Exploration of the Professional Group Course System of Intelligent Navigation

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Abstract: With the development of intelligent ships, intelligent navigation has become the inevitable choice of the future shipping industry, which will have a profound impact on the navigation education. In order to meet the needs of the cultivation of intelligent navigation talents in the future, it is necessary to timely reform and adjust the training mode and curriculum system of Marine professional group talents. This paper analyzes the changes of intelligent navigation's demand for talents, expounds the types of intelligent navigation positions and their professional abilities, redefines the training objectives of intelligent navigation professional group talents, explores the reform path of the training mode of intelligent navigation professional group talents, and carries out the course deconstruction and reconstruction. This paper puts forward the intelligent navigation major group course system based on the four modules of "artificial intelligence general education", "vocational general education", "core skill training" and "intelligent navigation education", so as to provide reference for the construction of intelligent navigation major.

1. Introduction

With the development of computer and artificial intelligence technology, the shipping industry is undergoing profound changes. Ship intelligence has become the inevitable trend of the development of the shipping industry, and the navigation industry has ushered in the era of intelligent navigation. Intelligent navigation will have a profound impact on navigation education, the number of traditional navigation talents will be reduced, new navigation talents adapted to intelligent navigation will continue to emerge, the connotation of navigation education will undergo profound changes, in order to meet the needs of future intelligent navigation talents training, it is necessary to timely reform and adjust the training mode and curriculum system of navigation professional group talents [1].

2. The Changing Demand for Talents in Intelligent Navigation

The Marine professional group belongs to the transportation category, which generally includes Marine technology, Marine engineering technology, Marine electronic and electrical technology, etc. The talents trained are respectively called Marine pilot, Marine engineer and electronic technical officer. [2] Traditional maritime talents mainly carry out navigation education in accordance with

the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978 (STCW Convention for short), and cultivate talents who are proficient in the operation, maintenance and repair of ships and their equipment and systems, as well as ship management and other specialized knowledge, skills and qualities. At present, due to the relatively single training level, type and employment orientation of traditional maritime talents, they are faced with a big development dilemma in recent years, and the enrollment scale is declining year by year. On the one hand, it shows that the appeal of seafaring profession has declined significantly, on the other hand, it also shows that the traditional seafaring talents have been difficult to adapt to the needs of intelligent navigation. [3]

The future of navigation is a world of smart ships. In traditional ship operation, a certain number of crew members such as officers, engineers and electrical and electronic engineers are required. These crew members directly operate various kinds of mechanical and electrical equipment and instruments of the ship, and carry out equipment maintenance and management. Most of the working places are on the ship. In the era of intelligent navigation, ship control will mainly be in the form of remote control, and the position, quantity and working location of crew will change greatly. Maritime employment opportunities will be transferred to the design, production, manufacturing, maintenance, operation, operation and other related jobs of intelligent ship systems and products. [4] The jobs of seafarers may change from "officer" and "engineer" to "ship condition monitor" and "ship remote operator", etc. The work of seafarers will be highly integrated with various professional skills, and their knowledge structure presents the characteristics of multi-professional and multi-level highly intersecting, which poses a great challenge to the training of seafaring talents.

3. Analysis of Professional Ability of Intelligent Marine Professional Group

With the continuous development of intelligent navigation, the position of staff on board is gradually weakened, and "deep integration of ship steering, marine engineering and electrical technology" has gradually become a new trend. Intelligent navigation talents will have the characteristics of multi-post skills and multi-professional knowledge.

The STCW Convention summarizes the duties and functions of the crew into seven aspects, namely navigation, cargo handling and stowage, radio communication, Marine engineering, maintenance and repair, electronic electrical and control engineering, ship operation management and personnel management. According to the technical characteristics and development trend of intelligent ships, the intelligent ships will gradually realize remote control or autonomous operation, some traditional crew functions will disappear or weaken, the number of crew members engaged in corresponding functions will be reduced, and some functions will be transferred to shore-based personnel. Ship operation will be coordinated by the ship remote control, shore-based remote management and independent shipping support. Therefore, in addition to the seven functions stipulated in the STCW Convention, intelligent navigation talents should also have the core skills of intelligent ship monitoring and operation, intelligent data analysis and processing, intelligent stowage and energy efficiency control. [2]

3.1. Intelligent Monitoring and Operation of Ships

Intelligent ship navigation integrates a large number of advanced technologies, including information technology, computer technology, communication technology, sensors and other advanced technologies. The intelligent ship gradually forms an information and physical system, and the crew needs to use these technologies and intelligent equipment to realize the ship's autonomous navigation, condition monitoring and fault diagnosis. Relying on advanced technical

means, the operation of the equipment is monitored in real time. Determine whether the device runs stably and report the fault in time. In the future development of intelligent ships, the equipment condition monitoring system will be established by using big data technology for fault diagnosis and multi-scale analysis. Relying on the fault diagnosis technology, the design and operation status of the equipment can be known without disassembling the ship's equipment, the comprehensive analysis and processing of equipment information can determine whether the monitored objects are in the normal operation state, analyze the causes of equipment failure, and understand the future development trend of the equipment, which helps to avoid the occurrence of equipment failure and improve the operation efficiency of the equipment. To provide security for the operation of intelligent ships. [5]

3.2. Intelligent Data Analysis and Processing

Intelligent navigation personnel should be familiar with the knowledge of computer and information processing, and be able to comprehensively apply the information perception technology in intelligent ships. Through sensing equipment, sensing network and information processing equipment, intelligent perception can obtain the ship's own state and surrounding environment information, and conduct comprehensive data analysis to assist the unmanned control of the ship and provide solid guarantee for the safety of the ship. The ship can sense its own state, including the operating state information of all equipment in bridge, cabin and cargo warehouse, understand the sailing speed, position and direction of the ship, and obtain temperature, rotational speed, pressure and liquid level information through sensors; The surrounding environmental information includes other ships, obstacles, meteorological conditions, water depth, water velocity and direction, etc., through AIS, video camera, radar, lidar sensor, laser sensor, wind direction sensor, wind speed sensor, log, visibility acquisition equipment, navigation data recorder and electronic chart, to achieve the acquisition of ship-shore information interactive. [6]

3.3. Intelligent Stowage and Energy Efficiency Control

With the development of the shipping industry, the emission of carbon dioxide and other greenhouse gases has been aggravated, which has caused serious pollution and damage to the ecological environment. In order to reduce the greenhouse gas emissions of ships and improve the energy efficiency of ships, the International Maritime Organization has issued new shipbuilding design energy efficiency index and ship operation energy efficiency index and other indicators. In the long-term development and improvement of intelligent ships, in addition to improving the level of intelligent ships, we should pay attention to the penetration of green environmental protection concept. Therefore, intelligent Marine talents should have the knowledge of intelligent stowage and energy efficiency control, and be able to skillfully analyze factors such as intelligent ship's loading capacity, navigation environment and main engine power, so as to further optimize and control the ship's loading capacity, speed and draft while ensuring safe and environmentally friendly navigation, so as to reduce the ship's operational energy efficiency index as far as possible. At the same time, intelligent algorithms such as genetic algorithm and particle swarm optimization algorithm can be used to intelligentially plan routes and determine the location of waterways by combining water traffic flow control information, water flow distribution information of ship lanes, ship density and navigation difficulty in the forward waterways with intelligent algorithms such as genetic algorithm and particle swarm optimization algorithm, so as to meet the requirements of ship navigation safety, energy conservation and environmental protection. [7]

Therefore, the skills of intelligent navigation talents are highly integrated with computer technology, information technology, communication technology, Internet of Things technology and

other multi-disciplinary knowledge.

4. Reconfiguration of Intelligent Navigation Professional Group Course System

Under the background of intelligent navigation, the professional group of navigation should analyze and summarize the advantages and development bottlenecks of traditional navigation education, deepen the cooperation between schools and enterprises, actively explore the training mode of intelligent navigation talents, promote the cross integration of artificial intelligence and traditional navigation education, reconstruct the curriculum system of intelligent navigation professional group, and gradually establish and improve the talent training program of intelligent navigation professional group.[8]

Based on the analysis of professional abilities of intelligent navigation groups, it can be seen that the core technologies of intelligent navigation mainly include information perception technology, energy efficiency control technology, condition monitoring and fault diagnosis technology, communication and navigation technology, distress warning and rescue technology, route planning technology, integrated navigating and engineering technology and autonomous navigation technology. In the course system design and curriculum setting, in-depth analysis should be made of the knowledge structure corresponding to the core technology of intelligent navigation. In view of the job content and post eligibility standards of the crew of intelligent ships in the future, according to the requirements of the Action Plan for the Development of Intelligent Ships, the Code for Intelligent Ships and the relevant conventions on crew training, Reconstructs the professional group course system of intelligent navigation according to four major areas: "AI general education", "vocational general education", "vocational skill training" and "intelligent expansion education". [9]

4.1. AI General Module

This module mainly completes the basic education of public education and general education of artificial intelligence in the university. It mainly sets courses such as ideology, morality and rule of law, the theoretical system of socialism with Chinese characteristics, college Chinese, health education, innovation education, information technology, college sports, professional literacy, college English, Python language, database technology, advanced mathematics, and foundation of artificial intelligence.

4.2. Vocational General Education Module

This module mainly completes the education and training of basic skills of navigation occupation, including navigation introduction, ship principle, ship radio technology basis, basic safety, mastering first aid, mastering craft raft, ship security, advanced fire protection, navigation geography, boating training and other courses.

4.3. Core Competence Module

This module mainly completes the professional skills education and training stipulated in the STCW Convention. The main core courses include navigation, ship maneuverability and collision avoidance, ship management, Marine meteorology and oceanography, maritime cargo transport, nautical instruments, main propulsion engine power plant, ship auxiliary machinery, ship automation, route planning technology, ship communication and navigation, etc. [10]

4.4. Intelligent Navigation Module

This module mainly completes the education and training of intelligent navigation skills, including introduction to intelligent navigation, sensor technology, artificial intelligence technology, ship engine maintenance theory, automatic control principle, network technology, ship monitoring and control technology, Internet of Things technology and other courses.

Intelligent navigation majors should timely cooperate with Maritime majors and artificial intelligence majors to develop cross-professional intelligent ship courses such as "ship intelligent control" and "ship networking", and integrate the latest ship intelligence teaching content into the core professional courses. At the same time, the modular teaching mode is explored in the professional group courses, and artificial intelligence, Internet of Things and big data are infiltrated into the navigation courses by modules to stimulate students' interest in learning and improve the effect of knowledge learning and skill cultivation of intelligent ships. Courses such as ship shoreline monitoring technology and intelligent ship remote control technology are offered to cultivate students' skills in operating intelligent ships. AI related professional courses such as Internet of Things, automatic control, information perception, big data, cloud computing, machine learning, and ship motion control and so on will be offered at the right time.[11]

5. Conclusion

Intelligent navigation is the inevitable trend of the future development of shipping industry, and intelligent navigation talents will be interdisciplinary integration and high-end technical talents. Facing the opportunities and challenges, navigation colleges should carry out the reform and exploration of intelligent navigation education as soon as possible.

In order to meet the training needs of intelligent navigation talents, navigation majors should actively carry out the reform of personnel training mode and reconstruct the professional group course system of intelligent navigation majors. In addition, the navigation major should also reform and explore in the aspects of teaching staff, teaching mode and so on. In terms of teacher training, it implements cross-professional teaching mechanism, carries out cross-professional teacher training, strengthens self-study and further study, builds intelligent navigation collaborative innovation center, and builds a "navigation + intelligence" composite professional teacher innovation team. Reform the teaching mode, implement the teaching mode of "learning by doing, learning by doing, learning by training", enhance students' learning interest and participation, improve learning efficiency and learning effect; Reform the teaching method, using the case - based discussion learning, problem - based inquiry learning and project - based participation learning teaching methods, cultivate students' engineering application ability; We will make full use of information technology to promote flipped classroom, blended teaching, virtual simulation, MOOC, SPOC private teaching and other new teaching methods , and actively cultivate a new learning ecology in which in-class learning and extra-class learning, offline teaching and online teaching complement each other. We should reform the assessment and evaluation methods, separate teaching from testing, reform the assessment and evaluation system, improve the assessment plans and indicators for students' study and practice training, and make course assessment more targeted and scientific.

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