

# Swarmtech

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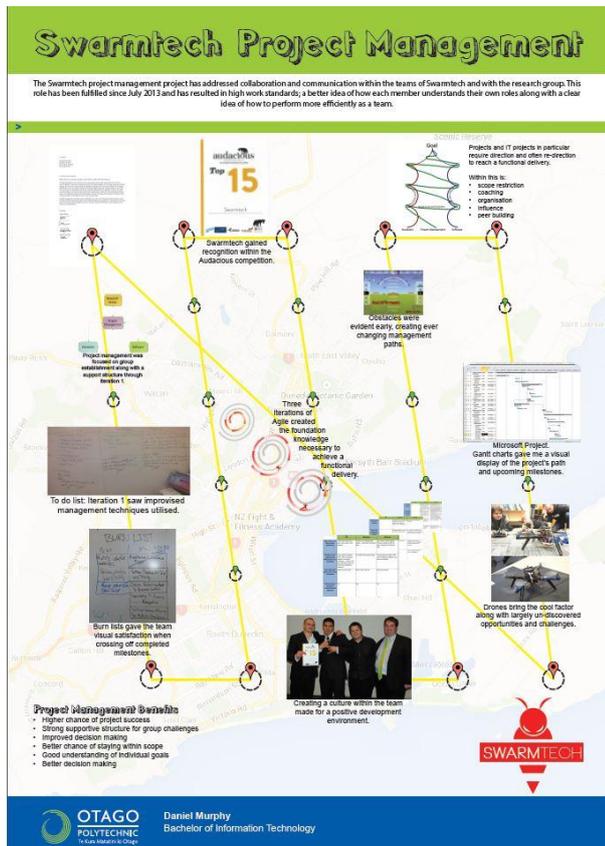
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## ABSTRACT

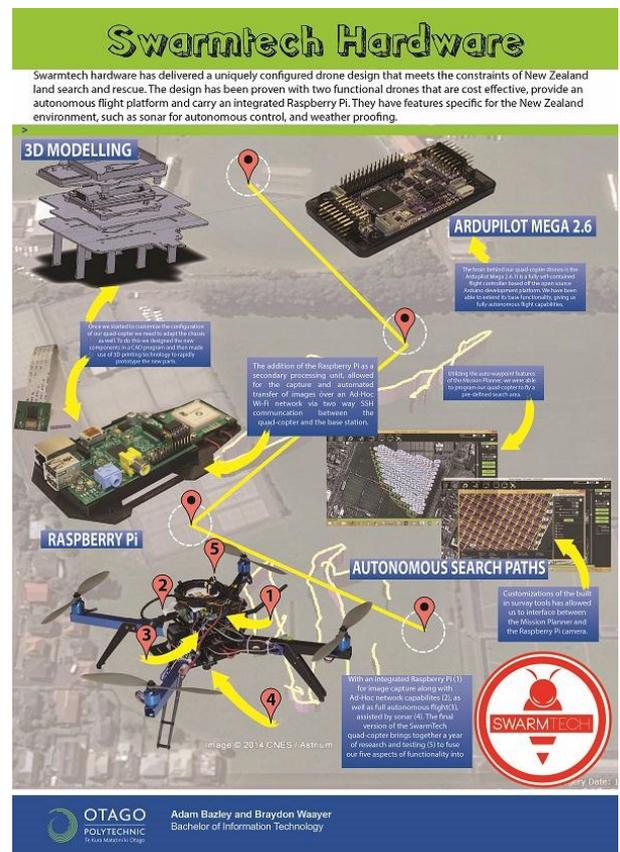
Swarmtech is focused on proving that New Zealand Search and Rescue could use drones as a viable alternative to current applications. After discussions with a LSAR (Land Search and Rescue) we discovered that current practices for searching for missing persons were people on foot, dogs and rescue helicopters. The Helicopters can only be run for a certain period of time for each call out. Cheap low maintenance drones could be used here as an alternative. We have studied the restrictions that drones face being licensing, battery life and intelligence. We found that we could get around the licensing by proof of concept that they can be viable, found some smaller drones can still cover a large quantity of area within a small flight time and also that they are compatible with other microprocessors to increase their abilities and intelligence. The Swarmtech group is split into 3 separate groups: Project Management, Software and Hardware.

The Software team set out modifying open source software called Mission Planner 1.2. The Hardware team have researched and built 2 quad copter drones that have Raspberry Pi microprocessors on them to take photos and wirelessly download them to the ground station when they have finished a flight.

The Swarmtech project management project has addressed the problem of collaboration and communication between the three groups of Swarmtech (Hardware, Software and Project Management) and the Research Group. This role has been fulfilled since July 2013 and has resulted with higher work standards and a much better idea of how each group member understands their own roles along with a clearer idea of how to perform more efficiently as a team.



This poster paper appeared at ITX 2014, incorporating the 5<sup>th</sup> annual conference of Computing and Information Technology Research and Education New Zealand (CITRENZ2014) and the 27<sup>th</sup> Annual Conference of the National Advisory Committee on Computing Qualifications, Auckland, New Zealand, October 8-10, 2014. Mike Lopez and Michael Verhaart, (Eds).



The Swarmtech hardware project has addressed the problem of overly expensive surveillance equipment used by Land

Search and Rescue. The prototype drones have been successfully integrated with the support software since November 2013 and in field testing since May 2014. Alongside this testing we have designed and produced, through the use of 3D printing, custom parts for our Drones. These parts will allow the drones to operate within New Zealand's harsh weather conditions.



Swarmtech Software has extended open source mission planning software to enable communication and control of multiple drones for Search and Rescue applications. The system has been tested with two flying drones, with demonstrated capacity for more.

We have built a system that should prove the viability within LSAR for the use of small scale drones at affordable prices.

SwarmTech Hardware produced a fully functioning quadcopter that is able to; follow commands programmed into it by a mission planner, take photos mapping out an area and then transmit them to the base station. It addresses the problem of overly expensive surveillance equipment and proves that drone technology can be used in practical applications. With further development to refine the system and add stability to the drones this platform could become an extremely viable option for large area search and rescue.

The software team has delivered a modified version of open source software called Mission Planner 1.2. This now has the capability to have multiple flight paths and one instance of the planner can connect to multiple drones at any one time. They have also authored their own colour detection software which

scans a selected directory of images and will give the user feedback on the percentage of coloured detected within the image and GPS Latitude and Longitude coordinates while ordering order the images accordingly to the amount of colour detected. We think a robust ground control station that takes care of most of the more complicated or unnecessary tasks. This combined with a suite of add-ons or plugins, like how Visual Studio or Mozilla Firefox use add-ons to increase functionality and complexity would allow operators of every field to benefit from the GCS. A platform for all developers to focus solely on advancing a particular field with a module that can be added on to the GCS, like our colour recognition software.

The entire Swarmtech team had complicated work from the start. The project manager had to learn about project management then implement their learnings with the team. The hardware team had to learn all about drones and how communication, battery life and flight controllers all worked together. The software team had a large open source program to familiarise themselves with then modify and fix compiling issues.

We worked hard with little progress sometimes and big leaps of progress other times. We finished with a result that reflects the challenging genre of product we took on, not the final result we aimed for when we were full of ambition but a result that will prove with more resources and time our system could be a viable option for search and rescue applications.