

Macao Funding Scheme for Key R & D Projects 2022

Application Guideline for Projects of Intelligent Robots

I. Background

Robots are known as “the pearl at the top of the crown of the manufacturing industry”, and the R&D, manufacturing, and application of robots are important indicators to measure a country’s technological innovation and high-end manufacturing level. At present, the booming robotics industry is significantly changing human production and lifestyle, injecting strong momentum into economic and social development. The world’s major industrialized countries have all regarded robots as the forefront and focus of their competitiveness in the science and technology industry, and have stepped up their planning and deployment in this aspect. In accordance with the Outline of the 14th Five-Year Plan for Economic and Social Development (2021–2025) and Long-Range Objectives through the Year 2035 of the People’s Republic of China, the Mainland formulated the 14th Five-Year Plan for Development of Chinese Robotics Industry and carried out the comprehensive deployment and systematic planning.

High-tech industries are the development priorities proposed by the Macao SAR government in its Policy Address for the Fiscal Year 2022, whereas artificial intelligence is a key industry development area specified in the Second Five-Year Plan for Economic and Social Development of the Macao Special Administrative Region (2021-2025). Macao has a certain R & D foundation in the field of intelligent robots, and intelligent robots

“made in Macao” should gradually be brought out of the laboratory and promoted. Carrying out research on cutting-edge technologies and high-end platforms of intelligent robots can facilitate the continuous innovation of technologies and products, implement the high-end applications of products and systems, and improve the robotics industry chain, which is crucial to enhance the development of Macao’s science and technology industry.

In order to give full play of Macao’s advantages in the field of intelligent robots, further integrate existing advantaged resources and enhance R&D capabilities and industrialization levels, the Science and Technology Development Fund (FDCT) of Macao has, upon seeking opinions from researchers of relevant fields in Macao and expertise from experts in the Mainland, proposed a key R & D project of intelligent robots in Macao that aims to: bring Macao’s advantages into full play in a planned and step-by-step manner to accommodate the needs of our country; cater to the needs of Macao’s social, economic and technological development; promote the moderate diversification of Macao’s economy and the development of the Guangdong-Macao In-Depth Cooperation Zone in Hengqin through technological innovations in support of the development of International Innovation and Technology Hub in the Guangdong-Hong Kong-Macao Greater Bay Area, thereby contributing to China’s development into an innovative country.

II. Overall Objectives

To carry out research on cutting-edge technologies and high-end platforms for intelligent robots with Macao’s research and development foundation in the field of intelligent robots, taking

into account the construction of the International Innovation and Technology Hub in the Guangdong-Hong Kong-Macao Greater Bay Area and the development needs of Macao's high-tech industries. To develop intelligent robot products and systems through the innovative design of robots and breakthroughs in key technologies, thereby enhancing Macao's technological innovation capabilities and facilitating the development of high-tech industries.

III. Research Field

Research Field: Research and development of key technologies and systems for collaborative robots focusing on high-end manufacturing applications, supplemented by medical services and other industrial applications.

To meet the application needs of high-end manufacturing/medical services and other industries, carry out research of the key technologies such as the behavioral intention understanding of environment perception and voice command fusion, operational semantic reasoning and development mechanism based on knowledge graph, cooperative robot sensing and force control joints, key technologies including human-computer cooperation and safety interaction control, develop new intelligent cooperative robots, build robot integration systems, and carry out application verification for typical scenarios.

Performance Indicators: Developing 1 set of new engineering prototypes for intelligent collaborative robots with the performance indexes fulfilling the followings: (1) Having at least 3 sensing modes; (2) Having no less than 2 ways to understand and integrate behavioral intention; (3) The minimum perceptible collision force shall be better than 2N; (4) The

dynamic response time shall be greater than 100ms; (5) Repeated positioning accuracy shall not be greater than 0.1mm; (6) Having functions of motion planning, flexible dragging, virtual security constraints, etc.

IV. Application Requirements

The applying entity shall file the application in the form of a project under the research topics of the fields listed in this Guideline. Each project should be submitted for the application as a whole, with content research and performance indicators fully covered. The leading entity of the project must be a local one but we also encourage cooperation with entities from areas outside Macao. No more than 6 participating units in each project are allowed. Unless otherwise specified, a project should include no more than 3 topics. Every project leader or topic leader(s) must be qualified to work full-time in Macao. Led by Macao's scientific research units, research should include participation from enterprises with relevant backgrounds, and a formal cooperation agreement must be provided.

The implementation period of the project is 3 years. The maximum application amount for each project is MOP 10 million.

V. Experts Involved in the Formulation of the Guideline

Wang Shuo	Researcher, Institute of Automation, Chinese Academy of Sciences
Sun Nianjun	Researcher, AVIC Manufacturing Technology Institute
Wang Yingchun	Researcher, Beijing Kangtuo Technology Co., Ltd.
Qin Shiyin	Professor, Beihang University

Duan Xingguang Professor, Beijing Institute of Technology