



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Kaushik Salem	Project Number J1028
Project Title A Target Acquisition System for Landing Auto-Pilot Aircrafts in Constrained Spaces Using Modified Hough Transform	
<p style="text-align: center;">Abstract</p> <p>Objectives The objective of this project is to design an auto search and target acquisition system for landing auto-pilot aircrafts and drones in constrained spaces in search and rescue missions. The design uses modified Hough Transform to identify and locate landing coordinates. This will help locate survivors faster and with better precision during natural disasters. This system can also be used to drop food and medicines to people at remote locations.</p> <p>Methods The main components of the prototype are Raspberry Pi, camera, and red bingo coins to represent a landing pad. Hough Transform is a feature extraction technique used in image processing that uses a voting procedure to find similar shapes. In this project, a modified version of the Hough Transform is used to detect a specific pattern of landing pad (4 red circular pattern of the pad) for aircrafts or drones. First, edge detection is applied on an image of the ground to get an edge-map of the landing pad. Then, modified Hough Transform is applied to the edge-map to get Hough peaks. The landing coordinates is the centroid of the Hough peak clusters (Hough pegs).</p> <p>Results Based on data from 4 scenarios with varying aircraft height simulation and varying objects surrounding the landing pad, the software algorithm was able to find the landing coordinates within the landing pad. This was true even when only 3 Hough pegs were identified. Therefore, a minimum of 3 Hough pegs are required to locate landing coordinates. The algorithm executed in under 30 seconds. Also, based on the data of the relationship of prototype measurements to real world use, the landing pad diameter for algorithm use was within 10% of expected diameter.</p> <p>Conclusions The prototype for auto search and target acquisition system using modified Hough Transform was able to find and locate landing coordinates that can directly be used for auto-pilot aircrafts and drones in search and rescue missions.</p>	
Summary Statement I designed and created a prototype for an auto search and target acquisition system using modified Hough Transform for landing auto-pilot aircrafts and drones in constrained spaces in search and rescue missions	
Help Received My dad explained image processing techniques and taught me how to use MATLAB. I verified my algorithm in MATLAB first, and then ported my code for Raspberry Pi environment with camera.	