

**SEE- Award (name “Herman Potočnik – Noordung Award” proposed by MHEST) for
 Research Infrastructure Donations within the Framework of RTDI Collaboration
 with West Balkan Countries**

Research Infrastructure needs

- Application form for Scientific & Research Institutions from West Balkan Countries

Section A – General information
A.1 Contact details
Name of applicant /(institution) Faculty of Electrical Engineering of Sarajevo, Department of Automatic Control and Electronics
Legal status / Type of organisation: GOV
Address (Street name, ZIP code, town): Zmaja od Bosne bb, 71000, Sarajevo
Telephone no.: ++387 33 25 07 25 Fax no.: ++387 33 25 07 25 e-mail: jasmin.velagic@etf.unsa.ba web address/url: www.etf.unsa.ba
represented by (name of person <u>legally responsible</u>) Prof. Kemo Sokolija, Dean.
Name of the contact person Jasmin Velagic
Address (if different from address stated above) Telephone no.: Fax no.: e-mail: web address/url:
A.2 Applicant (Institution) profile (half page A4)
<p>Faculty of Electrical Engineering of University of Sarajevo, was established 46 years ago, in the year 1961. Department of Automatic Control and Electronics is a part of the Faculty of Electrical Engineering at the University of Sarajevo. The Department was founded in 1964. The department has a highly qualified technical staff. The staff and student are knowledgably in relevant scientific disciplines as mathematics, electronics, control, computer sciences, communication, etc. The academic staff of the Department has 17 professors and 20 teaching and research assistants (PhD students) will successfully complete its assigned and granted projects at high scientific and professional standards and levels of quality.</p> <p>The Department has a Laboratory for Robotics and Autonomous Systems (LARAS). This Laboratory has been established in 2001. It is run by some senior staff and several young researches which are devoted to scientific work. An intensive theoretical and practical research work is carried on in the fields of robotics, soft computing, electronics, mobile robotics and automatic control. Currently, the particular attention is paid</p>

to navigation of the mobile robots, networked and cooperating robots through wireless communication and man-machine interface design. The laboratory so far got projects from governments agencies of Bosnia, Italy and Austria. LARAS laboratory staff actively contributes to scientific conferences as well as professional standard organisations as IEEE, IFAC and ECC, and publishes in international journals. The scientific results of LARAS laboratory generated in 2000-2006 a total amount of 8 international journal papers and over 80 international conference papers. In the last three years (2004-2006), the LARAS lab got 3 research projects for a total amount of 71.500,00 €.

Section B – Description of the research infrastructure requirements/needs

B.1 Please list your research infrastructure requirements – the most urgent equipment you would need.

Quanser's 5 DOF Telepresence System

1. 5DOF PANTO - 5 DOF Pantograph (The Haptic Wand)

System Includes...

- Q8 Hardware-In-The-Loop Board
- 4-Axis Linear Power Amplifier
- 2-Axis Linear Power Amplifier
- WinCon 5.0 Real-Time Control Software

2. 5DOF ROBOT - 5 DOF Open Architecture Robot

- #1 Robot System, Articulated, Catalyst-5 Package
- 5-Axis Catalyst-5 robot arm with C500 Controller
- AC and umbilical cables, 10'
- Teach Pendant
- User Manual, Ashpro SI
- #2 Country Kit
- #3 Servo Gripper with fingers
- #4 Robcomm-3
- #5 Q8 PCI Hardware-In-The-Loop (HIL) Board
- #6 Auxiliary Circuit for Open Architecture Operation
- #7 Full Equations for Forward and Inverse Kinematics
- #8 Functioning PID Controller from Simulink

3. 6DOF Force/Torque End-Effector

- for use with the 5DOF Open-Architecture robot

4. Turn-Key optimized PC

- fully configured for the telepresence experiment.
- includes 19" LCD monitor, keyboard and optical mouse.
- includes Windows XP - OEM
- includes installation of Q8 DAQ cards and software
- includes installation of WinCon Real-Time control software

Manufacturer and Distributor of all mentioned products is:

Quanser Consulting Inc.
80 Esna Park Drive, #1
Markham, Ontario, CANADA L3R 2R6
Tel: (905) 940-3575
Fax: (905) 940-3576
E-mail: sales@quanser.com
http://www.quanser.com

B.2 Describe the relevance of the requested research infrastructure for the work of your institution and the potential impact of receiving the items listed above (B.1).

Over recent years, the Internet has proven to be an invaluable tool in education. Internet-equipped computers are much more common now in schools, universities, and in people's homes compared to a decade ago. This rapid growth has attracted interest of many researchers to embed intelligent devices into Internet. Although Internet robotics or Web-based telerobotics is still a relatively new research area, it had opened some up new real-world applications, as on-line open laboratories and teletraining.

In the past few years, telerobotic systems have become more and more important in robotics, by introducing the issue of intelligence and of the emergence of structures through interactions. Teleoperation (telerobotic) systems allow a person to manipulate of remote processes through coordinate control of two robotic manipulator (arms), i.e., a master hand controller used by the operator, and a slave robot that manipulates the environment. Applications of teleoperation are numerous, ranging from space operation, underwater exploration, and mining, to nuclear and toxic materials handling, and robotic-assisted medical interventions.

Our Department has a tradition in the field of robotics and a potential for further development. The department has a highly qualified technical staff. Our students are very much interested in robotics. The staff and student are knowledgeable in relevant scientific disciplines as mathematics, electronics, control, computer sciences, communication, etc.

The first goal of this proposal would be the development of the so called Virtual lab on our Department. The users/students will be able to do series of experiments remotely via internet where they will develop their own programs and test them on the server or several already prepared experiments which will serve as educational tool to understand some aspect from robotics and control theory.

The proposed research equipment will enable students to make virtual visits of remote laboratory rooms to perform course required experiments. The location of resources and their operation will be made much easier. It should be easily extendable in order to realise some more complex functions. A user could submit a simple program to the server and test it in the real remote robot. The opportunity that the project provides is to learn new principles, methodologies, technologies and applications that have been developed in recent years in the area of telerobotics and web-based robotics.

Also, those will make a good basis for future research. This system should have following features: interface for robots; a possibility to integrate different robots into a system's framework and an intuitive user interface and adequate feedback. It should be easy to maintain and have a low cost. This system provides experiments execution in the following research topics: Haptic Interface Control, Impedance Control, Telepresence, Parallel, Redundant Manipulators, Kinematic & Dynamic Modeling and Effects, Robotics, Telesurgery & Microsurgery (scaling), Teleoperation, Time Delay Compensation, Rehabilitation, Fatigue, Human Factors, Haptics Performance Benchmarking, Motion (Position & Speed) Control, Force Control, Force/Velocity Observer, Position and Force Tracking: In Free Motion & During Hard Contact, System Identification, Multivariable Control Design, PID Control Design, Adaptive Control, State-Feedback, Real-Time Control, Discrete Time Sampling, etc.

Other impacts of the proposed project to the concerned areas are: reinforcement of the research potential at our Department, stimulation of scientific cooperation and research coordination, establishment of critical mass of researchers in various disciplines, encouragement of students to obtain BSc, MSc and PhD degrees, Dissemination of research results in international journals and conference proceedings, etc.

B.3 Please indicate the potential users of the requested equipment.


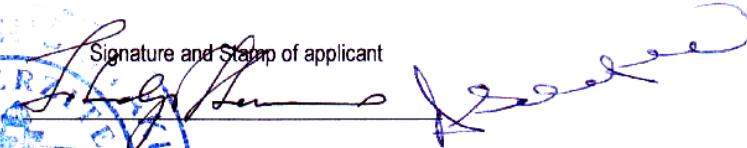
The potential users of the requested equipment are professors of the subjects related to the proposed system, research and teaching assistants and students.

<p>B.4 Please describe the training needs of your institution related to the requested equipment</p> <p>No external training is needed.</p>
<p>B.5 Please indicate if there is assistance needed with regard to the transportation and maintenance related to the requested equipment</p> <p>Yes, we need assistance regard to transportation and maintenance related to the requested equipment.</p>
<p>B.6 Additional Comments</p> <p>We have no additional comments.</p>

Please fill in and return the form by email to the contact person in your country (see appendix 1)

Place, date: **Sarajevo, November 11, 2007.**

Signature and Stamp of applicant



BROJ: 02-1-2588/07
DANA, 13.11.2007