Robotic Cleaning and Disinfection System with Video Analytics and Robotic Arm

It is proposed to develop a multi-function cleaning and disinfection robotic system ("i-Cleaner") integrated with video analytics to perform autonomous cleaning and disinfection work. The "i-Cleaner" could reduce the exposure of cleansing workers to potential epidemics, enhance the disinfection works quality without human fatigue, reduce workers' physical workload, improve the disinfection work efficiency and become more cost-effective in the long run. The major functionalities of "i-Cleaner" are shown as below.

1. Consists of 6-axis manipulated robot module with Automated-Guide Vehicle (AGV) operates in fully autonomous and semi-autonomous mode. Fully autonomous mode enables cleaning based on pre-defined map routing, obstacles avoidance and automatic charging features; while semi-autonomous mode enables operator's remote control with real-time vision.

2. Equips with robot arm(s) installed with nozzles and wiper (e.g. high steam pressure or mixture of water/ detergent) pointing to target of cleaning regions to perform cleaning tasks, on floors and vertical walls below 1 meter height. After cleaning, UV disinfection module could be used to destroy bacteria and further prevent the spread of COVID-19.

3. Installs with camera on the robot arm and video analytics module for the identification of target dirty regions on different surfaces, from carpets to polished smooth surfaces and from dry to wet dirt. The analysis could facilitate cleaning and disinfecting target dirty regions autonomously. It also could be used to notify operator once the cleaning task is completed and alert operator if another dirty region is identified.

4. Provides remote control feature for operator on robot sheering handling, so as to provide useful distances as protective measures and eliminate mutual contact contamination on physical buttons (e.g. start / pause, touch screen, etc.) on the robot.

System pilot of “i-Cleaner” would be conducted on program optimization, especially on robot actions, routing path and video analytics on identification of dirty regions.