ONE-PAGE SUMMARY

Project and contact details

The name of the quality sustainability project : R&D of High-efficiency Power Equipment Detection System Applying QFD and Multi-vision Intelligent Perception.

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Project description

The reliable supply of electrical energy is an important anchor for the high growth of the global economy and an essential part of the sustainable development of power systems. To resolve the existing problems of high manual dependence, inefficient real-time and low intelligence in the existing power equipment inspection, this project has developed an efficient power inspection system with state-of-the-art multi-source three-dimensional visual intelligence perception. This inspection system can greatly reduce the delays in handling dangerous situations caused by untimely manual inspection or missed inspection. It can also reduce the loss and waste of power resources, bringing great significance to the maintenance of safe and reliable power supply for the society during the pandemic. Ensuring the development of various tasks during the prevention and control of the pandemic, and promoting the sustainable development of manpower and resources in the power industry.

This project focused on multi-source three-dimensional visual intelligent perception theoretical methods, key technologies and application systems to carry out technical researches between January 2016 and April 2022, using QC quality management methodology, Six Sigma Design methodology system and field improvement methodologies to complete the research and development work of the achievements, the specific use are as follows:

1. Determine a systematic R&D process for achievements through the PDCA cycle (Plan-Do-Check-Act Cycle) methodology and provide R&D design ideas.2. Analyze and determine the actual requirements through QFD (Quality Function Deployment) methodology to ensure the alignment of system design with user requirements.3. Implement scientific work analysis methodologies through 5W2H field quality improvement tool to improve performance efficiency.4. Develop and implement countermeasures through comparative analysis methodology and flow charts to determine consolidation measures and next steps.

This project has broken through several key technologies and obtained 8 invention patents from the US, Singapore and China. It has established an effective collaboration mechanism for multi-source information and created a new mode of multi-source three-dimensional visual perception, allowing for "ready-to-use installation, ready-to-test installation", improving the efficiency of power inspection operations and facilitating collaborative R&D and production in different fields to achieve sustainable development goals for industry, innovation, and infrastructure. This project has been awarded the Quality Technology Award of the China Association for Quality, the Science and Technology Award of Jiangsu Province, and the Science and Technology Progress Award of State Grid Jiangsu Electric Power Co., Ltd. The expert appraisal committee led by academics concluded that all the achievements of the project have reached the global advanced level, of which the innovative development of multi-view visual clearance measurement, infrared and visible image matching and fusion, binocular visual defect detection and size measurement technologies in the field of power transmission and substation has reached the global leading level.

The UAV inspection system developed by this project has been widely applied in Yancheng, Changzhou, Nantong, Huai'an and many other cities. Whereas the original 5km transmission line inspection required 6-8 people and took 4hrs, it now requires only 1-2 people and takes 15mins, shortening the single point clearance measurement time of a single inspection by more than 70% and increasing the regular inspection speed of transmission lines by more than 50%, which significantly reduces the loss of electrical energy due to power faults, optimizes the allocation of human resources and creates a cumulative economic benefit of more than USD $4,480,000 featuring significant importance in promoting the sustainable development of cities and communities.

In conclusion, the following five UN Sustainable Development Goals have been fully supported in all the achievements of this project：

GOAL 8: Decent Work and Economic Growth..GOAL 9: Industry, Innovation and Infrastructure.GOAL 11: Sustainable Cities and Communities..GOAL 12: Responsible Consumption and Production.GOAL 17: Partnerships for the Goals.

Project leverage potential	Picture/Image describing the project

The multi-source information three-dimensional collaborative sensing integration system developed by this project has been mounted on different types of UAVs and inspection robots and applied in different cities in China, gaining cumulative new profits of USD $3,240,000. The project has now reached long-term cooperation with many companies, which has effectively promoted the quality and sustainable development in the field of power inspection.

The market prospects for the achievements of this project are broad. It can not only be fully promoted for global electric power enterprises, but can also be procured by 3D Robotics, Parrot and other UAV manufacturers as well as robot manufacturers such as FANUC, Stäubli for the functional upgrading of various types of UAVs and robots and other carriers. In the future, further technological innovations and upgrades can be carried out, further broadening the market scale, and creating greater economic and social value.

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The core technology has been authorized by the invention patents of the United States and Singapore.