

Humanoid Seminar Assessment in High Technological Studies

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Abstract

This paper presents a qualitative assessment of the experience of integrating a humanoid robotics seminar in a mobile robotics-related subject at the Master's degree on Automatic Control and Robotics. In this way, social robotics is included as a part of the syllabus of this Master's subject taught using the Problem-Based Learning (PBL) methodology. The assessment of our experience shows high interest in the new robotics approach and students are satisfied.

1. Introduction

Isaac Asimov succeeded when forecasting about Robotics even though it will leave him behind. The biochemist and science fiction American writer predicted half a century ago that “Robots will neither be common nor very good in 2014, but they will be in existence”. But humanoid robotics, with anthropomorphic aspect and human functionalities, is giving huge leaps when living and sharing daily task with humans such as elderly attention, therapeutic training, medication supplying to unhealthy people, and kids' surveillance at home [1] [2]. Nowadays, the robotics is a part of daily life. Most recently, European technological universities are introducing Social and Humanoid Robotics in their curriculum with a good pedagogical result.

In this work, the main objective is to show the successful introduction of social robotics (using humanoids) in a funny and entertained manner into the classrooms. The idea is that students acquire skills related with social robotics in the major subject of Robotics in the second year of the master of Automatic Control and Robotics. At the end of the seminar a questionnaire is passed to students to have a fruitful feedback to improve the subject together an evaluation sheet to know whether they have acquired some important skills in this matter. Specifically, in this work authors present the assessment of a novel robotics seminar integrated in the “Robotics, Kinematics, Dynamics and Control” subject taught in the Master's degree in Automatic Control and Robotics at BarcelonaTech. This subject has a load of 45 hours, which 16 have been reserved for the Robotics Seminar.

2. Assessment of the Seminar and Discussion

The teaching results obtained by introducing this seminar as a part of “Robotics, Kinematics, Dynamics and Control” subject been promising [3] [4] [5]. To assess this seminar, an experimental evaluation protocol is followed. This protocol is based on the evaluation of the objectives and competences that were proposed in this robotics subject by two indicators: first, the achieved level of knowledge of students for generic and specific competences and, second, using a questionnaire targeted to students' opinion about the seminar. This first indicator has been obtained in two different academic years, that is, one year without integrating the social robotics seminar in the “Robotics, Kinematics, Dynamics and Control” subject, and the next academic year with this seminar.

Using this evaluation methodology, the goal is to assess the performance of the subject in the following aspects: 1) students achieve the required generic competences and above all the specific competence of teamwork; 2) training is tested mainly according three important features (building awareness, knowledge and skills). Fig.1 shows the normalized score for each competence of the subject (mechanics and electronics, programming, control and sensors and teamwork). For each competence, first column corresponds to the score of the subject without this seminar, and the second column to the score with the social seminar.

Analyzing these results, all the students have finished the workshop with successfully grades showing high interest in the new robotics approach (with social seminar). In the case of the generic competence, it is clear that students raise 60 points more of performance. Besides, at the end of the term a questionnaire is given to the students to know their opinion about the seminar, see Table 1. It is concluded that they found the experience very fruitful and they are highly motivated to continue with this degree. The score for these questions range from 1 to 5 (1-completely disagree, 5-completely agree). All the enrolled students answered the questionnaire. Fig.2 shows the questions passed to the students.

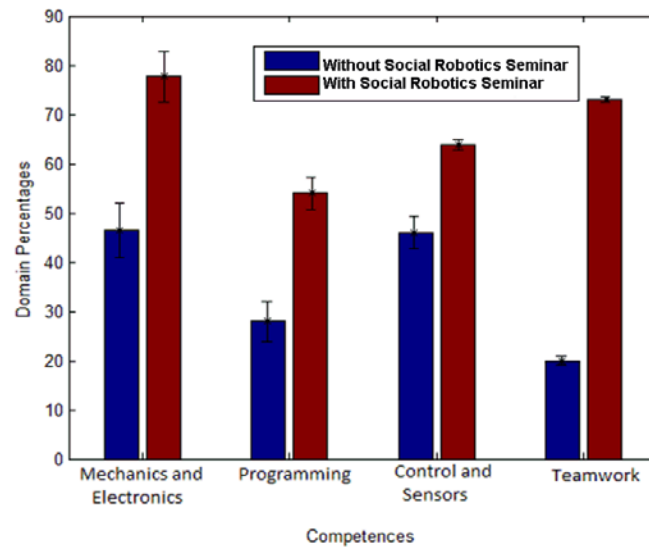


Fig.1 Comparison between students' scores in "Robotics, Kinematics, Dynamics and Control" subject with and without social robotics seminar.

From the results, it can be observed that students found that this pedagogical procedure requires a higher effort than the traditional procedure. The students' motivation about the developed activities is also higher, stimulating their interest for the university degrees. Moreover, students have achieved a greater number of skills, competences and also talent that are evaluated in the professional world respect to others academic years where the seminar was not taught. A second edition of the seminar is ongoing by the authors because the experience has been also very enriching for all the instructors that participated in this new pedagogical methodology. The weak point of the seminar is the reduced number of laboratory sessions in order to acquire a good level in social robotics.

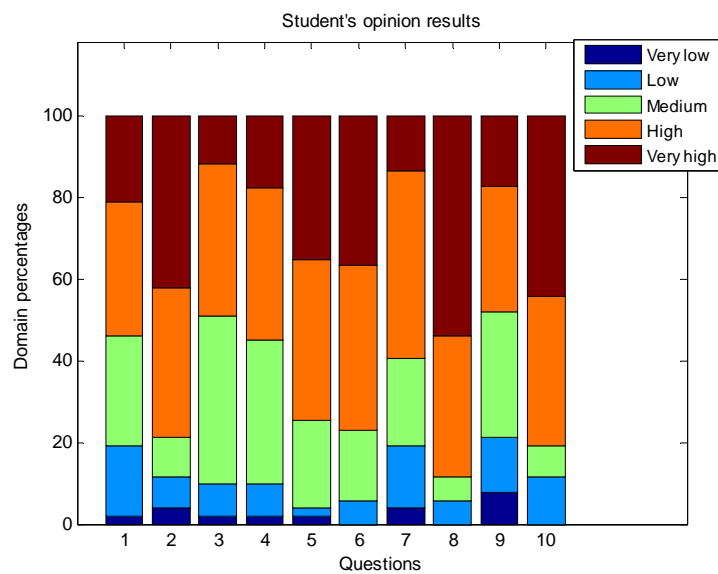


Fig. 2 Students' opinion results.

3. Conclusion

In this article, the novel seminar of “Social Robotics” for Master’s students has been evaluated. From the assessment of the seminar, the training methodology ensured their active participation and this encourages the authors to repeat the experience. This seminar has been carried out successfully as a part of the “Robotics, Kinematics, Dynamics and Control” subject taught in the Master’s degree in Automatic Control and Robotics. This methodology can be exported to other robotic subjects independently of the hardware that will be used in the laboratory.

Table 1. Questions passed to students to know their opinion

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| 1. Do you consider that social robotics practices provided you additional knowledge to the industrial robotics practices? |
| 2. Do you consider that the social robotics practices provided you additional knowledge to the industrial robotics theory? |
| 3. Do you think that industrial robotics and social robotics are related? |
| 4. Have you acquired new competences and abilities with the teamwork methodology? |
| 5. The pedagogical methodology is suitable to obtain skills in social robotics. |
| 6. The developed pedagogical resources (robot handbook, practices...) have been clear and useful. |
| 7. The laboratory facilities (rooms, equipment...) are suitable to do social robotics practices. |
| 8. The subject of these practices on social robotics is interesting for me. |
| 9. Do you think that these skills on social robotics can be useful in your professional career? |
| 10. Do you consider that social robotics should be a compulsory subject for future professionals? |

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References

- [1] IFR, International Federation of Robotics, Service Robots survey, 2016. Accessed on June, 13th 2017. <https://ifr.org/ifr-press-releases/news/service-robotics>.
- [2] R. Brachman and H.J., Levesque, *Knowledge Representation and Reasoning*, Morgan Kaufmann Ed., 2004.
- [3] D. R. Woods, R.M. Felder, A.R. Garcia and J.E. Stice, “The future of engineering education III. Developing Critical Skills”. *Chem. Engr. Educ*, vol. 34, 2000, pp. 108-117.
- [4] A. Chiou, “Teaching technology using educational robotics”, *Proc. 2nd International Conference on Autonomous Robots and Agents*, Almerston North, New Zealand, 2004, pp. 13-15. .
- [5] Lee, Tsui-Lee, “Effects of a Cooperative Learning Strategy on the Effectiveness of Physical Fitness Teaching and Constraining Factors”, *Mathematical Problems in Engineering*, Volume 2014 (2014), Article ID 519291, 6 pages, <http://dx.doi.org/10.1155/2014/519291>