter/2850.pdf [5] LPSC 46 #2602 http://www.hou.usra.edu/meetings/lpsc2015/eposter/2602.pdf [6] LPSC 47 #2098 http://www.hou.usra.edu/meetings/lpsc2016/eposter/2098.pdf [7] LPSC 48 #2250 https://www.hou.usra.edu/meetings/lpsc2017/pdf/2250.pdf