Development of a Multi-Sensor System to Prevent Child Vehicular Heatstroke

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Purpose: Children mistakenly left and trapped in cars can be victims of heatstroke, sometimes resulting in hospitalization, injury, and death. From 1990-2023, the average child vehicular heatstroke deaths per year was 38, one every nine days. I wanted to become part of the solution to protect children and help prevent future deaths by developing a multi-sensor alert system for when children are left in a hot car. Procedure: This project builds upon two prior years when I integrated a micro-controller, infrared camera, temperature algorithm, and an optical camera machine-learning model to manually determine a baby alert. This year's project added a Tensor Flow Lite model that ran an image recognition locally and autonomously on a Raspberry Pi 4 computer and automatically sent a text when a child in danger was determined. I added image recognition for the infrared camera by training on the infrared data. I then developed a code which automatically read data from the infrared camera, transformed the 64-pixel data into an image, and sent this image through the trained model. I also wrote a code that integrated calls to the Tensor Flow Lite codes, compared sensor results to check several different/redundant alarm cases, and sent a text through the Raspberry Pi computer 4G Hat on alarm. Results: I ran multiple trials to test different plausible scenarios: different car temperature, baby presence/absence, and different skin tones of baby dolls. The results correctly identified all alarm/non-alarm scenarios with little false positives/negatives. Conclusions: By analyzing data collected, I concluded that I successfully created a system that identifies and alerts for a baby in danger in a hot car. I hope this system can contribute to ending child vehicular heatstroke deaths.

Awards Won:
Air Force Research Laboratory on behalf of the United States Air Force: Glass trophy and USAF medal for each recipient
Air Force Research Laboratory on behalf of the United States Air Force: First Award of $750 in each Regeneron ISEF Category,