

## **Educational Robotics Laboratory of Federal University of Espírito Santo - Brazil**

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*Abstract*—**This paper presents the Educational Robotics Laboratory (LRE) of the Federal University of Espírito Santo (UFES). It explores the laboratory implementation proposal; the projects developed with engineering students along with students from elementary and high schools the courses offered for teachers of basic education; and the importance of creating a space within the university which provides integration of different levels of schooling.**

Keywords: Educational Robotics, Robotics Competitions, Teamwork

### **1. Introduction**

The Educational Robotics Laboratory (LRE)[1] was founded in 2006 with the purpose of integrating programs of mechanical, electrical, and computer engineering through robotics projects aimed at building prototypes in order to provide a practical application of theory studied in the classroom. The idea of founding the lab was also intended to provide a space for students of basic education to have access to this technology through activities guided by the university students.

### **2. Objective**

The intended objectives from the creation of the LRE were:

- Creation of a learning environment where engineering students of the university can apply the theories discussed in the classroom, through the construction and programming of prototypes, enabling them to acquire hands-on knowledge by conducting experiments.
- Providing opportunities for project development for students from elementary and high school.
- Train basic education teachers to use robotics as a support tool for classroom content.

### **3. Implementation of the Laboratory**

In the first year of the LRE program, projects were developed with the subjects of Industrial Robotics and Introduction to Programming for students of the undergraduate programs in mechanical engineering and computer sciences. Due to the good results obtained and the presentation of prototypes developed at fairs and events, the laboratory received financial support for acquisition of more robotics kits, allowing the increase of supplies available for projects so that a greater number of students had access to this technology. The following step was a new project with elementary edu-

cation students invited to UFES. Additionally, several courses dedicated to promoting robotics-related education for the local community were initiated.



**Fig.2.** Current Educational Robotics Laboratory

#### **4. Projects and activities developed in the LRE**

In over seven years of operation, many projects were developed in the LRE, and gradually the laboratory was structured as it had been planned to fulfill the purposes that were set at the beginning of the project. Listed below are some of the projects that have been developed and milestones achieved by the lab:

- Development of activities related to mechanical, electrical and computer engineering programs.
- Providing robotics courses for undergraduate students with the LEGO Mindstorms NXT, VEX [3] and Arduino[4]kits.
- Providing courses for basic education teachers.
- Creating teams of graduation students in engineering to participate in technological tournaments.
- Forming teams of elementary school students to participate in school competitions.
- Giving mini-courses at conferences and events.
- Lecturing in elementary and middle schools.
- Organization of Robotics Olympiads – State level .[5]

Since 2007 the LRE organizes the Brazilian Robotics Olympiads on a state level, which qualifies teams that will compete on national level with winning teams from all states of Brazil. The national level is part of the Brazilian Robotics Competition which encompasses the Robotics Olympiads (OBR), RoboCup, RoboCupJr, and IEEE categories. This event brings together students of all grade levels.

## **5. Participation in Competitions**

Participation in robotics competitions enables the application of theoretical concepts covered in engineering courses, and provides our students with a learning environment through information exchange with students from other universities. It also encourages the production of articles submitted to national and international conferences related to the use of robotics in education.

LRE teams participated in both national and international competitions with excellent results, such as the Tetra-Latin American Championships in category IEEE for university students and the Bi-Championship in the RoboCupJr Rescue category in Brazil.

## **6. Conclusion**

Since the beginning of the LRE program the importance of providing an integrated environment at the university with undergraduates in engineering courses has been observed. Open to students of middle and high school, the laboratory has been successful in the spreading of science and technology in basic education. Some of the past LRE elementary school students are now studying mechanical engineering and contributing to the training of new students thus continuing the practice of bringing together university with basic education.

## **7. Acknowledgement**

Participation in robotics competitions requires team involvement in the project, and dedication of the students to solve problems creatively. However, it is crucial that they have financial support to help with the costs of parts, devices (sensors, actuators, processors, software, etc.), building arenas for testing, team registration, travel, and daily sustenance. It would not be possible to participate on so many teams in different projects if there were no acknowledgment and support from the Technological Center UFES and institutions such as the ES-CREA - Regional Council of Engineering, Architecture and Agronomy, Arcelor-Mittal, SECT-Secretariat of Science and Technology-ES and FAPES Research Support Foundation of the ES.

## **8. References**

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- [5] <http://www.obr.org.br/>