Teledyne FLIR: Wireless Thermal Camera for Automotive

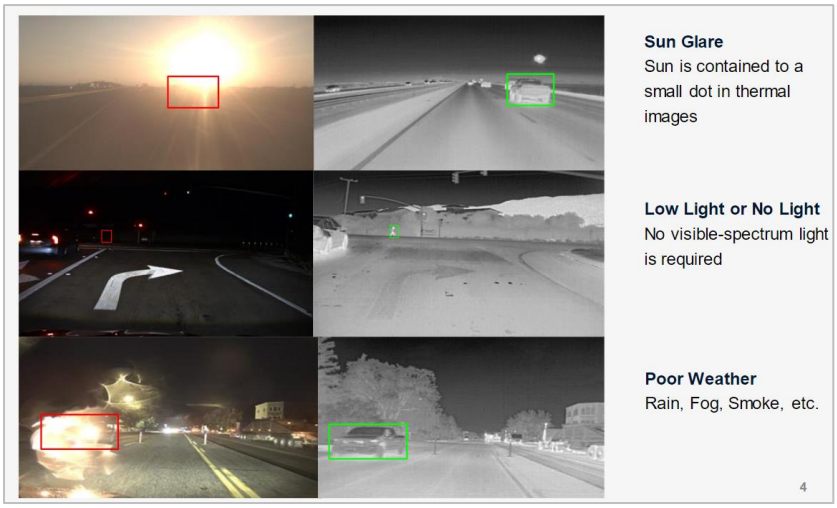
Sponsor: FLIR - This project is in cooperation and partnership under a gift with Teledyne FLIR located in Goleta. Teledyne FLIR Project Lead – Ryan Stevenson (UCSB Alum, 2014)

Teledyne FLIR is the global leader in Infrared cameras, night vision and thermal imaging systems. Our products play pivotal roles in a wide range of industrial, commercial and government activities in more than 60 countries. Pioneers in the commercial infrared camera industry, the Company has been supplying thermal cameras to many industries like airborne, marine, land, border surveillance, tactical goggles, and security cameras.

The division in Goleta employs 100 engineers of which 40% are ex UCSB students. They have 5 internships active at all times.

Problem Statement:

Although automatic emergency braking (AEB) systems have helped reduce pedestrian fatalities by more than 25%, they are not very effective in the dark (source: IIHS). In 2020 alone there were over 4795 pedestrian fatalities that occurred at night. At FLIR we believe that our thermal imaging cameras can save lives by providing safer AEB systems both day and night.



Most visible cameras installed in consumer automobiles are placed behind the windshield, located just forward of the rearview mirror. To allow sensor fusion between visible and thermal cameras, mounting the thermal camera in this same position is preferred. Although thermal cameras have multiple benefits and strengths over visible cameras, they do have one weakness: they do not see well thru glass.

Project Objective:

The objective of this project is to design a wireless camera assembly that will mount on the front windshield of the FLIR ADAS test vehicle. The thermal camera and housing will be located on the exterior of the windshield and wirelessly transmit video data thru the glass to a processing and display assembly inside the cabin.

The mechanical team will need to develop an aerodynamic and waterproof "shark fin" that will enclose a FLIR thermal camera core plus the additional PCBs needed to perform the wireless power and data transfer across the glass. Inside of the cabin, another assembly will be needed to enclose the wireless receiver and a video display. The design will need to consider high volume manufacturing and automotive environmental specifications (thermal, shock/vibe, waterproofing). For the exterior shark fin, industrial design will be very important to match the look and feel of the FLIR ADAS test vehicle. Thermal analysis will need to be performed to show that the camera can meet the stringent requirements of an exterior mounted vehicle safety accessory.

The electrical team will need to design and build an electrical system that can transfer power, video data, and command/control signals between the exterior shark fin and the interior display assemblies. A new transceiver-on-chip technology will be utilized to establish the data link, and the electrical team will need to work directly with the vendor to learn the intricacies of this new technology and how to use it on this project. The EE team will be required to select electrical components that meet the design requirements and then develop a schematic and layout of the PCB. Design of interface cables, microprocessor code, and testing on evaluations cards will also be needed.

Ideal Student Qualifications:

- Mechanical engineers with emphasis on thermal analysis and industrial design for consumer products
- Electrical engineers with emphasis on compact circuit board design and interest in wireless communications

Assets Provided by Teledyne FLIR:

- FLIR thermal camera
- Access to FLIR ADAS Vehicle for mechanical design and integration
- Access to mechanical, electrical, and systems engineering expertise as required
- Access, on as available basis, to environmental test facilities at Teledyne FLIR

Project Requirements

- Invention assignment **IS** required for this project