Project: Paper Racing

Team Members:
Battushig Myanganbayar
David Gomez
Kevin Chan

Abstract:
The goal of our project is to have an RC car race autonomously on a user-drawn race track. Our system will process the track drawn by the user as well as control the RC car on a scaled up version of the track. The user will then be able to race an RC car they control against one controlled by the FPGA.

The user will first draw an arbitrarily shaped closed loop track on a piece of paper. This picture will be processed by a camera connected to an FPGA in order to locate the track limits. The image of the track will then be displayed on a projector pointing at the floor. The cars will race on this displayed track. Having identified the track limits, our system controls a car to keep it within the boundaries at all times.

We will also have another camera pointing down on the displayed racetrack. The camera will detect the position of the computer controlled car and send that to the FPGA. We use this visual data to obtain feedback on how to control the car's turning and speed.

Once the track is loaded, the FPGA controls the car through a hijacked RC remote. The off the shelf RC car we are using has pushbutton controls, so we can control throttle and steering inputs with digital commands to FETs we hack into the included remote control.

At a first pass, we will allow the car to travel around the track slowly at constant speed. We will then develop algorithms to allow the car to travel as quickly as possible around the track. Also on a first pass we will simply have the user race against the FPGA car indefinitely but later add the ability to set a number of laps and then detect if the human or FPGA controlled car has won.