

Inspection of Confined Spaces Using Robotics (Team 3)

Supervisors:

Dr Simon Watson and Dr Paul Wright

Industrial or other End-User Institutional Involvement:

Amentum (formerly Jacobs)

Overall Aim and Objectives of the Project:

The aim of this project is to further develop the Inchtinium robot prototype which was developed in a previous MEng project. The Inchtinium is a combination of an Inchworm robot and a continuum robot which has been developed to navigate and inspect box-section confined spaces, such as those found in motorway gantries. The unique design enables both translational movement and bending around corners. The previous MEng team evaluated the feasibility of the core sub-systems but did not demonstrate a fully integrated system.

Key requirements for the second-generation prototype:

1. The Inchworm and continuum actuation systems must be redesigned to address the limitations of the earlier prototypes.
2. Demonstrate a fully integrated system, comprising two Inchworm and one continuum modules and associated sensors, that can be tested in a specialist rig provided by Amentum.

The demonstration system should include:

1. Include a payload to demonstrate the inspection system.
2. A Human-Robot-Interface which enables remote tele-operation.

Tasks to be Undertaken:

- Review the existing Inchworm and continuum robot designs to evaluate their limitations and propose modifications which overcome them.
- Design, build and test revised actuation sub-systems to demonstrate their feasibility in the context of an integrated system, i.e. with representative loadings.
- Combine these revised Inchworm and Continuum robot sub-systems into a second-generation prototype system.
- Design and integrate a Human-Robot-Interface enabling efficient remote teleoperation, using information from onboard sensors and cameras.
- Design and integrate a payload to enable remote inspections.

Relevant Background Information:

This project has been developed in collaboration with Amentum (formerly Jacobs) and National Highways to explore the feasibility of using robotic systems for the remote inspection of confined spaces, specifically those with a box-section profile. It is part of the CRADLE project (www.cradlerobotics.co.uk), a collaboration between

The University of Manchester and Amentum that aims to empower UK and global industries with advanced robotics and autonomous systems.

Other Information:

If this project is successful, Amentum have indicated an interest to potentially commercialise it. They are also interested in recruiting graduate engineers to their engineering and robotic teams.