

NTU Singapore's robot to spray paint JTC's industrial developments

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Autonomous robot co-developed by NTU, JTC and Aitech. Credit: NTU Singapore

A new NTU robot will soon be spray-painting the interiors of industrial buildings in Singapore, saving time and manpower while improving safety.

Known as PictoBot, the robot is invented by scientists from Nanyang Technological University (NTU Singapore) and co-developed with JTC Corporation (JTC) and local start-up Aitech Robotics and Automation (Aitech).

PictoBot can paint a high interior wall 25 per cent faster than a crew of two painters, improving both productivity and safety.

Industrial buildings are designed with high ceilings to accommodate bulky industrial equipment and materials. Currently, painting the interiors of industrial buildings requires at least two painters using a scissor lift. Working at such heights exposes painters to various safety risks.

In comparison, PictoBot needs only one human supervisor, as it can automatically scan its environment using its optical camera and laser scanner, to navigate and paint walls up to 10 metres high with its robotic arm.

It can work four hours on one battery charge, giving walls an even coat of paint that matches industry standards. Equipped with advanced sensors, Pictobot can also operate in the dark, enabling 24-hours continuous painting.

Developed in a year at NTU's Robotic Research Centre, PictoBot is supported by the National Research Foundation (NRF) Singapore, under its Test-Bedding and Demonstration of Innovative Research funding initiative.

The initiative provides funding to facilitate the public sector's development and use of technologies that have the potential to improve service delivery. This is done through Government-led demand projects, where agencies use research findings to address a capability gap and quickly deploy the new technology upon successful demonstration.

Principal Investigator Prof Chen I-Ming, the Director of NTU Robotic Research Centre, said the spray-painting robot can paint faster and more evenly in tests, and has a higher quality of finish compared to current methods.

"Painting large industrial spaces is repetitive, labour intensive and time-consuming. PictoBot can paint while a supervisor focuses on operating it," said Prof Chen, who is also a faculty at NTU's School of Mechanical and Aerospace Engineering. "The autonomous behaviour also means that a single operator can handle multiple robots and refill their paint reservoirs."

Mr Anil Das, Director, Innovation Programme Office and Corporate Planning, JTC, shared that through collaborations with academic institutes and the industry such as NTU and Aitech, JTC hopes to continue developing new and innovative approaches to enhance construction productivity, reliability and safety for industrial infrastructure projects.

"Using PictoBot to automate spray painting helps us mitigate the risks of working at heights when painting high walls typically found in industrial buildings. In addition, it helps to reduce labour-intensive work, thus improving productivity and ensuring the quality of interior finishes. We look forward to seeing the results from the pilot deployment of PictoBot at JTC Space @ Gul."

Mr George Loh, Director (Programmes), NRF Singapore said, "In

Singapore, the demand for construction projects is expected to increase as we continue to develop. PictoBot is an example of how autonomous robots can be deployed to boost productivity and overcome the manpower constraints that Singapore faces in the construction industry. NRF will continue to encourage the public sector to identify and adopt technologies that can address our national needs."

PictoBot ready for deployment

The PictoBot integrates several high-tech components to automate the spray-painting of interior walls of various specifications:

1. six-axis robotic arm that can move speedily and steadily
2. precise spray nozzle and high pressure paint pump (four times faster than brushing or rolling)
3. automated jack-up platform that enables it to reach up to 10 metres high
4. optical camera to scan the work space to calculate trajectory of nozzle and paint
5. laser scanner to measure the range and distance

To enable the robot to reach high places and to move around quickly, the research team worked closely with engineers from Aitech to integrate the PictoBot's mobile jack-up platform with its [robotic arm](#).

The next step is to testbed the new robot at industrial developments such as JTC Space @ Gul, to ensure that the quality of PictoBot's spray painting is comparable or better than industry standards.

This test-bedding phase will be done jointly with engineers at the NTU-JTC Industrial Infrastructure Innovation (I³) Centre. The joint research centre between NTU and JTC aims to develop solutions that can tackle challenges such as safety, productivity as well as manpower and resource

constraints, faced by Singapore and its companies.

Provided by Nanyang Technological University

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