SIMULATED MARS ROVER MODEL COMPETITION – MORE THAN A DECADE AS A RESEARCH AREA Pál Gábor VIZI[1], Attila SIPOS[2] , [1]Wigner RCP, Hungarian Academy of Sciences, H-1121 BUDAPEST, Konkoly 29-33.Hungary vizi.pal.gabor@wigner.mta.hu, [2]Competition of Applied Engineering Sciences, Hungary siposattila@magyarokamarson.hu

Introduction: The Competition of Applied Engineering Sciences, working name is Magyarok a Marson (Hungarians on Mars) is in process more than a decade. Founder of the contest is Attila Sipos. We presented our previous works (Sipos, Vizi 2009-2015) [1,2,3,4,5,6] at the 40th-47th LPSC and at several conferences in Hungary, e.g. at H-SPACE 2016 where we described shortly the ten years of the Competition [7].

Competition's next decade: from basics to mission realization: A contest is the base of the evolution. Possibilities are increasing in the field of space research and industry according to evolution of the industrial progression worldwide both in science and in the available technology. New demonstration and standardized methods can arise virtually from nothing, but the background of the new successful solutions is the several independent attempts. A serial of competition is a proper field and can speed up this process together with competitors from many educational centers and can proof the students and young experts in one time. Results can be realized as mission concepts in integrated space systems when solutions are emerging from serials of tasks during year by year of the contest.

Benefits from a simple robot to a 'swarm': Missions completed during years from the simple classical 'one device per mission to fulfill one task' to the 'high reliable swarm and fleet of micro robots to accomplish a complex job from different manufacturers' solutions.

Certifiable result of our research is: The reliability to fulfill a mission is considerable better when we deploying different manufacturers parallel for one task. This method is applicable during demonstration missions. The best results of a successful mission can be standardized for the future.

Way of a new technology for missions, standardization: Why don't we use immediately standardized methods? The answer mainly comes from from the worldwide evolution when new reliable solutions sometime are already excellent to implement into space missions but the skills are emerging from work of recently educated engineers and researchers, because they can use and implement technology of nowadays bravely and successfully.

2016: The task of the year 2016 was a blind remote and self-controlled contest to reach several places, to position a small target in different highs of tower shaped targets, to take a sensing/measuring process, to compete others by catching high score targets form each other. It was similar to a *job to clean up a contaminated target field only from dangerous pieces of space debris repeatedly* as the frame story described.

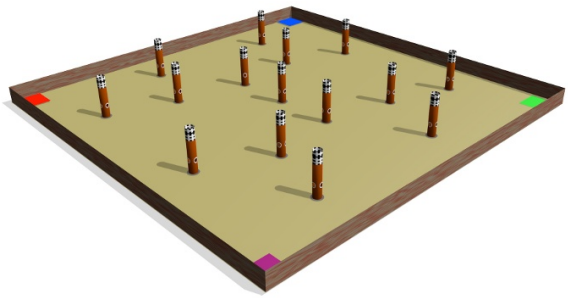

Figure 1: Plotting board of 2016

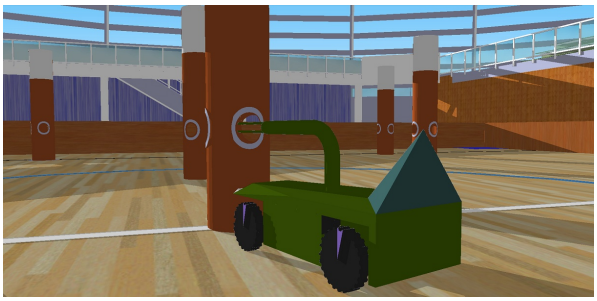

Figure 2: Pre-simulated full controllable robot and field of competition 2016 (any target can be simulated e.g. a sports hall which is the place of the contest)

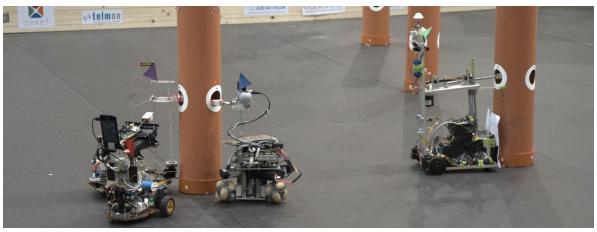

Figure 3: Robots in action to solve the task to win

Figure 4: Teams and solutions of the year 2016

2017: The tasks for the 2017 year will a remote (‘hand moving follower’ sensors) and self-controlled contest to deploy ball shaped, meteor ball like small robots, to reach several different high positions, to pass rotating gates, to set they own color marks as a sign that the measurement made by the team. Competitors have to invent and apply several smart tricks when crossing the plotting board. They not only have to build a proper hardware but they have to know the target place and to estimate the complex moving on the obstacle course and in addition they must have an optimization for crossing each other.

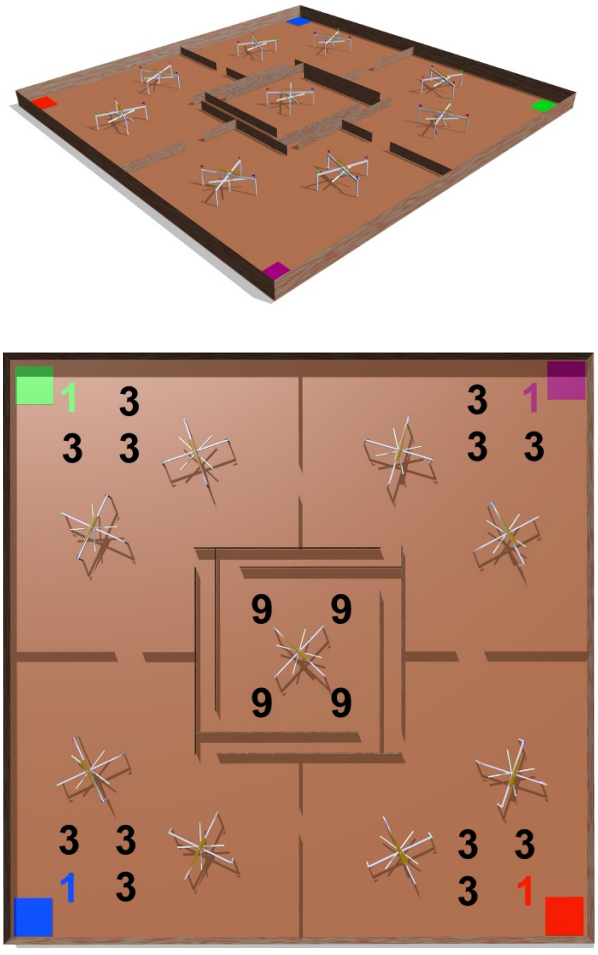

Figure 5: Plotting board of 2017.

Competitors score is 1 in self-part, 3 points in others part and 9 points at the center portion. Positions and points can be captured from each other to increase the score. In point of view of researching the best contestant team can became a good robot builder expert to reach the more places for the more significant measurement data.

Estimated type of robots will be balance transfer pendulum driven, inside of the sphere two wheels driven robots, four tetrahedron wheels driven or some other tricky driving solution, who knows?

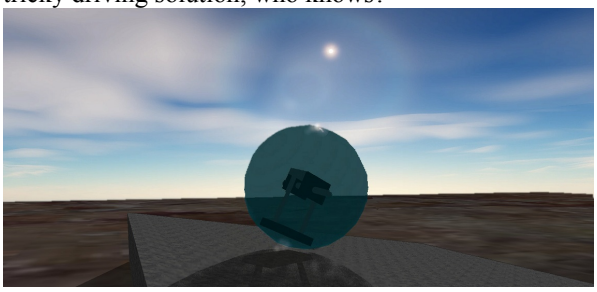

Figure 6: Pre-simulated Spherical Robot with balance transfer driving

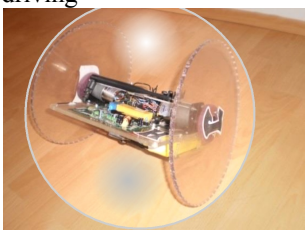

Figure 7: Possible transferable already have built robot in a plastic ball

Conclusion: The emerging skills during our competitions are giving an excellent self-developing process not only for participant students and young engineers but also for their teachers. The most important outcomes of the races are the realized and mainly solved problematic remote controlling situations on a mainly unknown “detached” terrain for a researcher who is involved in remote distant space missions, because several successful and reliable solutions are born during contests.

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] A. Sipos, P.G. Vizi: Ten Years of the Simulated Mars Rover Model Competition, p 61/62 in H-SPACE 2016 - 2nd International Conference on Research, Technology and Education of Space, 2016., http://space.bme.hu/sites/default/files/sima_lap/Proceedings_H-SPACE2016.pdf