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## Robotics for Safeguards Inspection - Drum store inspection

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All over the world stores of waste are kept in steel drums that are crammed in sheds multiples high and deep, often preventing a thorough inspection of the contents of the drums or the use of containment measures like seals. This paper aims to explore robotic systems that can provide a comprehensive and autonomous coverage of such hazardous environments keeping human inspectors out of harm's way. This is achieved by firstly 3D scanning the entire area in order to create a 3D map that allows 3D positions to be tracked and then using the robotic system to inspect the drums. In this paper, the Data 61 innovation network of Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) proposes two robotic systems, (a) one for the top of the drums to be inspected and (b) the other for an in-layer inspection through pallets. The Through pallet inspection robot is a small robot that is able to move through the pallets where a forklift's tines sit in order to gather information. This robot would have to be very narrow (<100mm) and long in order to bridge gaps, and navigate through misaligned pallet sections. Tracked wheels would provide sufficient traction and distributed loading even in the case of slippery and uneven surfaces.

In both of these cases the robots would be tethered so that a reliable communication and data transfer is maintained, and the robots could be pulled back via the tether if anything goes wrong. These systems would have a 3D Lidar to map, localize themselves and gather data, cameras to gather visual information on the pallets and barrels, as well as radiation dosimeters or spectrometers for determining levels of radioactivity and identifying the presence of specific radionuclides. This data would all be stored/viewed from within the 3D point-cloud so that the location information is correctly associated.

These systems of robots will give access to an area that was inaccessible in the past with the potential to assist in both inventory verification inspections and complementary access activities under the additional protocol.

### Which "Key Question" does your Abstract address?

TEC5.1

### Topics

TEC5

### Which alternative "Key Question" does your Abstract address? (if any)

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