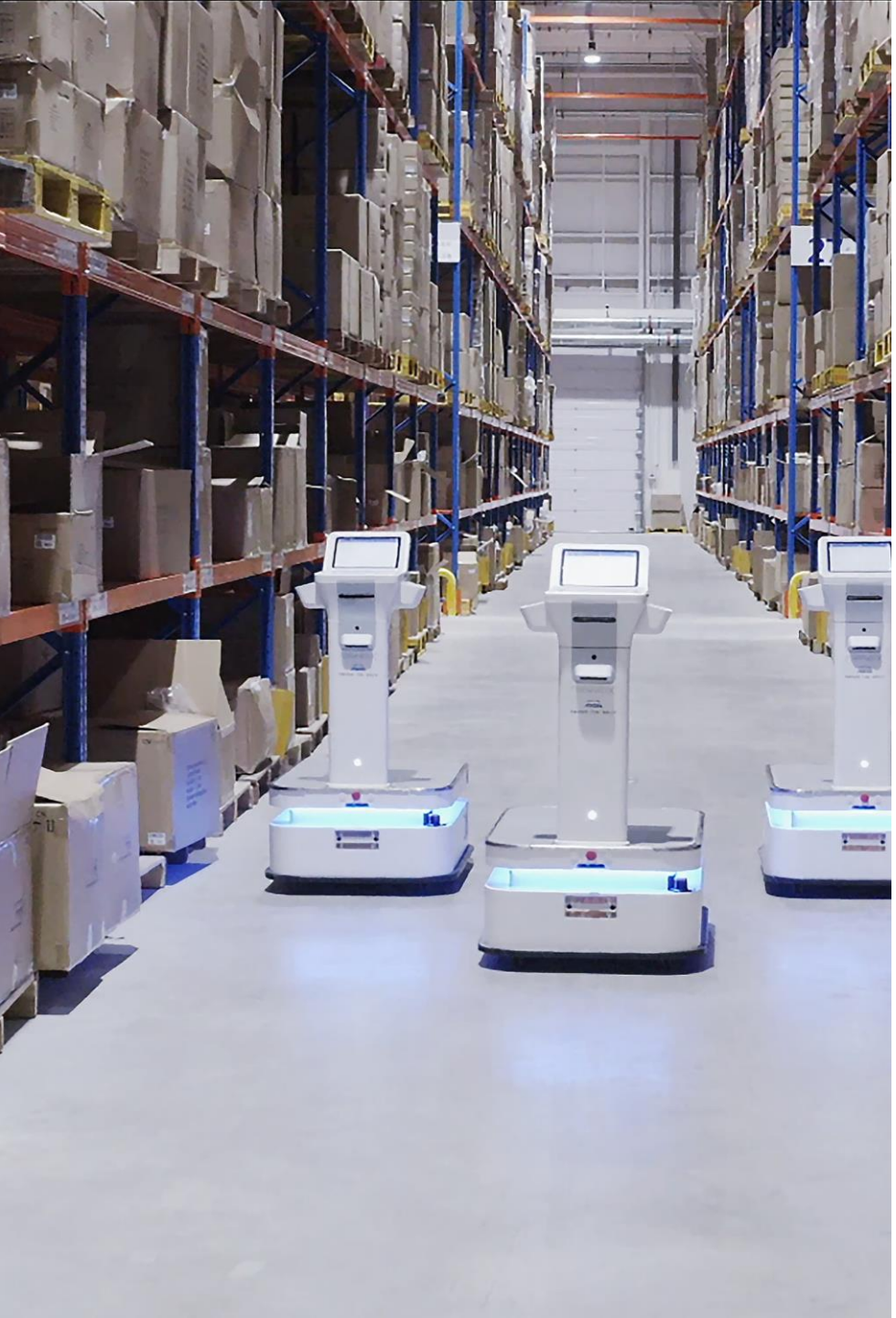

Project Title: Scheduling of Heterogeneous Autonomous Mobile Robots for Robotic Cells Manufacturing in Smart Manufacturing
研究項目: 異構自主移動機器人在智能製造工作單元中的調度
Investigator: Dr. Hoi-Lam MA (PI), Dr. Sai-Ho CHUNG (Co-I)
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Abstract

Nowadays, applications of autonomous mobile robots (AMRs) have become more prevalent than ever. AMRs refer to the autonomous robots, which have the mobility and capability of navigating themselves without requiring any physical or electro-mechanical guidance devices. As such, it provides huge flexibility. Moreover, AMRs can be equipped with a robotic arm or a special tool, which allows them to perform specific tasks. Back in 2012, Amazon had already started using AMRs to support their order picking operations. Since that, AMRs have been widely applied in logistics industries, e.g., Alibaba, JD.com. In recent years, its applications have also appeared in supporting manufacturing operations, known as smart manufacturing. Enabled by the support of information and communication technology (e.g., sensors, the Internet of Things, 5G), AMRs can be able to move around to support various tasks. In enhancing robotic cells manufacturing efficiency and flexibility, it is particularly useful in the manufacturing shop floor, which consists of several robotic cells. In the past, even though two robotic cells may have been installed with the same type of robotic arms, these two robotic arms cannot be shared between the two robotic cells because they are installed and fixed at two different locations. Uninstalling from one place and re-installing at another is not wise because it is time consuming and costly. However, with the support of AMRs, the fixed robotic arm can now be installed as the robotic arm of the AMR, and which is freely moveable among different robotic cells. This provides huge flexibility to the production shop floor. The main objective of this proposed project is to develop a solution approach for this new scheduling problem, which is the scheduling of heterogeneous AMRs with the considerations of deadlock and blocking problems, to avoid disruptions caused by deadlocks or blockings.