Valeo Innovation Challenge
Phase 1

To be uploaded as a .pdf document to the Valeo Innovation Challenge website
before the submission deadline

Deadline: February, 14 2014; 8:00 pm CET

*Please read carefully the **Valeo Innovation Challenge Rules and the FAQ** before starting the description of your proposal. Bear in mind that the proposal will be evaluated according to the selection criteria set out in the rules Article 7.*

*The project description **must use the headings** on page 2. The structure of this document and the font must not be changed. The **minimum font size** allowed is **11** points and the font type is **Arial**. The maximum number of **6 pages** should be respected. You can insert texts, images or drawings.*

Team name: Falcons

Project title: SteerSense

Abstract (15 lines max):
We envision the transportation systems of the future to be much more centralized (public), and roads to be full of automated self-driving cars. Our project helps people in the midst of such roads, who prefer to drive themselves. The dependence of people on smarter technology is rapidly increasing, and in the context of the road of the future, we expect the average driving skill of the people to decrease sharply. We want to help such people drive better by enhancing the very basic tool for driving – **the steering wheel.**

1. What is the problem? Or situation to improve?

Driving in the current world is largely based on on-spot judgment, and most people are good at it due to the simple fact that they drive frequently.

We expect the roads of the future to be filled with self-driving cars. Taking this into account, and the rate at which congestion on the roads has been increasing, we can expect the traffic on the roads to increase manifold.

And no matter how smart those self-driving cars become, the machines will never be able to match human instincts. Due to the increase of the dependence on cars to drive themselves, we expect the average driving skill of the people to be much weaker.

There will always be people, who love driving, people enthusiastic about taking the wheel, and their cars - Individuals who will prefer driving on their own rather than depending on a machine. Keeping that in mind, and the fact that situations will always arise when the intelligent driving cars fail, and make you inevitably return to the driver's seat.

This would be the time, when these people with their rusty driving skills would need all the help they can get. That's where our system comes in.

2. What is/are the current solution(s), if any?

Currently the systems which are using the technology we plan to use, are simple Parking Assist systems, or glorified self parking systems. It's either this, or it's complete self-driving cars (like the one by Google) which use multiple expensive cameras and processors (and hence, power) to drive on the road by themselves.

There are also collision avoidance systems, which maneuver the car in cases of emergencies.

The problem we feel is, these sensors turn on only during a specific period of time, for example during parking etc. Why shouldn't they always be on, assisting the driver continuously?

3. What is your solution?

In a nutshell, we want to build a system that offers real time vehicle maneuvering assistance, using ultrasound sensors around the car, and an LED light ring around the steering wheel.

We plan to collect data from the around the car using the ultrasonic sensors, and use that data to help the driver during a sharp turn by lighting up the ring on the steering wheel green, to the amount to which the driver can turn the steering for a safe collision-free turn.

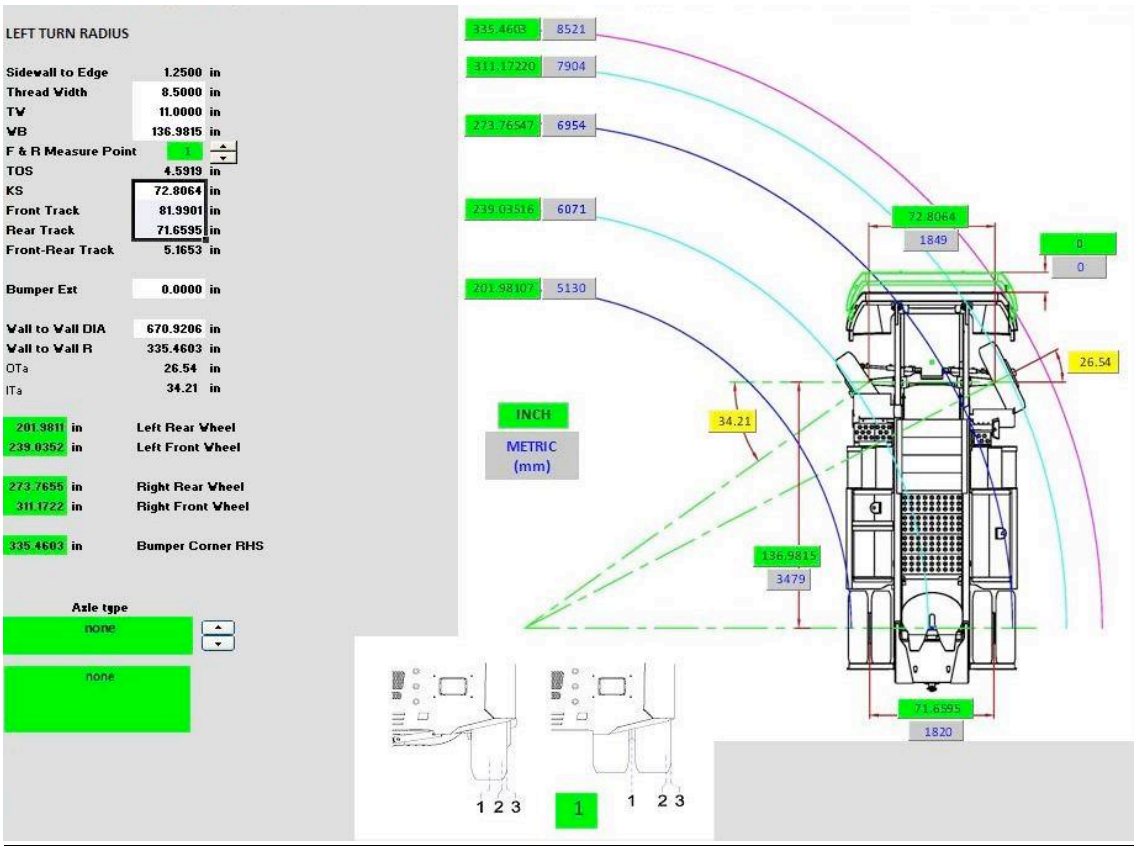
In a little more detail, for example the car is taking sharp turn:

Step 1: We collect the data from around the car using sensors at the back, the side, and the front.
Step 2: This data goes in to the microprocessor, and as the driver starts turning the steering wheel, the distance of every sensor from an obstacle changes.
Step 3: Calculating from this live data, the microprocessor lights up the ring around the steering in green upto the angles it is safe to turn the car, and red for the upper limits. If you turn your steering wheel upto the red angles, the system beeps to let you know to either stop or change your steering angle to something safer.

The thing which sets our system apart is the fact is that the data is absolutely real time. Even if you make a mistake while making a turn, the system is adapting in real time, that is, the ring's lighting is continuously changing, helping to rethink your turn every second.

Our basis for this project on three basic principles: Turning Radius, Steering Angle (the amount to which the driver is turning the steering wheel), and distance between any of the sensors and an obstacle.

The position of the sensors can approximately be the origins of the arcs in the following image:



We plan to create this system as an extension for existing cars, so that you can just install a high quality LED strip around the steering wheel, and ultrasound sensors around car, and you can be good to go. There will be, of course a device to measure the current turned angle of the steering wheel or a way to get that information from existing car systems.

4.What type of mock up are you considering and how do you plan to build it?
(Proposal for Phase 2)

We plan to build the mockup is three phases:

Phase 1: Installation of sensors

- Installing the sensors in a car: This part is relatively easy, because of the fact that a lot of cars already use ultrasonic sensors for existing systems. What we need to do, is install the sensors on the side of the car. We plan to use the skirting on the sides, and bumpers in the front and the back.

Phase 2: Building our relation and our algorithm

- We will build a proper relation between the projected position of a sensor relative to an obstacle, and the steering angle. This is the algorithm which will decide in real time what steering angle is a safe turn and what is not. This will have a deep relation with the turning radius of the car, and the positions of the sensors around car, and the distance between the sensors themselves.

Phase 3:

- Install the LED ring on the steering wheel, and calibrate them according to a zero turn. For the purpose of the mockup, instead of using a specialized microprocessor, we use a laptop for the time being, with the lights, and the sensors connecting using a convenient interface (serial / USB).

We really think this can be a great way to help drivers get a better idea of turning their cars, and hence lead to better driving. Turning is one the difficult concepts to learn while driving, and turning the right way, is even harder. We plan to make this much more easier with our system.