

CALIFORNIA STATE SCIENCE FAIR 2016 PROJECT SUMMARY

Name(s)	Project Number
Adiyan Kaul; Sohan Vichare	
	36463
Project Title	
Hawkeye: Unmanned Search and Rescue Missions through Intelligent	
Drones Guided by Computer Vision & Dynamic Pathfinding	
Abstract	
Objectives/Goals	
Build and program an autonomous drone that can carry out search and rescue n dengarous terroin without human control. More specifically, the dron-should b	institution in realistically
nattern around an area of land 2) Search for and identify people 3) Being these	e able to. 1) Fly a flight
pre-designated safe locations and 4) Detect and navigate around abstacles through	people back to
Methods/Materials	is four the process.
Software Components: OpenCV Computer Vision Library (python), modified	acial recognition classifier
algorithm with 500 additional positives and 400 additional negatives for drope of	capability. Paper written
by Sven Koenig and Maxim Likhachev (http://robotics.cs.takev.edu/dshell)/s62	5/aaai02b.pdf) detailing
D*Lite Pathfinding Algorithm. Computer with Python 2.6 Suite and stock math	libraries.
Hardware Components: 3DR Y6 Drone Body. SF and SFP ropeller, Paspbern	ry Pi 2 B+ Running Debian
OS. 5500 mAH LIPO battery. Various wires. Soldering materials wire Module	e for Ad-Hoc Network.
Drone modified by us to hold a Raspherry Pi and Camer successfully searched	for and identified 2 out of
2 people in windy environment using computer vicion algorithms/classifier we	trained Drone proceeded
to lead said people back to safe locations while detecting/avoiding obstacles usi	ng the D*Lite pathfinding
algorithm.	
Hardware: Successful interfacing between Raspberry Pi Semera, Raspberry Pi, Pixhawk Drone CPU, and	
Drone.	
Software: 1) Successful person ecognition (modified OpenCV) 2) Successful spoofing of MavLink	
commands to control drone 3) Successful obstacle detection using OpenCV 4) Successful obstacle	
avoidance using D* Lite Patninding Agortanin (same algorithm was used on Mars Rovers Spirit and Opportunity)	
Conclusions/Discussion	
In the status quo, search and rescue prissions remain immensely dependent on a	large human volunteer
base - which can be problematic in rural or dangerous locations. Our project all	ows for a \$40 modification
to an existing industrial drone that can automate it to carry out search and rescu	e missions independently -
something which we believe will be immensely useful to government organizat	ions. Secondly, we have
developed a modular way for a Raspberry Pi and Camera to interface with a con	nmon drone CPU (the
Pixnawk) and greate and a HSC network for computer connection - something to automate	that any developer can use
Summery Steement	
We area ad a 140 method of outomating industrial drames to some out unmanned sourch and resource	
missions in realistically rough and windy terrain	
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Help Received	
None, save for open source libraries (OpenCV, math libraries) and this paper: Pathfinding with D* Lite	
(http://robotics.cs.tamu.edu/dshell/cs625/aaai02b.pdf)	