

SIMULATED MARS ROVER MODEL COMPETITION – 2018 AND 2019 BACK TO THE MARS

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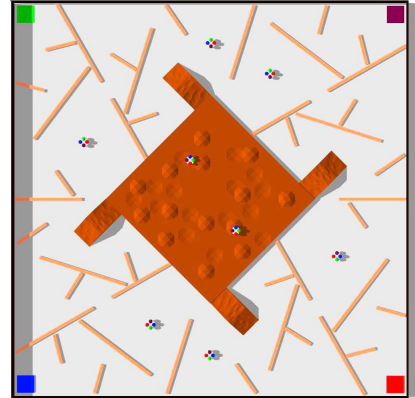
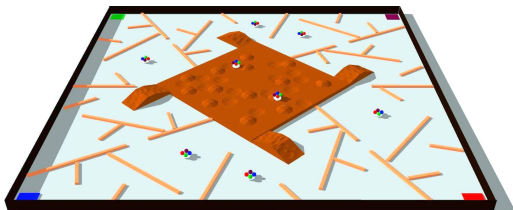
Introduction: This is an annual report of our Mars rover model competition, the Hungarian Competition of the Applied Engineering Sciences called Magyarok a Marson (Hungarians on Mars) about the year of 2018 and 2019. Since 2006 we have been successfully organizing the contest throughout several difficulties. We reported the Competition in the previous years (Sipos, Vizi 2009-2018) [1,2,3,4,5,6,7,8] at the 40th-49th LPSC and at several conferences in Hungary, e.g. at H-SPACE 2016, 2017 and 2018 where we described shortly the more than ten years of the contest [9].

2018: The Competition of 2018 was very successful in organization, in the number of participants and in effective robots thanks to Attila SIPOS who is the father of the Contest, Judit PINTER the local organizer and Chancellor of the University of Miskolc.

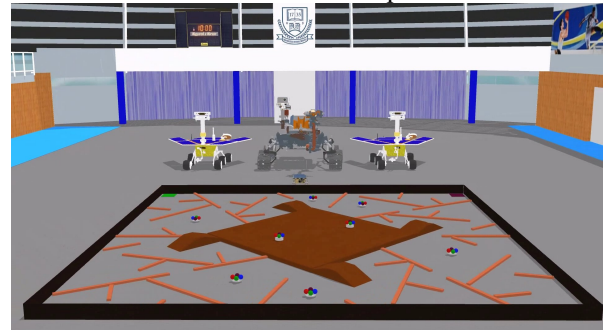
As we reported last year we wanted to put back the environment to a near Mars surface plotting board in the year 2018 with slopes, valleys, hills and canyons with cliffs throughout an obstacle course. Sources were enough to build planned sand table but the sports hall have just been renovated fortunately therefore we used easier matters and eventually we did not applied real 'sand' inside.

The task: The task was to go to the targets on path which were eight bouquet of balloons (red, green, blue and purple) and it was necessary for the competitors to burst out balloons with matching color of the team using a needle on a robotic arm during passing the full path. Two bouquet of balloons were put in harder places and they could only be reached through slopes and/or with robot arm with 3 or 6 degrees of freedom.

The plotting board: Plotting board was built from some squares of extruded polystyrene (XPS) foam which could be easily formed to construct highland, slopes, rocks and cliffs. The picture of the final board:



The trailer video of 2018: Usually we show the frame story of the Competition in the videos, the plotting board and rovers. This year we don't show any possible rover in the animation part of the video only the audience is visible but an example were built and it



is visible at the beginning of the movie. [10]

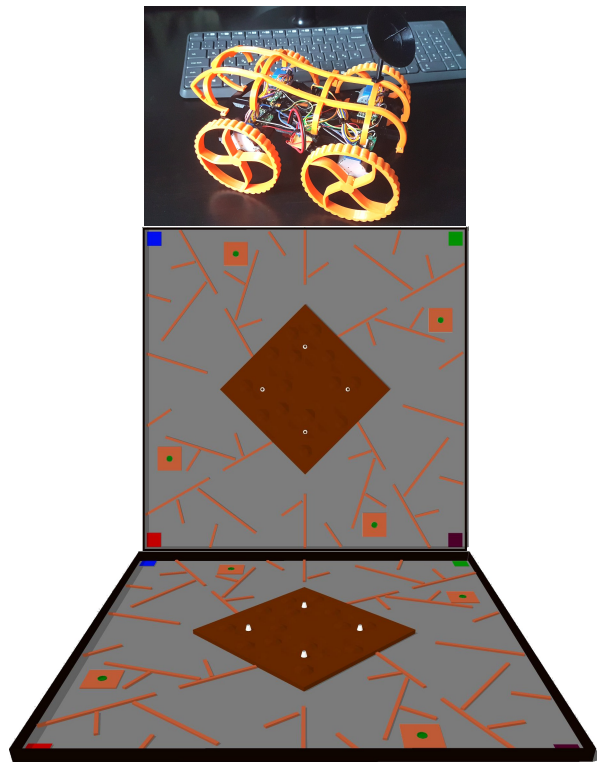
Solutions: We gave same wheels and motors to the teams of the competitors free of charge to ensure a level playing field. Teams used Arduinos, PLCs, Wi-Fi, Bluetooth and mixed versions of solutions. The result, publications and several videos can be found on the net. In the picture You can see all of the robots. The videos of robots in working state at the link. [11]



2019: *The Plan:* We want to emphasize the mechanical and 3D knowledge of our competitors. We want to keep and to open our contest to the wide range of young people. Cheap parts (electrical and mechanical) are enough for the goal to build a competitive robot-rover. Those cheap parts can be reached on the Internet with wide range of possibilities.

The frame story: This year we also have a frame story, based on a well-known novel and movie “The Martian”. The idea in 2019 is to save astronaut Mark Watney (Matthew Paige Damon) on the surface of Mars. To collect, carry and give him ‘supply’. To carry or to build a rescue robot in-situ at the target place on the ‘Mars’.

The task: To build and control a rover with manipulator(s). We re-recommend to use the cheapest steppers, servo motors and electrical components. Furthermore it is possible to need a 3D printer (less than \$ 400) to use it to construct, print and build a rover.



The plotting board and the path on the field: The route will be contained four positions where resources can be collected for Mark Watney and from those places will be added one type of score, according to race. The resource supply represented by 6 mm airsoft balls. During the rest of the collecting score points will be given for every successful step. The final goal is to put all the collected airsoft balls – as supply – into the

‘spaceships’ in the central part of the dashboard which will be assembled on the central square platform known from last year. The full score will be summarized and multiplied from the collected amount of source and the duration of time. The plotting board will be based from last year but will be modified. Inside the 8 m x 8 m barriers there will be put collectible airsoft balls (as collectible supply sources) in four flower pot washers with 15 cm diameter, which will be fitted in the center of 60 cm x 60 cm sized and 2 cm tall square barriers. Targets will be represented by 10 cm tall, 11 cm diameter base and 6 cm diameter top opened truncated cones. Four of them will be put on the central platform proportionally on both of diagonals, with equal score values.

The stimulating movie ‘The Martian’: The movie has more than 33 percent Hungarian origins which are the movie recording location as The Bánya (Whale) Building Budapest [12], Müpa Budapest [13], Korda Studio Etyek [14] and many members of filmmaker staff, one of them class-mate of author. It is very inspiring for young engineers to live there, near that buildings where “The Martian” movie was filmed.

The competition venue will be the fourth time the University of Miskolc, Miskolc, Hungary.

Conclusion: We experienced during last years and in 2018 also that young competitors use very well the electrical and informatics knowledge. But we want to emphasize the needs of modern mechanical engineering possibilities in 2019, moreover students and young engineers will be forced to learn and use those CAD-CAM and 3D printing opportunities.

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> ; [8] LPSC 49 #2191 <https://www.hou.usra.edu/meetings/lpsc2018/pdf/2191.pdf> ; [9] [Simulated Mars Rover Model Competition - More than a decade as a research area](#) pp. 48-49. [10] Trailer 2018 <http://youtu.be/EsBXHXzP1Zg> ; or <http://magyarokamarson.hu/virtu> [11] Videos from teams http://www.magyarokamarson.hu/webalap2018/index_elemei/kepekvideok2018.html ; [12] The “NASA” Banya Building <http://www.banya-budapest.hu/?lang=en> ; [13] “China Space” MüPa <https://www.mupa.hu/en/about/mupa-budapest> [14] Korda Studios <https://kordafilmpark.hu/kiallitas/>