HUSAR EROVER – WEB ACCESSIBLE PLANETARY PROBE IN THE LABORATORY. S. Hegyi[1], Gy. Imrek[1] Z. Gocze[2], Z. Markovics[2] A. Kereszturi[3,4], [1]Faculty of Science, University of Pecs, [2]NapPort Kft., [3]Nagy Karoly Astronomical Foundation, [4]Research Center for Astronomy and Earth Science (Email: hegyis@ttk.pte.hu),

Introduction: This publications is to report about a laboratory rover called Husar eRover (Figure 1.), developed at Pecs University in Hungary, to support the education of informatics, space science and technology. The activity related to this rover is connected to the education of space sciences in Hungary [1,2], and it is part of the Hunveyor educational space probe project [3].

The first part of the name: Husar is an acronym for the Hungarian University Surface Analyzer Rover (that also means knight in Hungarian language), the second part of the name: eRover represents it is a digitally and remotely guideable moving probe. The rover can be programmed and used to solve various tasks ad problems.

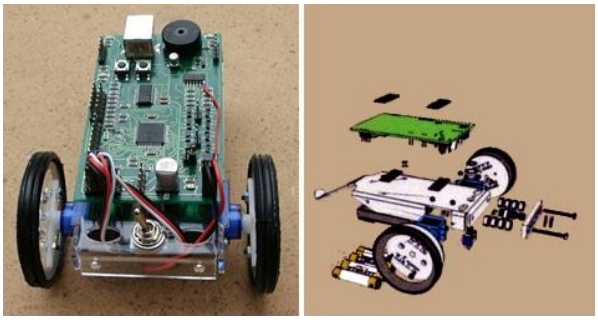

Figure 1. The image (left) and structure (right) of the Husar eRover

Discussion: the main characterstics of the rover:

Main functions of the rover are to discover its surroingings by remote control, partly in autonomous method. The rover is able to work independently and using preprogrammed outines to measure environmental parameters (temperature, image, sound, movement etc.). The students using it get knowledge in the steps of the workflow in a complex system to measure environmental variables, without deep knowledge in all the details.

Figure 2. The planned (left) and the final (right) robotic controller

Structure: the rover is compiled from electronic accessory set in modular structure, controlled by microcontroller (PIC) (Figure 2.), giving possibility for the students to contribute in the compilation of new versions of this rover system. External parts could be connected to the eRover, including various detectors and robotic arms (Figure 3.). Part of the Hunveyor-Husar robotic system is protected by patent.

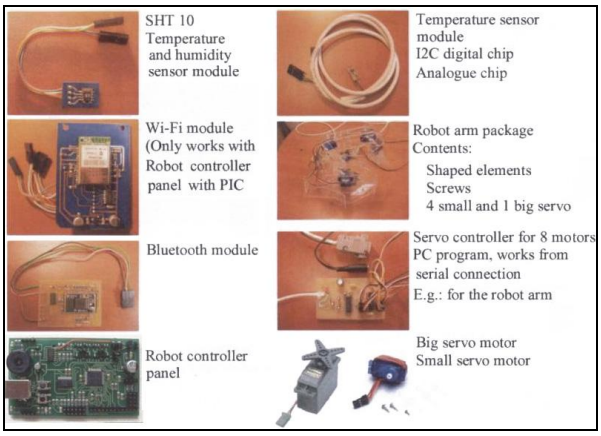

Figure 3. List of equipments of Husar eRover

Digital access: the eRover could be controlled from a computer by WIFI (Figure 4.) but also from a cellphone, and by joystick or remote switchers. The web based access is useful above all for the netgeneration of youths. The eRover can be used in C (as general and widely used), Pascal (as it is taught for the students at our university) and Basic (as it is very easy to learn, and developed by the Hungarian Kemeny Denes) programming languages. Actually we mainly use C as it is compatible with most operational systems, and also preferred by Microchip Technology Inc. the producer of this PIC.

Discussion: Beside educational issues, important aim of the these small rovers that the tests with them help in their development. During the work with the Husar eRovers the control elenctronic was used in another project that simulates and represents a remotely controlled robotic arm. We used this robotic arm together with a Husar eRover on a Mars simulating terrain in the laboratory. The robotic arm (Figure 5.) was built by the students from accessory set and can be used remotely 1. as a manipulator (directed by the students remotely with their computer) and with also web-

based access 2. as a controlled robot itself (in this case controlled by software written by the students and run on a PIC inside the robot).

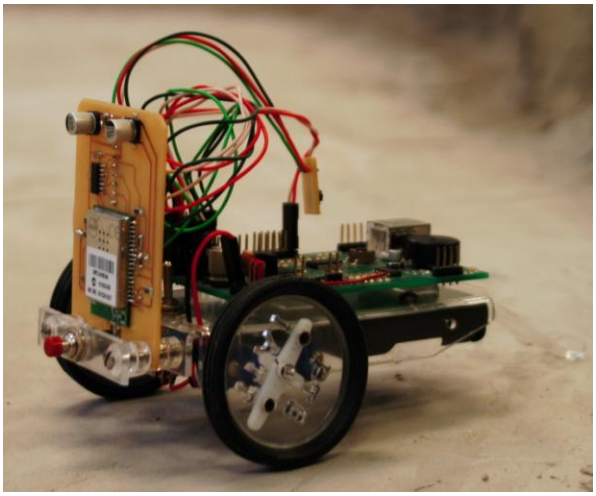

Figure 4. Husar eRover with WiFi module

During the project students simulated hypothetic work (designed by them) on analog terrain – a situation that might be similar to the work with remotely controlled robots on the Martian surface by astronauts onboard a space craft orbiting Mars without landing.

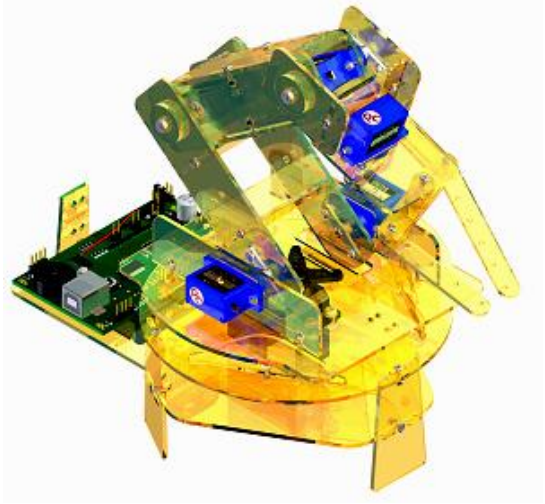

Figure 5. The robotic arm of the Husar eRover

Conclusion: The main benefits of this rover are: 1. low cost production, 2. could be improved easily by its modular structure, 3. felxiblity, 4.can be used for education in informatics and programming, physics, chemistry, Earth sciences, biology and space related topics. We are working with this rover in modular system (Figure 6.) and its maintenance is also part of the educational project, to help its future development (Figure 7.) too.

Figure 6. System architecture

In the future, improverd versions of Husar eRover-could be used beside education and scientific research as a toy, or at various industrial applications too. Several eRovers could form a group to model the realization of tasks by several remotely controlled and partly autonomous rovers together. Our next aim is to integrate the eRover into the MOODLE based e-learning system for space and planetary sciences [1].

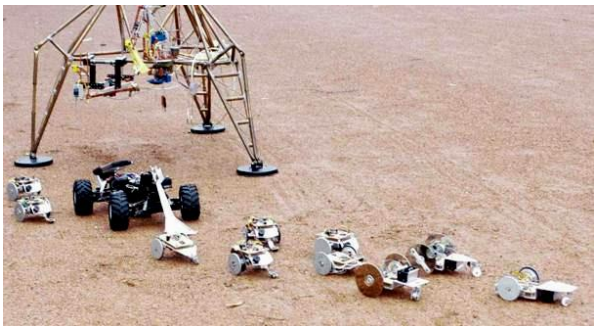

Figure 7. Step toward the future: group of autonomous robots show more capabilities and could be used in different ways than single ones

Acknowledgment: The support from the NapPort Kft. is acknowledged.

R**eferences:** [1] Hegyi and Kereszturi 2012. *43rd LPSC* #1812. [2] Bérczi Sz., Hegyi S., Hudoba Gy., Lang Á., Magyar I. 2010. The variability of Hunveyor in the education (hung. lang. A sokhasznú Hunveyor az oktatásban), *Conference Proceedings*, ed: Juhász A. & Tél T. (hung. lang.: Fizikatanítás tartalmasan és érdekesen Nemzetközi Konferencia). [3] Bérczi Sz. et al. 1999. *30th LPSC #1332.*