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Bilingual course of industry robot basing digital twin technology

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Abstract: Bilingual teaching background is an innovative method for teaching a course on robotics. This could include a combination of both the technical and language-learning aspects of the subject matter. Through a bilingual approach, students can gain a comprehensive understanding of the fundamentals of robotics, including its history and development, to its applications and implications. The course could also include the use of digital twin of robot software in classrooms, with a focus on critical thinking and problem-solving. Finally, the course would also cover the language-learning aspects of robotics, such as how to communicate with robots, how to program them, and how to use them to create a more interactive learning environment. In this bilingual project, students can acquire basic robot programming skills, robot vision, and robot integration.

Keywords: Bilingual course; Industry robot; Digital twin.

1. Introduction

This report provides an overview of the industry robot bilingual course offered at Chinese polytechnic which focus on professional skills instead of theory of robot, such as robot programming skills, robot vision skills and robot integration. The course object is to give students a comprehensive understanding of the latest technologies used in robotic systems. Topics covered include robotics engineering, programming, robot vision, and automation. The course focuses on providing a comprehensive understanding of the latest technologies used in robotic systems and how to use them to increase productivity and efficiency.

2. Problem statement

(1) The practical and applied nature of industrial robot course is very strong, and the effective learning of the course is inseparable from the operation and programming on the actual equipment, and the equipment is expensive, and the requirements for the site are strict, and many colleges and universities cannot effectively carry it out. (2) Pre-class preparation is not in place, self-study resources vary widely, because industrial robots integrate mechanics, control science and computer science and other multidisciplinary integration products, so the problems in practical education are more complicated, teaching resources are difficult to solve some of the complex problems encountered in practice, resulting in the implementation of after-class extension. (3) The management of the learning process is not meticulous, and the assessment method is single, and the final evaluations such as practical examinations or practical task achievement are arranged as students' assessment results. (4) Lack of bilingual teaching staff according to statistics, the total number of bilingual demonstration courses in the school is lower than the number required by the school. At present, most teachers who undertake bilingual courses have no overseas study experience, and the proportion of short-term oversea studies and study visits is small, and the number of bilingual teachers with foreign academic backgrounds is almost very small. At present, most professional teachers are limited by language skills and are unable to undertake bilingual courses, and the few existing bilingual courses are also due to the unfamiliarity of classroom communication language of classroom teachers, as well as pronunciation, fluency, tone problems and non-verbal behaviors, which reduces the flexibility of teaching content transmission and makes teaching results less satisfactory.

3. Course Objectives

The primary objective of the course is to provide students with a comprehensive understanding of the latest technologies used in robotic systems. Through this course, students should be able to:

- Understand the fundamentals of robotics engineering, programming, robot vision, and automation
- Develop a basic understanding of the principles of robot control and operation
- Become familiar with the latest technologies used in robotic systems
- Learn how to effectively use robots in industry
- Understand the implications of robotics in the workplace
- Be able to design and implement robotic systems in industry.

4. Suggestions and solutions

Based on PDCA cycle concept and flipped classroom form Combining the traditional teaching mode with the information teaching mode, based on the PDCA cycle concept and flipped classroom form, the practical teaching mode of industrial robots of "online and offline, virtual and real" is designed. Taking experimental projects with different design priorities as an example, the specific realization of the teaching model was elaborated in detail according to the four stages (PDCA cycle concept), which is mean of "teaching preparation (plan)-teaching implementation (do)-teaching evaluation(check)-teaching reflection (act)"[1]. Teaching allows students to think independently about tasks, make plans independently, and make decisions through teacher explanations and group discussions; Then independently carry out preparation, analysis demonstration, practice training, final examination and evaluation. Guided by project

innovation, select excellent projects for continuous change of teaching resources to meet the needs of the development of the industrial robot industry. In the teaching process of each project, a variety of teaching methods such as task-driven pedagogy, online and offline pedagogy and group discussion methods are integrated. The offline course can be divided into two parts: on-site lecture + group innovation experiment, and the implementation location is the industrial robot laboratory. In addition to teaching the content specified in the syllabus, on-site lectures should also guide students to implement innovative projects in small groups based on the specific needs of enterprises, and assist in the production of simple processing models; Group innovation experiments should be arranged centrally, because industrial robots are highly specialized and the audience is relatively narrow, so weekends or evenings can be arranged to carry out innovative new project experiments in an incentive-oriented way, guide and stimulate students' interest on the spot, and provide preparation for the implementation of flipped classrooms. For the implementation of innovative projects, it motivates students to complete through the integrated evaluation mechanism, and through flipped classrooms, the selected excellent projects are used as guidance books or courseware resources, and the content of new project guidance books is constantly followed to meet the needs of enterprise development.

Introducing External and Internal Training to Build Bilingual Teachers Local advanced manufacturing enterprises, because most of the regions in which they are located are ordinary small and medium-sized cities in China, lack the advantage of attracting talents in economically developed areas. Therefore, local industrial robot training needs to rely on intelligent manufacturing enterprises with developed industries at domestic and abroad, and with the help of international school-enterprise cooperation, real-time update of the training project content of industrial robots, aiming to match the needs of enterprises in real time and provide talent reserves and intellectual support for the industrial upgrading of local related enterprises. Therefore, in terms of introducing teachers abroad, it is necessary to cooperate with the local government for policy support and guidance, and vigorously introduce teachers with foreign academic backgrounds to solve the problem of bilingual teachers' language shortcomings; At the same time, it is also necessary to strengthen teacher training and expand bilingual teachers based on the current teaching force to meet the current bilingual teaching requirements. The mode of internal training can be through external training and on-site intensive training, that is, on the one hand, key teachers of young and middle-aged people can be sent to study abroad, such as short-term visiting training abroad, to make up for the shortcomings of bilingual teachers in language use; On the other hand, bilingual training experts at home and abroad can be regularly invited to carry out systematic bilingual teacher training and learning, strengthen the use of classroom communication language, voice intonation and non-verbal skills, and help most bilingual teachers who have acquired professional knowledge to get rid of language constraints. Finally, a two-pronged approach will be used to improve the construction of bilingual teaching faculty [2].

Strengthen the top-level design of the curriculum and build a scientific bilingual curriculum system the curriculum of industrial robot practical training needs to fully consider the development needs of the local society where it is located, and carry out curriculum planning and talent training program formulation according to actual needs. At the micro level, from the teaching plan (the beginning grade), the teaching process (the proportion of English used in teaching), and the teaching assessment (the course assessment method), the current bilingual curriculum is scientifically set and planned, and the teaching plan is implemented "graded and gradually", the teaching process closely follows the curriculum development planning guidelines, and the teaching assessment fully realizes the promotion and monitoring of teaching goals. At the macro level, according to the needs of local economic and social development, according to the analysis of the current talent market's demand for industrial robot applications, combined with the school's various professional settings and students' learning motivation, from the top check, according to the requirements of graduates' knowledge, ability, quality specifications, detailed vocational and post ability analysis, so as to optimize the bilingual curriculum and make the development of bilingual courses can achieve learning and usefulness.

Establish a scientific and reasonable classroom teaching evaluation system to improve the monitoring of the quality of bilingual teaching Change the current problems of teaching evaluation, lack of fine management of the learning process, and single assessment methods, change the current teaching evaluation overly relying on a single student evaluation model, only use student evaluation data as the only standard to measure teachers' level, and at present, most of them use final evaluations such as practical examinations or practical task achievement as students' assessment results. It is necessary to formulate a multi-dimensional teaching evaluation system for schools, full-time teachers, students, etc. from the perspective of policies and regulations, and carry out targeted monitoring of teaching quality in all aspects, so as to achieve the improvement of teaching effectiveness relying on the model of "discovering problems - solving problems". Strengthen policy formulation at the school level, establish evaluation standards for the integration of teaching and research practice, such as fully implementing the supervision and listening evaluation system to grasp the current bilingual teaching status in real time, vigorously promoting the cultivation of bilingual teaching-related teaching reform topics, using scientific research mechanisms to drive the development of bilingual teaching reform, and cooperating with industry enterprises inside and outside the school to conduct talent evaluation to track the effectiveness of bilingual teaching practice; At the teacher level, give full play to their subjective initiative and pay close attention to the improvement of teaching professional ability, such as implementing cross-faculty and cross-professional class evaluation, strengthening participation in peer evaluation, and encouraging teachers to participate in various bilingual teaching competitions to promote teaching through competition; At the student level, we should focus on various forms of evaluation according to the talent training goals of bilingual teaching, such as adding "project innovation" items to the evaluation system, promoting experimenters to solve practical problems through industrial robots, selecting excellent projects as updating projects of teaching resources, and evaluating and monitoring the effect of bilingual teaching through student curriculum project innovation.

Digital twin technology has made a great progress in recent years, there main aspects of digital twin include data acquisition, data modeling and data application [3], students

can get real industry workcell requirements to build a robot workcell in modeling, and use some offlien programming method to control robot in virtual reality, finally load the programming or method to reality.

5. Course Content

The course is divided into several modules, each focusing on a different aspect of robotics engineering, programming, robtot vision and automation. The modules include:

• Introduction to Robotics - This module provides an overview of robotic system components and the principles behind robot control and operation.

• Robotics Engineering - This module covers the fundamentals of robotics engineering, including robot design, mechanics, and operation.

• Programming and Automation - This module covers the basics of programming for robots and automation systems, including programming language and hardware.

Robt vision – This module includes the basic understanding of robot vision, and basic skills of communication between robot and vision system.

• Robotics in Industry - This module covers the use of robots in industry, their implications for productivity and efficiency, and the implications of robotics for the workplace.

6. Conclusion

The industry robot bilingual course provides students with a comprehensive understanding of the latest technologies used in robotic systems. Through this course, students should be able to understand the fundamentals of robotics engineering, artificial intelligence, programming, and automation, and be able to design and implement robotic systems in industry.

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