Jan 17 2014

Prof. Andrew Rawicz

School of Engineering science

Simon Fraser University

Burnaby, British Columbia

V5A 1S6

RE: ENSC 440 Project Proposal for a Blind Spot Sensor System

Dear Prof. Rawicz:

The attached document, Proposal for a Blind Spot Sensor System, gives a brief introduction to our ENSC 440 project. Our project intends to design and build a blind spot sensor system to aid the new drivers on the road when it has a car in the blind spot.

This proposal will provide an introduction to our proposed system. We will also be discussing the proposed design specifications and it's constrains and risks. This proposal will also be covering our source of founding and budgeting. We will also give a brief description to our company structure and the marketing aspect of the final product.

Out team contains four talented members: Angel Tian, Aziz Mikwar, Khalid Almoammar, Shaham Shafiei-fazel. Please feel free to contact us if you have any question and concerns about our proposal. Please feel free to contact me at 778.321.5551 or find me by email at kalmoamm@sfu.ca.

Sincerely,

Khalid Almoammar

Cheif Executive Officer

Car Sense

Proposal of Safe Direction:

- **Khalid Almoammar:**
  (Chief Executive Officer)
- **Angel Tian**
  (Chief Marketing Officer)
- **Shaham Shafiei-faze**
  (Chief Financial Officer)
- **Aziz Mikwar**
  (Chief Operational Officer)

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Submitted To:

Prof. Andrew Rawicz - ENSC 440

Prof. Steve Whitmore – ENSC 305

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i. Executive summary:

Evangeline just turned 16 and she was super excited for her first driving lesson. It was in a split of a second, she heard a loud honking from behind her as she tried to change lane. Her heartbeat rose, as her hands firmly grabbing onto the starring wheel and quickly moved back to the centre. Evangeline has forgotten to do her shoulder check and there was a car in her blind spot, she and the other driver glanced at each other and both were glad there was not a collision.

Do you remember those days as a new driver? Or even days that you were just too tired while driving and forgot about those proper shoulder checks? Luckily in the scenario above, Evangeline was able to avoid the collision, but what about those who are not lucky enough?

This document will introduce the proposed Blind Spot Sensor System that can be easily installed and removed on any model of car in the market. Although there are many newer high-end car models nowadays are equipped with the sensors preinstalled. We targeting the market of owners of cars that does not have such systems installed. Our system will provide the driver a notification when a car is in the blind spot and a warning if needed when switching lanes.

Blind Spot Sense System has four talented engineering students familiar with both hardware and software design. Our goal will be improving the safeties of general public by avoiding collisions due to blind spots.

Our team will be using the more popular agile method in the time span of 13 weeks to research, design, implementing, debugging, and finally arriving at the final product. We will be dividing our team into smaller teams that focus on hardware and software of the product and meeting twice a week in person and additional Skype meetings if needed.

1) Introduction:

Have you ever encountered the situation where that you have missed the car in your blind spot and got into a close call to an accident? Although newer high end models of car are equipped with the sensors. Most of the cars used for driving lessons are not equipped with those sensors. Considering newer drivers are more likely to forget the proper shoulder checks for lane change, we are proposing for a wireless blind spot sensor that is easy to install on any model cars and use instantly.

We are targeting the lower model cars that are currently in use and does not have the sensors installed. Considering most of the new drivers are more likely to buy a used car to practice we should be able to have a big market.

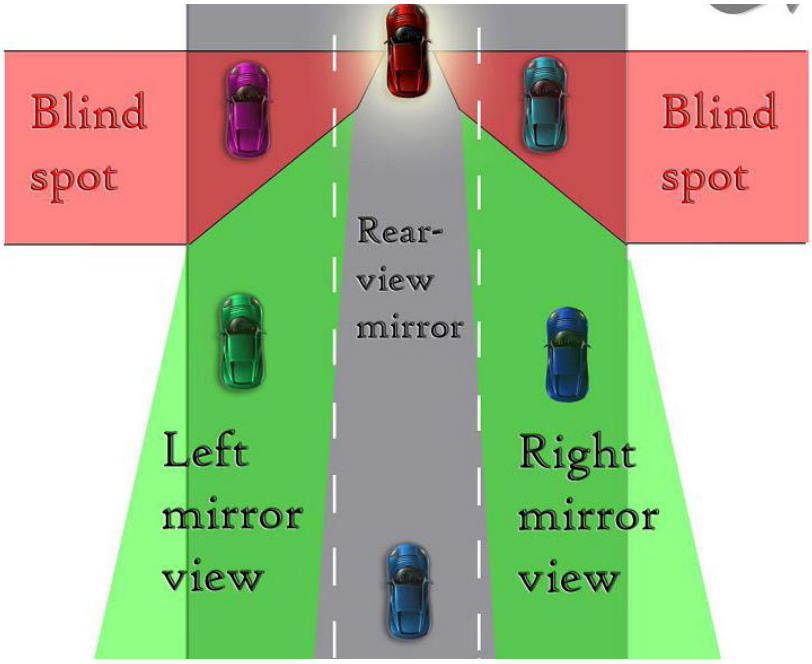

Figure 1: blind spot [1]

2) System Overview:

The system consists of 3 major components which are: Ultrasonic proximity sensors, microcontrollers and the users' light and sound notifiers.

2.1) Ultrasonic sensors:

The system should include a total of eight ultrasonic sensors distributed around the car as follows:

2 ultrasonic sensors installed on the vehicle side mirrors i.e. one on each mirror to detect for any cars located within the drivers blind spot region.

3 ultrasonic sensors installed at the front bumper of the vehicle such as one is on each of the front two corners and one at the center of the bumper to assist the driver when parking the vehicle

3 ultrasonic sensors installed on the back bumper of the vehicle such as one is on each of the back two corners and one at the center of the bumper as also a parking assistant.

2.2) Microcontrollers:

In order to achieve the desired functionality, the system should include two microcontrollers. One microcontroller to process the distance data of the two ultrasonic sensors monitoring the driver's blind spot and another microcontroller to process the distance data of the six parking assisting sensors.

Each of the two controllers is then connected to LED and sound indicators to notify the driver if a n object is detected within the blind spot reign or within a close range of the front/back bumpers in case of parking assisting.

2.3) Driver's Notifiers:

For blind spot monitoring, two LED lights in which each is installed left and right of the front such that they be within the drivers sight when he/she attempt to make a turn.

As for parking assistance, only sound notifiers are used such that if an object is detected within a close range of the front/back bumpers s notifying sound will be on.

Reasons behind choosing to only use light notifiers for blind spot monitoring and only sound notifiers for parking assisting are: Minimum distraction for the driver, distinction between the two notifications and minimization of production cost and product price.

The following diagram shows an overview of the system:

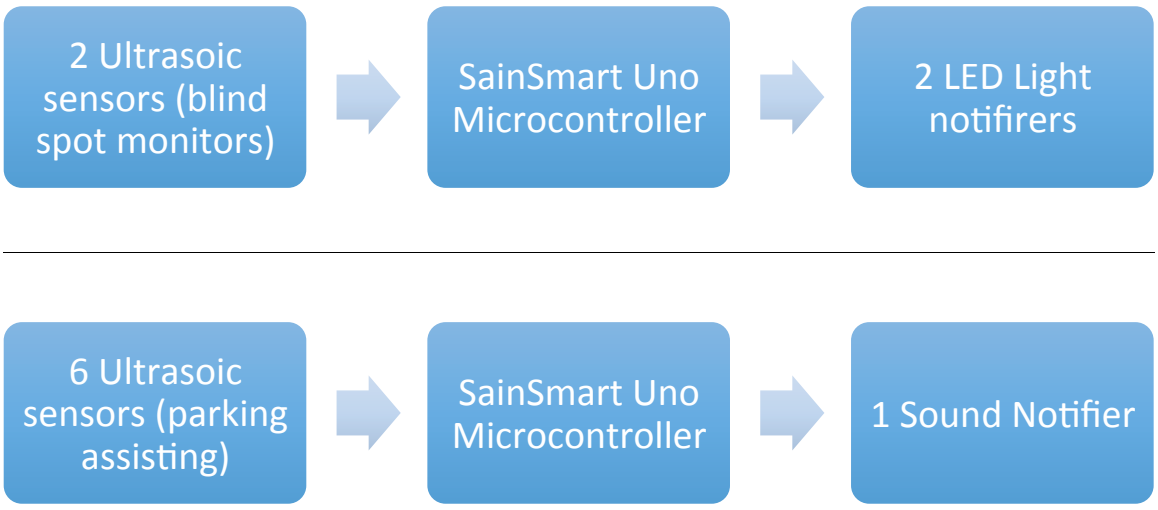

Figure 2: Overview of the system

3) Project Benefits:

The project aims to achieve the benefit of reducing car accidents and increasing safety on streets by providing a blind spot monitoring device at an affordable price for a large portion of the society and also a device that is applicable to all different car models. In addition, it aims to reduce the cars maintenance costs by reducing scratches and small bumped the might occur while parking. Finally, the product make driving more comfortable for drivers by monitoring their blind spot and assisting them with parking.

4) Project Risks:

The project holds the risks of causing drivers into accidents if a system failure occur while the driver solely depend on the system for blind spot check. In addition, it has the possibility of causing drivers to hit another vehicles or objects while parking in case of such failure.

5) Current Solutions and Market:

5.1) Current solutions:

Parking assistance is usually pre-installed in new cars or high-class cars. Some low-class cars offer their users these functions but with a very high cost. However; most of the cars don't have blind spot detection. Mercedes Benz and Volvo introduced this function in its newer cars but most of the other car brands didn't. The system installed in Volvo consists of a camera installed below the side mirrors [2]. The cameras' task is to detect any car at the blind spot and inform the driver by sending a signal to a pre-installed LED beside each mirror. On the other hand, Mercedes installed a radar sensor at the back bumper to detect blind spot, and attached LEDs at side mirrors as well [3]. The LED will flash whenever a car is at the blind spot. The disadvantage of this system is that the LED will flash even if the driver is not attempting to turn right or left, or change lane, which might distract the driver. However; if a car passes by in high speed the LED mostly will not flash. All of the blind spot detection systems are pre-installed by the cars' producers. Our goal is to create a product that can be easily installed by any driver and is wireless; in order to avoid any extra installation charges by a car facilitator. The product will have ultrasound sensors around the car that detects blind spots and assist the driver in parking. The sensors associated with blind spots will send a signal to two LEDs. The advantage of our product, beside that it can be easily installed in cars, is that the LED will only flash if the sensors detect a car at blind spot and the driver has put the turn left/right sign. Consequently, distraction caused by LED is avoided.

5.2) Market:

The projected market of our product are cars which does not have neither blind spot detection nor parking assistance which includes low class cars and old cars. Since new drivers tend to

forget to do the required over shoulder check, our product is mostly going to be used by student/new drivers. In addition, drivers who face problems with parking can benefit from our product as well by installing the front and back sensors. Experienced drivers are not a marketing target but we can attract them by emphasizing the danger of a blind spot and the necessity of having a detection system especially in foggy and rainy days. According to Forbes website, 17 percent of car collusions in the US is caused by lane departure [4]. Consequently, it is important to have blind spot detection.

6) Budget and Funding:

6.1) Budget:

The table below outlines the estimated budget necessary to develop the initial version of this blind spot monitor/parking assistant. Small components are not included since they are much cheaper than the main components and also because the prices are estimates and may slightly varry.

Component	Budget ($)
Raspberry Pi	60
Arduino	30
Ultrasonic sensors	50
Speed sensor	50
Rechargeable Batteries	20
PCB Boards	100
Power Cord/Car Charger	20
Shipping, Tax and Contingencies	200
	TOTAL ($) : 530

Table 1: Budget of the project components

6.2) Funding:

We have applied for funding through Engineering Student Society Endowment Fund (ESSEF) and are still waiting for the results but hopefully we will have all of our costs covered by this

funding. But In the case we do not, we will split the extra cost between the group members and apply for the Wighton fund and if the Wighton fund gets approved we will get reimbursed at the end of the semester.

7) Scheduling:

ID	Task Name	Duration	Start	Finish
1	Reasearch	10 days	Thu 1/9/14	Wed 1/22/14
2	Prposal	1 day	Mon 1/20/14	Mon 1/20/14
3	Parts ordering and collection	6 days?	Thu 1/23/14	Wed 1/29/14
4	Parking assisting detection syst	40 days?	Thu 1/23/14	Sat 3/15/14
5	Blind spot monitiring system	40 days?	Thu 1/23/14	Sat 3/15/14
6	Controlling system	40 days?	Thu 1/23/14	Sat 3/15/14
7	Functional specification due	1 day?	Mon 2/17/14	Mon 2/17/14
8	Design specification due	1 day?	Mon 3/10/14	Mon 3/10/14
9	Intergration	8 days?	Sun 3/16/14	Tue 3/25/14
10	Testing	5 days?	Wed 3/26/14	Tue 4/1/14
11	Progress report due	1 day?	Mon 3/24/14	Mon 3/24/14
12	Demo	10 days?	Wed 4/2/14	Tue 4/15/14

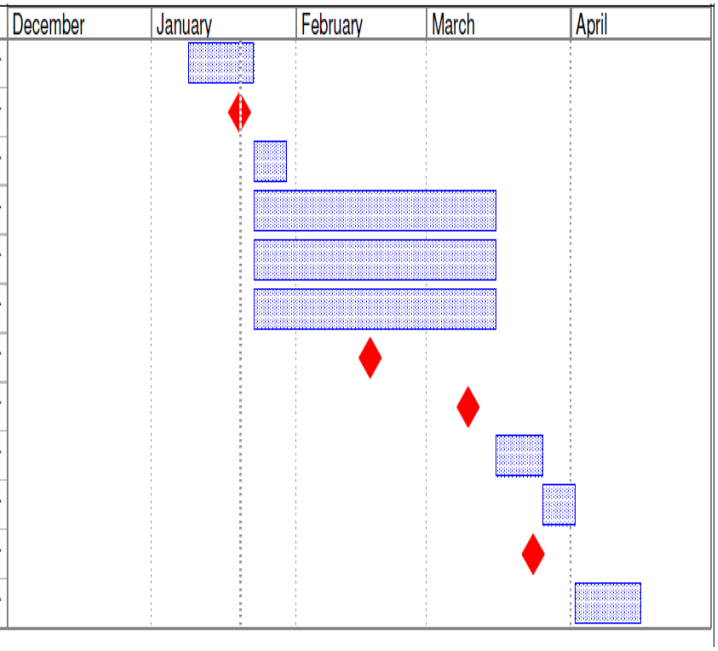

Table 2: Schedule of the project plan

8) Team Organization:

8.1) Company Profile:

- **Khalid Almoammar - Chief Executive officer (CEO)**

I am a 4th year electronics engineering student at Simon Fraser University. Through my 4 year period at SFU, I have gained knowledge and experience in dealing with systems consisting of both electrical and mechanical aspects as I have in addition to my major in electronics engineering have been taking the courses required for system engineering. I have also been performing C++ programming and using softwares such as : MATLAB, Comsol and Solidworks in my courses at SFU. My 8 months coop within the production and electrical department of Middle East Paper Company (MEPCO) gave me an experience in the production within the industrial field in addition to en experience in dealing with electrical systems of industrial equipment.

- **Shaham Shafiei-fazel - Chief financial officer (CFO)**

I am 4th year systems engineering student at Simon Fraser University. I have experience in variety of fields both hardware and software. In the past few years I have taken courses in circuits, microelectronics, real time embedded systems, linear systems, feedback control systems, as well as sensors and actuators, just to name a few. My focus is more on hardware than software. I really enjoyed designing and building a hockey-playing robot in my mechanical design class last year. I have experience with workshop machines as well as the generic electronic lab equipment. Besides my technical skills I have acquired lots of soft skills especially in the past few years such as team work, organization, problem solving skills and technical writing.

- **Angel Tian - Chief marketing officer (CMO)**

I am a 4th year Computer Engineering major student at Simon Fraser University with one and half years of working experience in cooperative environment and over two years of engineering lab experiences at SFU. I am passionate about programming and the concept of flexible electronics.

- **Aziz Mikwar - Chief operational officer (COO)**

I am a 4th year electronics-engineering student at Simon Fraser University. I worked for 4 months in Middle East Paper Company as electrical engineer assistant, and worked as a lab engineer for 4 months at laboratory of alternative energy conversion in SFU. I'm skilled in

circuits' connection and debugging. Also, I've built my programming skills with different languages such as C++, assembly language, C#, visual basic and VHDL.

9) Conclusion:

Our project aims to enhance roads safety and driving comfort by providing a device which helps drivers monitor their blind spot and assists them with parking at a valuable price and applicability to the variety of vehicles exciting on roads. Main components of the device include ultrasonic sensors to detect close range objects, microcontrollers to process the sensors data and driver notifiers in case of objects existence within the monitored region.

In our marketing of the product we target owners of cars which does not have such systems installed. Such owners represent the majority of car owners as mentioned earlier in the proposal which gives our product a success potential if the product met the needs of this portion of car owners at an affordable price.

Project scheduling aims to have a functional model of our system ready for demo and testing by early April. Further development of the model to produce a prototype of a device ready for industrial production shall continue after the success of the model testing. Funding for the project should be received from ESSSEF after funding application is approved. Otherwise, the project will be funded by the company personals.

10) References:

[1] Carmen C. drivinginstructorblog: accessed 18/Jan/2014 <http://drivinginstructorblog.com/q-when-do-i-have-to-shoulder-check/>

[2] Volvo, Blind Spot Information System: accessed 18/Jan/2014 <http://www.volvocountry.com/Volvo-S80/BLIS.html>

[3] Daimler, Active Blind Spot Assist: The Electronic Shoulder Check/: accessed 18/Jan/2014 <https://www.daimler.com/dccom/0-5-1210218-1-1210314-1-0-0-1210228-0-0-135-0-0-0-0-0-0-0-0.html>

[4] J. Gorzelany, The Safest Cars of 2012, Forbes: accessed 18/Jan/2014 <http://www.forbes.com/sites/jimgorzelany/2012/01/20/safest-cars-for-2012/2>