

## UK-RAS MANUFACTURING ROBOTICS CHALLENGE

### **Background:**

Industrial robots have been deployed in dull, dirty or dangerous applications for several decades. However, due to their dexterity and problem solving skills, human operators are invaluable in the manufacture, maintenance and repair of highly complex products. In order to keep UK manufacture competitive there is a need to help these operators work effectively. It is suggested this need could be fulfilled by robotics and autonomous systems.

### **Brief:**

Develop a robotic system to pass an operator tools or components from a based on verbal commands and provide visual feedback of the robots intention to allow safe collaboration.

### **Summary of challenges:**

1. Human Interface: This challenge demands the implementation of interpretation of verbal commands using natural language processing.
  - a. Change keyword to begin speech interface
  - b. Ask robot to pass items/tools to user; manipulate/position objects
2. Instrumentation: This challenge aims to identify objects and generate grasping strategies using machine vision.
  - a. Known named objects from known locations
  - b. Known named objects from unknown locations on a flat surface using machine vision
  - c. Known un-named objects from unknown locations
3. Robot Control Challenge:
  - a. Point-point
  - b. Obstacle avoidance
  - c. Dynamic path planning
4. Digital Twin interface: This challenge involves the visualisation of the real robot movement using augmented reality. Teams to be creative
5. Integration Challenge: This involves the integration of the 4 previous challenges to work as one single project.

### **Additional:**

Teams will be provided with a KUKA iiwa robot equipped with a gripper, microphone, camera, and tray of parts. The robot will be integrated to allow safe operation but will require programming through ROS.