Investigating the Impact of Video Quality, Hardware, and Software Stabilization on Facial Detection and Recognition in Mobile Robots Systems

James A. Murphy IV
Advisors: Mehmet Fuat Sener and Nicholas Webb

Introduction:
• Computer Vision (CV) is a rapidly growing field that offers a lot of potential for service robots.
• Without a stable image to process, these advanced systems will not be practical.
• Determine the most cost efficient solution for stabilizing images for mobile robots.

Objective:
• Quantify the benefit of four hardware and software stabilization solutions:
  1. No Solution (baseline)
  2. Hardware
  3. Software
  4. Both Hardware and Software

Methods:
• Used SLAM navigation to create a consistent path for the robot
• 3-D printed a mold to mount the hardware solution
• Conduct 15 trials for each solution (total of 60)
• Ran the 60 trials for two cameras, Samsung S7 (13 megapixels) and Logitech USB Camera (3 Megapixels)
• Extract data from facial detection/recognition system to R
• Evaluate the detection and recognition rate for each frame of the video
• Use the evaluation to create overall measure of success for the average of each solution/cameras trials.

Data & Conclusions:
• Stabilization Solutions negatively impacted detection rate but increased correct recognition rate
• Software had a minimal detection impact of -1.6% while benefiting recognition rate by 6.0%
• 3 Megapixels cameras are not practical when objects at greater than nine feet away
• -20% overall detection rate drop for 3 megapixel camera

References: