ROBOT DETECTIVES

SHERLOCK HOLMES MEETS SPIDERMAN

Our research aims to develop mobile wall climbing robots that like Spiderman can climb on vertical surfaces, go to a test site and then deploy sensors to find a defect. This leaflet describes some of the mobile robots that we have developed to provide access to remote test sites that may be located on very large structures e.g. a weld line on the hull of a huge cargo container ship, or in a hazardous environment e.g. a weld in a nuclear pressure vessel. The robots then deploy sensors to find defects such as cracks in a weld or corrosion in the floor of an oil tank.

DETECTING FAULTS IN LARGE STEEL STRUCTURES

How can you test very large steel structures e.g. to see if the many kilometres of welding on the hull of a cargo container ship is strong enough to prevent the ship collapsing into a heap? The current practice is to build a scaffold using ropes and wooden planks before inspection can begin.

Scaffolding erected to test a weld line on the hull of a ship

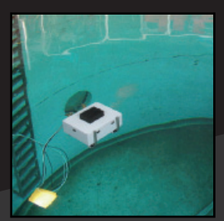
The CROCELLS wall climbing robot

Our approach is to send a wall climbing robot equipped with ultrasound probes to test the quality of the welding.

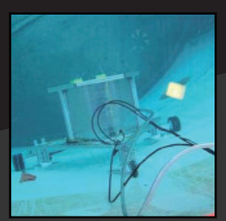
Our wirelessly controlled CROCELLS robot sticks to steel plates using permanent rare earth magnets. It uses electronics to steer an ultrasonic beam (phased array) through a range of angles to test the weld. Defect data is sent wirelessly to a laptop computer to enable an inspector to analyze the data.

SUBMERSIBLE SWIMMING ROBOTS

Oil leaks in the floor of an oil storage tank will seep into the ground and appear some miles downstream in your water supply!



FPSO amphibious robot swimming in water



RIMINI climbing robot in water on the wall of a tank

The current practice of inspection is to empty the tank, repeatedly clean it so that no explosive vapour remains before cutting a door in the tank wall to enable humans o enter. This can take up to 9 months for a crude oil tank.

The RobTank robot on the roof of an oil tank in Portugal

RobTank immersed in water on the floor of a tank

Emptying and cleaning a tank to inspect is very expensive. Outage time and expense could be saved by inspecting the floor of an oil storage tank when it is full of oil.

Our ROBTANK and FPSO robots enter into a tank through manholes in the roof of the tank. ROBTANK moves on the floor of the tank to look for corrosion thinning and pitting but also climbs the walls. FPSO swims to a given wall or floor area to inspect it. It is a wheeled robot that can walk on the floor.

The RIMINI wall climbing robot inspects welds on the shell of nuclear pressure vessels while immersed in radioactive water.

For more information see:

http://www1.lsbu.ac.uk/esbe/ndt/

To see videos of all these robots go to:

http://robotics.umng.edu.co

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