EEL 4924 Electrical Engineering Design
(Senior Design)

Project Abstract with Block Diagram(s)

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Project Name: **Automatic Camber Adjustment System**

Team Members:
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Project Abstract:
The objective of our project is to develop a system that can automatically adjust the camber of an automobile; the camber will be adjusted based on tire temperatures. A thermal sensing module consisting of 2-3 infrared non-contact thermometers will be constructed to provide the inputs for the system. A PIC microcontroller will be used to calculate the difference between the inner and outer tire temperatures and determine the optimal camber angle. An electric motor will then provide the force necessary to achieve this optimal value.

Abstract: Automatic Camber Adjustment System

Introduction:

The purpose of this project is to improve the existing techniques that race car teams use to tune their vehicle's camber. Figure 1 below depicts a vehicle with negative wheel camber.

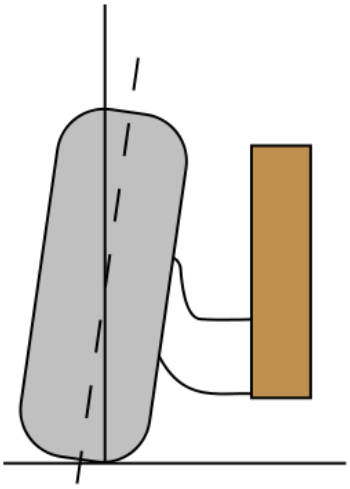


Figure 1: Example of negative camber.

Tuning the camber of a vehicle is a critical process for race car teams. The angle the tire creates with the road has a significant impact on the vehicles handling abilities. During a high speed turn, the driver wants to have maximum surface area contact between his tires and the road. This is usually achieved by increasing the negative camber before the race. Employing too much camber creates issues when the vehicle is traveling on a straightaway; the tires will burn up more quickly and driver will lose traction.

Today, camber is typically tuned by driving the racecar through the course, quickly removing the tire from the vehicle, and using thermal probes to measure the temperature differences across the tire. Installing a non contact thermal sensing module on board the vehicle would allow for real time temperature readings. Furthermore, the onboard electric motors will be able to adjust the camber of the moving vehicle.

Technical Objectives:

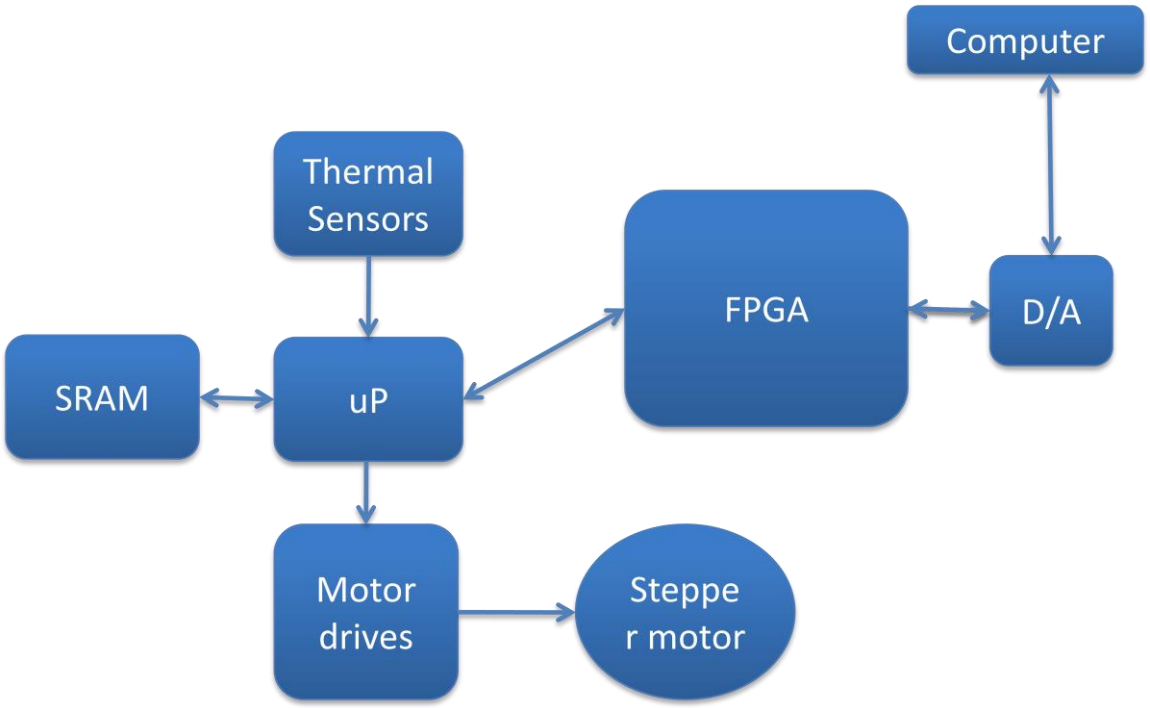
The main objective of our project is to design a system that can utilize a control system with a thermal sensor input and motor output.

- The first task is to find thermal sensors that can be used to effectively target a specific area of the tire and compare that temperature to a running average of all the sensors. We have found sensors that use an 8-bit I2C interface that can be read with a PIC.
- The microcontroller will have to be able to calculate a running average of the thermal inputs and locate which side of the tire is receiving less traction. Then it must calculate what angle of movement must be added or subtracted from the wheels camber.
- The microcontroller must interface with a computer that can show the thermal readings and the angle of camber. The interface should also be able to override the control system to allow the user to adjust the camber manually.

Abstract: Automatic Camber Adjustment System

- The microcontroller will change the angle of camber by using a stepper motor linked to the suspension system of the vehicle. A stepper motor will most likely be used to get precise control and movement of the linkage. The motor must also lock without using any extra power when not being moved.

This is a preliminary estimation of how the components will connected and function together.



Cost Objectives:

We expect the price of the system to be less than $350, not including the price of the computer connected to the system. A partial list of part prices will be given in the Preliminary Design Report.

References or Bibliograph:

http://compare.ebay.com/like/290463580999
http://www.trossenrobotics.com/easydriver-v3-stepper-motor-driver.aspx?feed=Froogle

Materials and Resources:

We plan to use a PIC microcontroller for our digital control and an Easy Driver Stepper Motor Driver from Trossen Robotics. We will have to simulate the power system of a car and most likely utilize a car battery as the power source. We will also require a demonstration set for our suspension system that will include a mock tire and shock with a treadmill that can change angle.