UTS:ENGAGE

CONTRACT RESEARCH:

Revolutionising steel bridge maintenance

Partners

Roads and Maritime Services

Problem

Steel bridges are a major part of any city or region's infrastructure, but in order to remain functional they need regular maintenance. One important maintenance activity is heavy duty grit-blasting, to remove old paint and rust. It is a necessary task to ensure the operating capacity of critical steel bridges, but for the workers that conduct the grit-blasting operations, it is fatiguing and potentially hazardous.

Roads and Maritime (RMS) contacted UTS with a problem: they wanted to know how they could minimise workers' exposure to the hazardous side of cleaning steel bridges. Finding a safer solution would meet the RMS OHS policy statement of "safety first, work second".

Solution

Leading robotics group Centre for Autonomous Systems at UTS were tasked with a world-first challenge: to create a robot capable of scanning a complex environment in real time without the intervention of a human, and then use this information to plan and carry out grit-blasting of the structure. This was completely unlike any other robot used in grit-blasting, as it required the use of the robot to operate in an unstructured environment, and with little prior knowledge of its surroundings.

RMS and UTS embarked on an ambitious collaborative research project which included an initial feasibility study, followed by a successful ARC Linkage project to tackle key research challenges. With the concept well and truly proven and key research challenges overcome, RMS contracted the UTS research team to build two fully operational autonomous grit-blasting robots that could support the maintenance of the iconic Sydney Harbour Bridge.

The research team were able to design a lightweight robot that answered the RMS needs: a safer solution to one of the most hazardous aspects of bridge maintenance work. Using the latest in intelligent mechatronic technology, these robots are able to autonomously sense and map a steel structure, and then plan a suitable collision-free grit-blasting pathway. They are fast, accurate, and most importantly, allow human workers to operate away from the dangerous blasting zone.

The proof of this success? There are two robots working on the world famous Sydney Harbour Bridge today: Sandy and Rosie.

Roads and Maritime Services Operating Assets and Security Manager Phil Brooks said the robotic grit-blasting system developed collaboratively by UTS and Roads and Maritime was one of the agency's best achievements.

"The project has presented many challenges since work started in 2005. These challenges were overcome with hard work, innovation and persistence to deliver an excellent outcome," Mr Brooks said.

About the UTS Research Group

The aim of the UTS Centre for Autonomous Systems is to build intelligent and autonomous machines that can operate in difficult and unknown environments. At UTS, the academic strengths of this Centre led to the development of a robotic navigation algorithm known as SLAM – Simultaneous Localisation and Mapping – the world-leading technology behind Sandy and Rosie.