

ROBOT ADVANCED INTELLIGENT CONTROL DEVELOPED THROUGH VERSATILE INTELLIGENT PORTABLE PLATFORM

L. Vladareanu¹, V. Vladareanu^{1,*}, H. Yu², H. Wang³, F. Smarandache⁴

¹Robotics and Mechatronics Dept. the Romanian Academy, Institute of Solid Mechanics,
Bucharest, 010141, Romania

²School of Computer Science and Network Security, Dongguan University of Technology,
Shongshanhu, Guangdong 523808, China

³Parallel Robot and Mechatronic System Laboratory of Hebei Province,
Yanshan University, Qinhuangdao, 066004, China

⁴Department of Mathematics, University of New Mexico, 705 Gurley Avenue,
Gallup, NM 87301, USA

Published online: 5 March 2018

ABSTRACT

The paper presents a versatile, intelligent portable robot platform VIPRo, which involves developing intelligent control interfaces by applying advanced control techniques adapted to the robot environment such Robot Neutrosophic Control (RNC), Robot Extenics Control (eHFPC), Robot Haptic Control (RHC), human adaptive mechatronics, implemented by high speed processing IT&C techniques and real time communication for a high amount processing data.

Author Correspondence, e-mail: victor.vladareanu@vipro.edu.ro

doi: <http://dx.doi.org/10.4314/jfas.v10i4s.75>



An original virtual projection method is applied to SMOOTH firefighting robots through representation of the intelligent mobile robots in a 3D virtual environment using VIP-F2Ro with robotic strong simulator, an open architecture system and adaptive networks over the classical control system of the robot.

Keywords: VIPRO platform, robot simulation, graphical user interface, reference generation.

1. INTRODUCTION

Mobile robots have caught the attention of the research community and the manufacturing industry as well, leading to a great hardware and software developing. Some applications of great interest for researchers are human behaviour in fires and the simulation of the movement of individuals in such hazardous environment [1-3].

Simultaneously, the real time robot control with remote network control having human operators' ability play an important part in hazardous and challenging environments of human life exposed to great dangers such as support and repair in nuclear contaminated area, fire, earthquake or any other disaster area in case of an accident or a terrorist attack involving CBRN materials. [2-3].

2. RESULTS AND DISCUSSION

A big amount of researches led to the development of different robots with sensing abilities, transport and manipulation of different applications.

3. EXPERIMENTAL

The VIP-F2Ro Virtual Intelligent Portable platform, is the one designed to acquire the data received from unmanned ground vehicles (UGV), to process and analyse them, to provide feedback. The VIP-F2Ro brings the virtual robots to the real world, wanting to create an innovative robot platform, which will allow to develop mechatronic systems of mobile robots in virtual environments and communicate with real robot systems through a high speed interface.

4. CONCLUSION

Development of 3D dynamic perception and visualization, and human-robot interaction software systems are formidably challenging and accordingly the activities to support software developments and project management processes are of vital importance to this piece of research. Attribute selected techniques can be categorised on the basis of a number of criteria. Dynamic data come from environmental and wearable sensors, mobile robots and radio communications. SMOOTH will therefore develop software systems for real-time data analytics to assess situational awareness, assess risk and improve decision-making by firefighters and ICs. New computational software tools and virtual reality engines are being developed to support both risk and the decisions. The VIP-F2Ro Platform also develop adequate metrics and testing tools to determine the effectiveness and validity.

5. ACKNOWLEDGEMENTS

This work was developed with the support of MENUFISCDI, PN-II-PT-PCCA-2013-4, VIPRO project No.009/2014-2017, Romanian Academy, “Joint Laboratory of Intelligent Rehabilitation Robot” collaborative research agreement between Romanian Academy by IMSAR, RO and Yanshan University, CN, project KY201501009/2016-2018 and H2020-MSCA-RISE-2016/H2020-MSCA-RISE-2016, SMOOTH project, GA no. 734875 , 2016-2020.

6. REFERENCES

- [1] Murphy, Robin R. "Human-robot interaction in rescue robotics." *IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews)* 34.2 (2004): 138-153.
- [2] Hongnian Yu (UK), L. Vladareanu (RO), H. Wang (CN), Z.G. Hou (CN), F. Gao (CN), FP7-PEOPLE-2012-IRSES RABOT project no. 318902, 2012-2016
- [3] Hongnian Yu (UK), L. Vladareanu (RO), H. Wang (CN), Z.G. Hou (CN), F. Gao (CN), V. Somoghi (RO), R. Lopez (SP), F. Claeysen (FR), H2020-MSCA-RISE-2016/H2020-MSCA-RISE-2016, SMOOTH project, GA no. 734875 , 2016-2020
- [4] Yang Liu, Hongnian Yu, Luige Vladareanu, Shuang Cang, and T. C. Yang, “Trajectory

Optimization of a Pendulum-Driven Underactuated Cart”, SISOM 2011 and Session of the Commission of Acoustics, pp 287299, Bucharest 25-26 May, 2011

[5] O. Formsma, N. Dijkshoorn, S. van Noort and A. Visser (2011), "Realistic Simulation of Laser Range Finder Behavior in a Smoky Environment", in "RoboCup 2010: Robot Soccer World Cup XIV", Lecture Notes on Artificial Intelligence series, volume 6556, p. 336-349, Springer, Heidelberg, March 2011.

[6] Vladareanu L., A.Curaj, R.I.Munteanu, Complex Walking Robot Kinematics Analysis And PLC Multi-Tasking Control, Revue Roumaine des Sciences Techniques – Série Électrotechnique et Énergétique, 2011, Volume: 57 Issue: 1 Pages: 90-99 Published:JAN-MAR 2012, WOS:000303096800010, ISSN 0035-4066.

[7] Yi Dong, Hongnian Yu, Feng Gao, Design, modelling and control of a light touch Mechanism, International Conference on Advanced Mechatronic Systems, Zhengzhou, China, 11-13 August 2011.

[8] R. R. Murphy, “Human-Robot Interaction in Rescue Robotics”, IEEE Trans on Systems, Man, Cybernetics, Part C, vol.34, no. 2, pp.138-158.

[9] Victor Vladareanua, Radu I. Munteanub, Ali Mumtazc, Florentin Smarandached and Luige Vladareanua , “The optimization of intelligent control interfaces using Versatile Intelligent Portable Robot Platform”, Procedia Computer Science 65 (2015): 225 – 232, ELSEVIER, www.sciencedirect.com, doi:10.1016/j.procs.2015.09.115.

[10] Luige Vladareanu, et. al, “Versatile Intelligent Portable Robot Platform using Adaptive Networked Control Systems of Rescue Robots”, VIPRO Platform, project no. 009/2014, PN-II-PT-PCCA-2013-4, MENUFISCDI, RO, 2014-2017

[11] Victor Vladareanu, Ovidiu Ilie Sandru, Luige Vladareanu, Hongnian Yu, “Extension Dynamical Stability Control Strategy for the Walking Robots”, International Journal of Technology Management, SKIMA 2012, Inderscience Publisher, 2013, ISSN online: 1741-5276, ISSN print: 0267-5730, <http://www.inderscience.com/jhome.php?jcode=ijtm>

[12] Smarandache F., Vladareanu L., “Applications of Neutrosophic Logic to Robotics -An Introduction”, The 2011 IEEE International Conference on Granular Computing Kaohsiung, Taiwan, Nov. 8-10, 2011, pp. 607-612, ISBN 978-1-4577-0370-6

[13] Şandru Ovidiu Ilie, LuigeVladareanu, Paul Şchiopu, Victor Vlădareanu, Alexandra

Șandru, "Multidimensional Extenics Theory", U.P.B. Sci. Bull., Series A, Vol. 75, Iss. 1, 2013, pg.3-12, ISSN 1223-7027

[14] Marina Shitikova, Luige Vladareanu, Claudio Guarnaccia, „Recent advances in mechanical engineering”, WSEAS Press, 2014, pg.207-2014, ISBN ISBN: 978-960-474-402-2

[15] S.B. Balakirsky and Z. Kootbally, "USARSim/ROS: A Combined Framework for Robotic Control and Simulation", Proceedings of the ASME 2012 International Symposium on Flexible Automation (ISFA 2012), St. Louis, June 18-20, 2012

[16] Cononovici, Sergiu Boris, and Adrian Curaj. "An approach to walking robots planning and control." Proceedings of the Romanian Academy (2010): 75-82.

[17] Y.F. Feng, H.B. Wang, T.T. Lu, et al. "Teaching training method of a lower limb rehabilitation robot." Int J Adv Robot Syst, vol. 13, pp. 1-11, February 2016.

[18] Cononovici, S.B., Vlădăreanu, V., et al. "Control Strategies for Synchronous Generation of Resistive Loads Correlated to the Robot Motion Environment", 5th International Workshop on Cyber Physical Systems (IWOCPS-2016), Romanian Academy, Bucharest.

[19] Vladareanu Luige, et all, Method and device for the real-time control of robots by virtual, projection, EPO: A 2008 00232.

[20] Yang Liu, Hongnian Yu and Luige Vladareanu, An Iterative Learning Control Scheme for the Capsbot, UKACC International Conference on Control 2008, University of Manchester, UK, 2-4 September 2008.

How to cite this article:

Vladareanu L, Vladareanu V, Yu H, Wang H, Smarandache F. Robot advanced intelligent control developed through versatile intelligent portable platform. J. Fundam. Appl. Sci., 2018, 10(4S), 122-126.