SIMULATED MARS ROVER MODEL COMPETITION 2011-2012. VIZI, Pál Gábor[1]
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Introduction: This is a report about the organization and management of the Simulated Mars Rover Competition events of 2011 and 2012.

www.magyarokamarson.hu [1] ('Hungarians on Mars'). This is a traditional competition of applied engineering sciences for seven years now. We covered it in our papers 2519.pdf, 2649.pdf and 2014.pdf before the 40th, 41st and 42nd Lunar and Planetary Science Conferences in 2009, 2010 and 2011. As usual, we reported about the gathered experience and results usually at the place of the tournament in II. Rákóczi Ferenc High School, Kiskunhalas, Hungary and Óbuda University, Budapest, Hungary) in 2010. Organizers of the competition are independent persons and organizations who work together with High Schools and enthusiastic sponsors. The founder and the main organizer of the competition from the beginning has been Mr. Attila SIPOS electrical engineer.

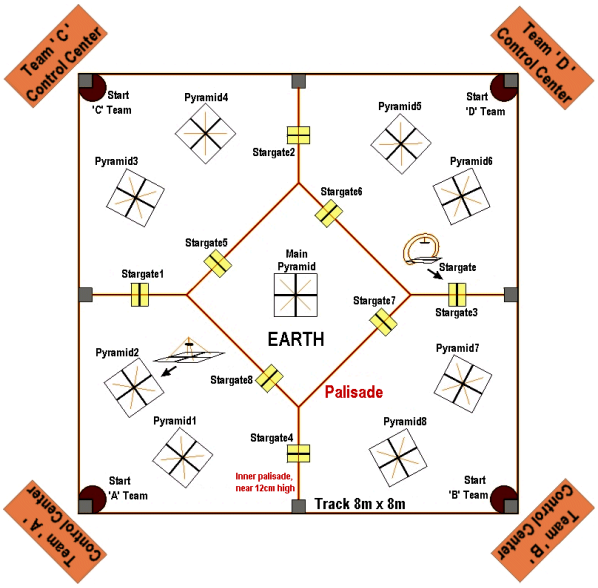
Discussion:

Ideas: To get more and more experience is one of the most important things nowadays and in each year and so is it when we offer another challenge. In order to achieve the automatism and to simulate time of signal spreading, human commands to robots must be delayed by 15 seconds. The jury works mainly automatically, only results are important, but there are experienced members in the jury and among them the author of the present paper.

2011

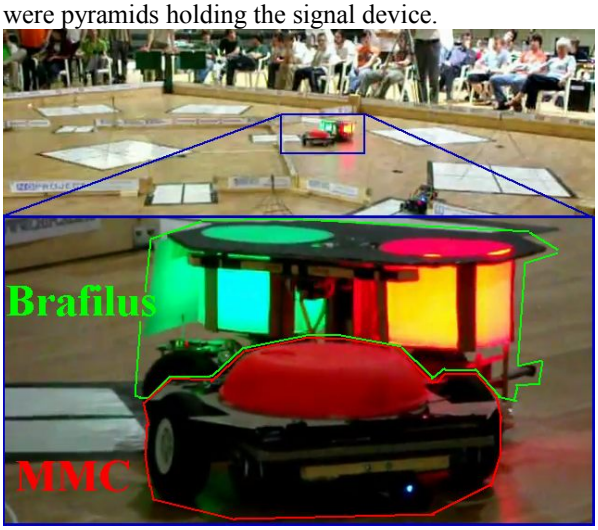
2011 results: When we are developing robots for a distant, almost unreachable destination, e.g. other planets, we think in terms of small and easy robots capable of working on their own and together at the same time. Mission can be achieved in different ways and routes. In addition a better robot can substitute the other one in order to reach the common goal. All robots must be capable of working on their own as well as in cooperation at the same time to achieve the best result.

More than one rover was on the stage in 2011, it was mainly due to the increased and large number of competitors so that full mission time was not enough to complete the contest one by one. The mission was to reach and occupy marked places on one's own field and to try to occupy other marked places on the fields of other competitors, thus some robots had to be substituted by other robot (!) as was the main purpose of the competition in 2011. The competition proved to be successful.



The 15 second delay in case of human command remained unchanged. The best competitors used advanced automatism, and rovers worked continuously and independently controlled by onboard computers.

Infra system spread signal was deployed to navigate robots through gates and into marked places which were pyramids holding the signal device.



In the picture above, the 1st and the 2nd best competitors, Brafilus and MMC, are fighting each other. The 2nd and 3rd places were shared by La cucaracha and MMC. The experience showed that the teams fought without shooting, they only tried to push the other one away. In this particular case, the 'fighting' movements were part of preprogrammed serial movements. Some competitors built in a software solution for incidental collision to avoid an endless jostling. [2]

2012

The plan: Every year there is a short action sci-fi tale for the competition. "This year we found spider like organisms on Mars (or on other planetary target) which reproduce themselves from eggs. It can be dangerous for us if they multiply themselves. According to our reconnaissances if we can occupy their oviposition places by putting our 'eggs', then we can win. Our robots must go on foot, because if we do so, the spider like organism does not want to attack us. If we use wheels, then they immediately attack us."

Limitations: Going on foot and jumping are allowed, but flying is impossible (because of thin atmosphere or quick winds). Size and weight are limited for robots; the maximum diameter is half a meter and mass can be maximum 2 kg. In case of any collision the mission must be restarted, furthermore necessary to take care of other robots.

Mission: One mission can last max 20 minutes for four teams. Robots fight against the enemy and have to have more scores than the other groups. The scores come from better oviposition places from 12 to 108 points. Missions start with a draw and after it they continue by scores. Three rounds of matches will give the final result.

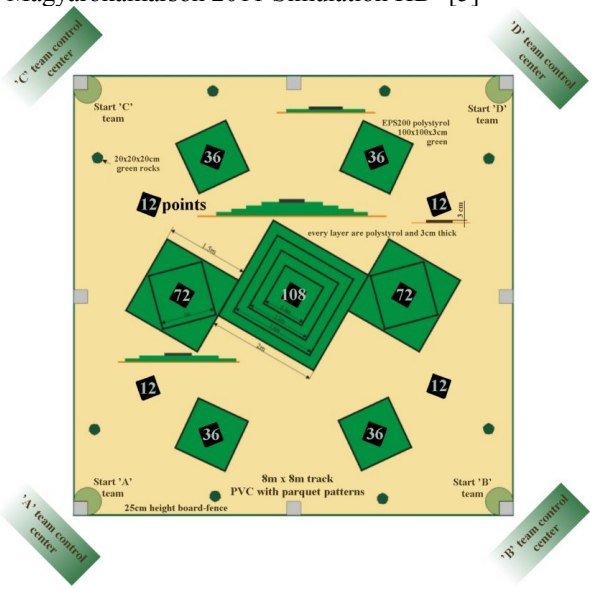
Control: Human commands have to be delayed for 15 seconds. The track is visible for the teams as in 2011 (because of cost limitations and it is easy to get pictures from robots nowadays).

The main scientific goal in 2012: The main scientific goal in 2012 is to implement legs for robots: to learn mechanical knowledge or to involve more mechanical engineers into design and competition. During years competitors were mainly electrical engineers and IT specialists. They should invite mechanical engineers or should acquire mechanical knowledge to build stepping robots, e.g. hexapods.

Planetary research specific features: Different objects, like layers will be placed on top of each other on the plotting board to make the task difficult enough to reach and to climb the targets. Different scores for goals increase the significance of a better strategy. Command time delay and automatism support the independent reliable operation.

Competition with ovipositing hexapods: They are similar to the 'alien life form' and are related to a not-too-distant future when micro robots may multiply themselves with eggs. A short description from the trailer video[3]: Any stepping mechanism, 9 reproductive fields and 9 eggs, 4 robots together at the same time on 'Mars', HD resolution satellite picture but only in 1fps 15s delayed control.

Virtualization: Organizers and competitors can make virtual traces for race already months before the date of the competition, as in 2010 and 2011 visible on youtube.com 'Mission animation 2010' [4] and 'Magyarokamarson 2011 Simulation HD' [5]



Teams came form: Budapest Univ. of Technology and Economics (BME); Óbuda Univ. Kando Faculty of Electrical Engineering; Faculty of Informatics of Univ. of Debrecen (UniDeb); Computer Science Department in Károly Eszterházy; Eötvös Univ. (ELTE) Institute of Physics, Department of Material Physics, and other team members from the Dept. Informatics; Pécs Univ. - Dept. Informatics and G. Technology; Széchenyi István Technical High School, Székesfehérvár; Miklós Zrínyi National Defense Univ. (ZMNE) MSc and Doctoral School of Military Sciences etc.

Conclusion: As a summary, it can be said that competitors have to be capable of designing, developing and constructing complex robots, and moving them by driving from wheel and caterpillar (2006-2008) through amphibians (2009) and elevator climbers (2010) to legs (2012). During competitions a lots of sensors, manipulators and tricks were used. We hope that a prize will be awarded thanks to the gratitude of our sponsors, media covers our events, and competitors join the work of Universities and research institutes.

References: [1] SIPOS, Attila et al. (2006-) www.magyarokamarson.hu
[2] KOCSIS, Viktor (2011) Brafilus, final round http://www.youtube.com/watch?v=1PpzpAbeAVQ
[3] SIPOS, Attila, Ovipositing hexapod http://www.youtube.com/watch?v=Keh5OlgxuXU
[4] VIZI, Pál Gábor (2010) Mission animation http://www.youtube.com/watch?v=2vO7AgGn-3I
[5] VIZI, Pál Gábor (2011) 'Magyarokamarson 2011 Simulation HD' http://www.youtube.com/watch?v=TGOdS-WnKi4