blindspot-440@sfu.ca

January 18, 2010

Dr. Andrew Rawicz
School of Engineering Science
Simon Fraser University
Burnaby, British Columbia
V5A 1S6

Re: Ensc 440 Project Proposal for a Blind Spot Safety System

Dear Dr. Rawicz,

The attached document provides an overview of our proposed project for ENSC 440. The aim of our project is to implement a blind spot safety system for automobile drivers.

This document provides an overview of the existing solutions for blind spot detection, and will show the distinct advantages of our solution over previous methods. Also included is an outline of our design considerations and possible variations, project budget, project schedule, and a description of the company. In addition, this document also includes a section on additional features that may be implemented as time permits.

Our company, iChecked Inc., consists of four talented individuals: Aron McKinnon, Elyas Sepasi, Barry Li, and Victor Chan. We believe this team is capable of accomplishing the proposed task in a timely fashion.

If you have any questions or concerns, please do not hesitate to contact us at

Sincerely,

Aron McKinnon

Enclosure: *Proposal for iChecked Inc. Blind Spot Safety System*

Proposal for

Blind Spot Safety System

iChecked inc.

Project Team:	Aron McKinnon	20003-2171
	Victor Chen	30102-3003
	Barry Li	20010-4017
	Elyas Sepasi	20013-3228

Contact Person: Aron McKinnon
blindspot-440@sfu.ca

Submitted to: Dr. Andrew Rawicz – ENSC 440
Steve Whitmore – ENSC 305
School of Engineering Science
Simon Fraser University

Issued Date: January 18, 2010

Executive Summary

When was the last time you tried to change lanes and almost got into an accident because someone was in your blind spot and you did not see them? This problem is very widespread and a solution has not been yet made available to the general public. Until now, iChecked Inc. has come up with a revolutionary product that will save lives, reduce the number of accidents, and provides peace of mind to the driver.

The initial system will include a detection system that will inform drivers if another driver is in their blind spot area with a warning light. This does not eliminate the necessity of shoulder check, but will make the drivers much more aware of the surroundings. So that before changing lanes, with this warning system, driver will be reminded there is a car in the blind spot area.

The size of the automobile industry is huge and growing exponentially, which makes our target market virtually the entire planet. With the price of insurance premiums rising, more drivers will search out alternatives to prevent accidents and thus lower their premiums, which iChecked Inc. provides with the blind spot safety system.

iChecked Inc. was formed by four engineering students from Simon Fraser University. Each member has experience in a wide range of areas, including software and hardware development.

The development cycle for this product will consist of research, design, implementation, and testing, with an estimated completion date on or before April 15th, 2010. Our estimated total expenditures is $560.00, while our estimated funding amounts to $500 from the Wighton Fund and the ESSEF.

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1. Introduction

Each year, more than 410,000 vehicles in North America are involved in lane-change blind-spot accidents[1]. Although the fatality rate is only 1 percent, low compared to other types of accidents, the extent of property damage and injury is high. This has therefore remained a cause of concern for years. Although several preventive measures have already been taken, they could not drastically reduce the number of these accidents. The direct need for an advanced solution for all cars regardless of their year or brand is prevalent. iChecked Inc. has seen this need and stepped up to the challenge by designing their Blind Spot Safety System.

The iChecked system uses an electronic sensor to detect if any vehicles are in the blind spot regions of the vehicle, and then provides a discreet warning to the driver if there is one. This warning light will be near the side mirror on the vehicle so that if the driver checks his mirror and the warning light is up, it will remind him to do a thorough shoulder check before changing lanes.

Our potential market in North America is huge, with 90% of North America households owning at least one motor vehicle and 58% own 2 or more [2]. There is also plan for iChecked Inc. to develop an equivalent version for motorcycles.

This document is a proposal providing an overview of our products, design considerations, product features, project scheduling, budgeting, team organizations, and company profile. Various designs and features will be outlined in details, and projected financial requirements and budgeting are illustrated using Gantt Charts. Lastly, team organizations and members' qualities will be listed in details. Skills to complete this project are sufficient as member's experiences and expertise are diverse, and team communications are excellent as meetings are organized and well managed.

2. System Overview

The flowchart in Figure 2-1 shows the basic functions of iChecked. Once our blind spot safety system is powered, it will actively check the blind spots in surrounding area of the car to see if another vehicle is present. Our system is sensitive only to the blind spots in the lanes neighboring our vehicle. When the safety system is triggered, the driver will be notified via a discreet and non-distracting warning indicator.

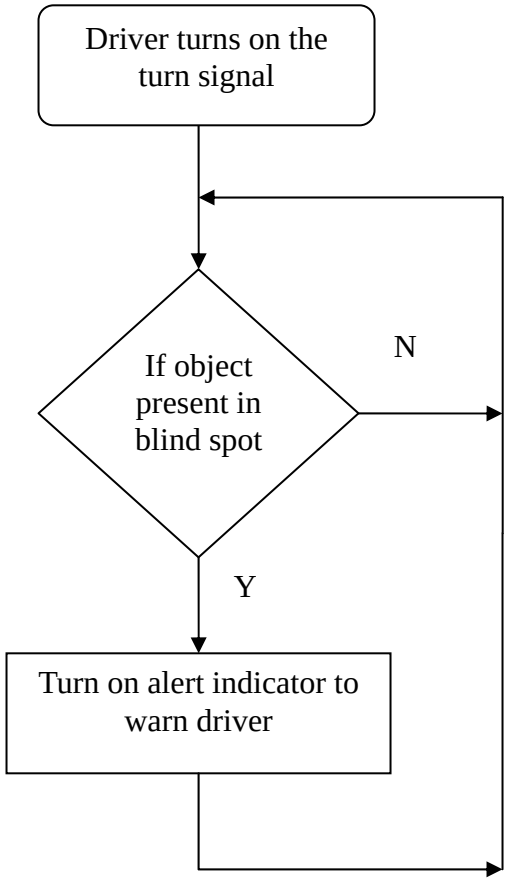

Figure 2-1: Overall Block Diagram

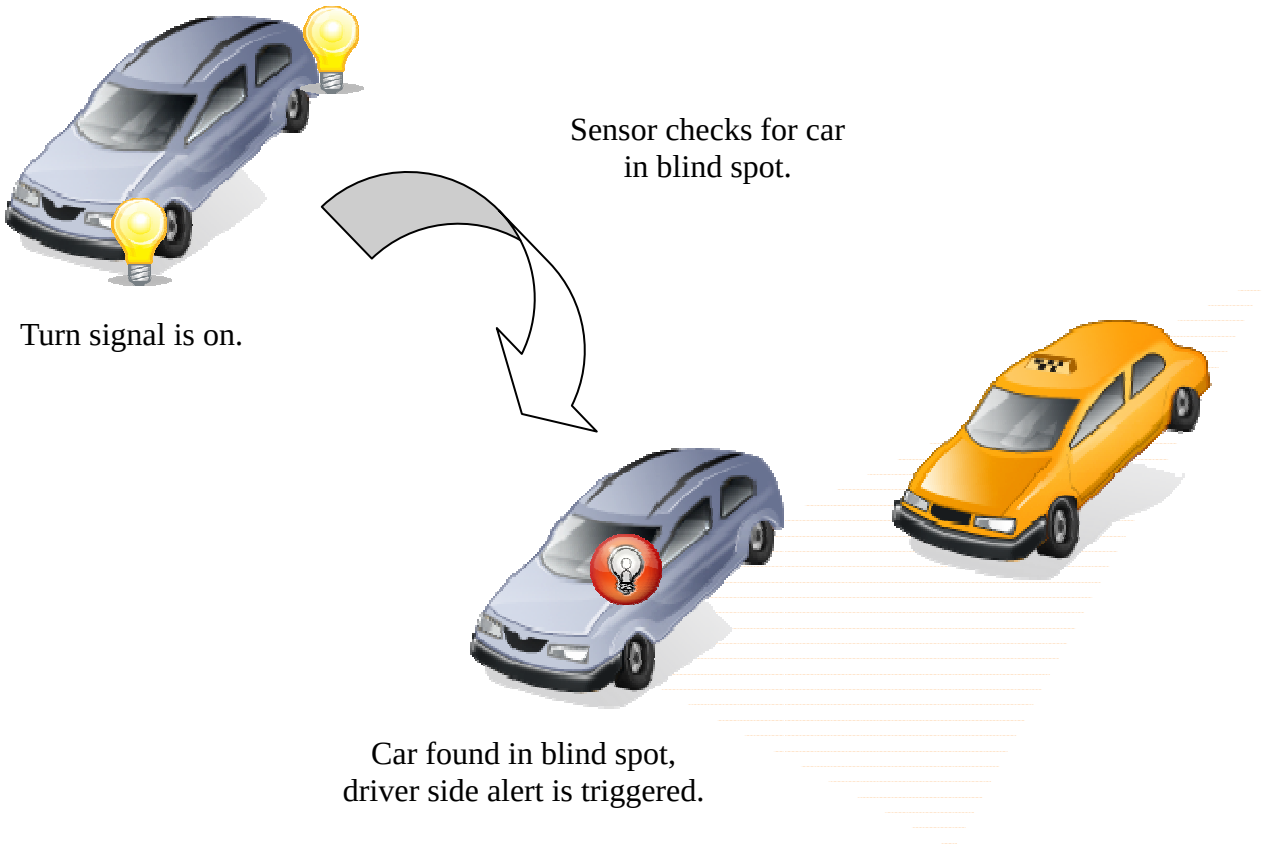

Figure 2-2: Conceptual Overview

3. Possible Design Solutions

To address the existing need of the safety issue comes from motorcycle, a compact and responsive system that can alert the user before the hazardous action is the main goal of all. Therefore the solution is composed of two subsystems, sensing and notifying component. Due to the simplicity of system choice of sensors and connectivity between the two subsystems are the focus point for design solutions.

3.1 Ultrasound distance sensor

Ultrasound sensors are great for long range and immune to object color and surface conditions. Its price is comparable reasonable to other distance sensors. However ultrasound sensor is not suitable for our design, since this type of sensors use sound detection and calculates the distance traveled by sound. Imagine the motorcycle travels more than 100 kilometer per hour while the sound travels back and forth the receiver is already moved by more than 5 meters. Therefore it is questionable that this type of sensors can manage to do a responsive detection.

3.2 Laser range finder

Laser sensors are also potential candidates. They provide wide range of sensing distance and frequency. But more sensors are required to cover the wide area of blind spot, forcing the uses of three to four sensors on each side of the vehicle. Even though, different design topology will use fewer sensors, such as mount one laser onto a stepper motor. In this case two laser sensors is enough, controls of stepper motor and output signals needs additional effort. [4]

3.3 Radio frequency connectivity

The technology has been developed over many years, and it is trusted and easy to learn. Our design does not require long range connection therefore the advantage of this solution is minimized. Since one of our features need to connect to the cell phone to make an emergency call from the helmet, and RF connection cannot perform such task. Other than using both RF and Bluetooth, Bluetooth will do all the work simply. [5]

3.4 Existing market product

Currently there are several blind spot detection system exists, and they are priced over 500 Canadian dollars. They are special dealers from General Motor and only provide in certain Chrysler and Dodge models. Additionally numbers of research and developer has already prototype such a system, such as Valeo Raytheon Systems and *Smartmicro Inc.*

4. Proposed Design Solution

The problem with side mirrors of cars is that they can not cover all the space around a car. Our proposed design solution for this problem is to build equipment which can be installed above or under the side mirrors to detect other vehicles in the blind spot of the car. This device notifies drivers if there is any vehicle in their blind spot and helps them to prevent accidents.

Some important design considerations need to be examined while designing the blind-spot safety system:

- The Blind spot safety system needs to only check the blind spot when a driver decides to change lanes not at all time. This will save power.
- The Blind spot safety system sensor range should be limited to within3-5 meters, because we do not want to sense cars in the oncoming traffic lane.
- The Blind spot safety system needs to have a fast response time, to inform the driver if a vehicle just moved into the lane.

With the amount of time and funding given for this project, we aim to finish the blind spot scanner suitable for cars. With more time and funding, we would be able to adapt this blind spot detector to any vehicle including motor bicycles. Therefore, all drivers with different vehicles will benefit from this blind spot detector. The basic design of the device includes three units as follows: sensors, controllers, and indicators.

Sensor: After considering many different designs, our group has decided to apply Infrared sensors. Infrared sensors have different ranges, and based on our objectives we consider to use those ones with the desirable range which is approximately 12 feet. Since our device does not belong to specific type of car, we need to choose a range which is compatible with all type of cars; SUVs to small cars.

Controller: Controller unit is applied to logically and physically connect the sensor units to the driver. Micro processor is responsible to check the signals from the driver and send the corresponding commend to the sensor unit. Moreover, the control unit processes the information from the sensor unit and send a signal to the indicator unit accordingly. This controller should be fast enough not to delay the communication between the driver and sensors, which may cause an accident.

Indicator: Micro controller sends the signals to indicator. Our team has decided to have LED. It may be installed on place which is easily visible to the driver with out any distraction. Some possibilities to install the LED are dashboard or rear mirror.

5. Sources of Information

For the preliminary research stage of our project, we were able to find valuable information from the years of knowledge we gained while studying here at SFU Engineering. We also used the ENSC lab resources to find component specifications, and to research on the potential candidates of sensors for our system.

We will also attempt to contact specific professors in SFU engineering who can offer valuable suggestions and feedback on image processing and object detection technology.

Once our project was defined, we spend a lot of time on the internet to search for existing technology, patents and products that may influence our project. We went to the websites of governmental agencies in charge of licensing and safety regulation, such as ICBC and Canadian Standard Agency.

6. Finance

6.1 Budget

The budget planning below has already factored in 10% overestimation for shipping and tax purpose. The cost might varies depends on what type of the sensors we are using, since laser cost more than ultrasound sensors. And different design for the detection stage will affect the number of sensors used in the prototype. However we will try to come up innovative design to minimize the overall cost.

Table 6-1: Tentative Budget for the Entire Project

Equipment	**Cost**
Microcontroller board	$100.00
Sensors	$260.00
Accessories	$200.00
Total	**$560.00**

6.2 Funding

As is typical, the cost for the research and design of the prototype is far in excess of the cost of the production cost for the system. Once the design has been finalized, parts can be purchased in bulk, parts can be replaced with less expensive parts that can get the job done, and expensive development tools will not be needed; the elimination of these costs will reduce the individual product cost.

In order to acquire the capital for this project, iChecked Inc. will apply for both the Wighton Development Fund and the Simon Fraser University Engineering Science Student Endowment Fund.

In order to reduce the cost of the project, many of the components used will be obtained as free samples, while most of the development tools will be obtained from the School of Engineering Science. If the funding is insufficient to cover the development cost, all of our team members are willing to contribute equally. Proper accounting measures will be followed and proof of all purchases will be kept for verification.

7. Schedule

Figure 7-1 shows the expected time allocated to each major component of the project in the course of this school semester.

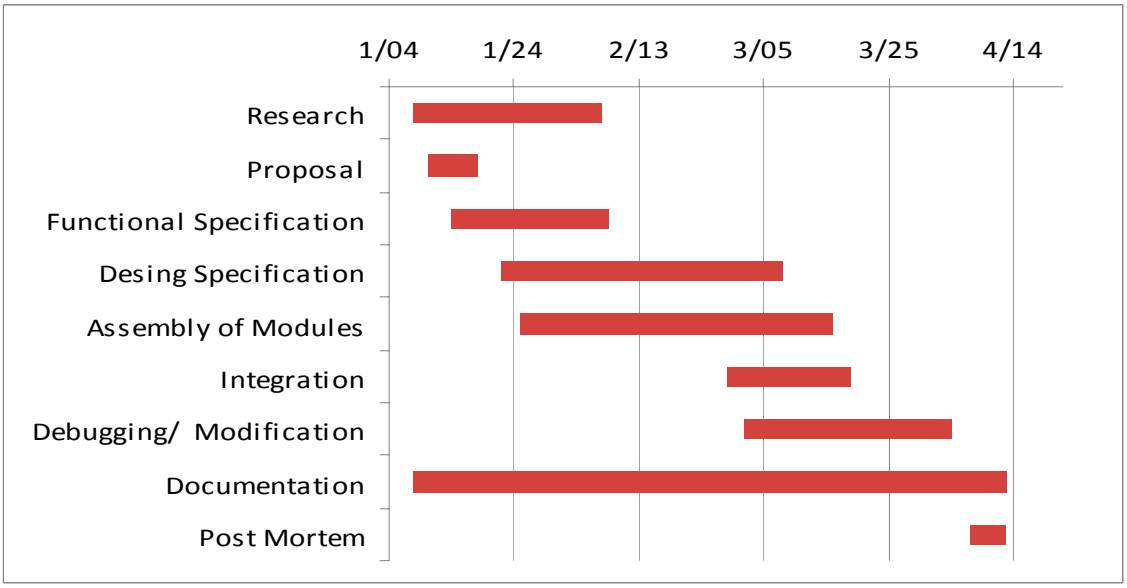

Figure 7-2: Gantt Chart

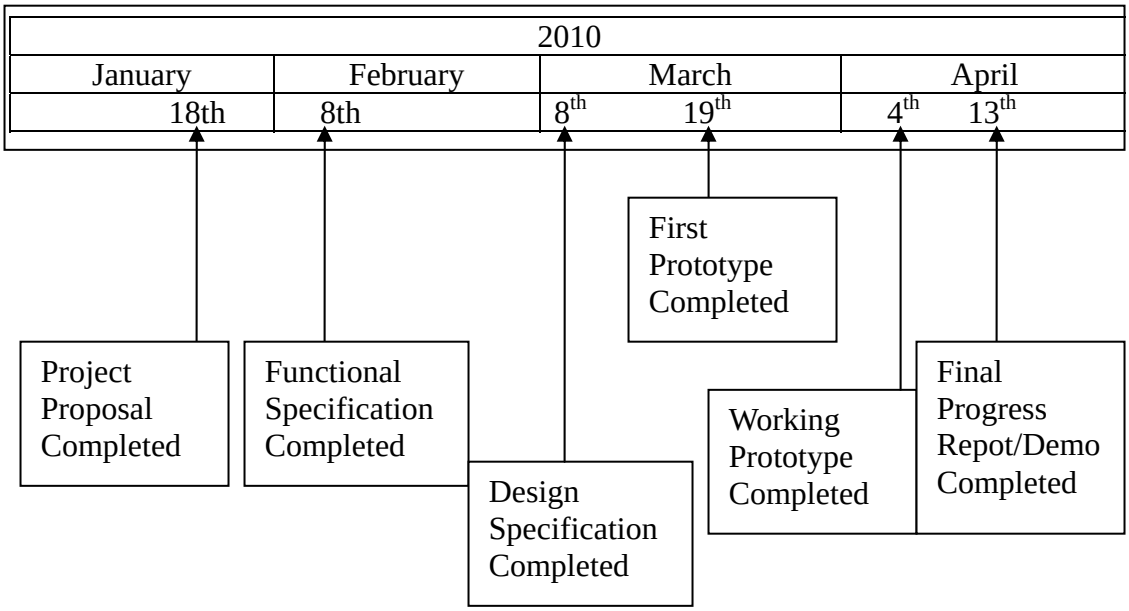

Figure 7-2: Milestone Chart

8. Company Profile

Our Team

iChecked Inc. consists of four talented team members from SFU School of Engineering Science. We are all experienced drivers all of whom have had very close encounters to collisions. In this regard, all of us are very motivated to find constructive methods to reduce or completely eliminate the danger associated with blind spots. We feel that we own the society a much safer alternative than rearview mirrors. The following is a description of the individual members of our team.

Aron M^{c}Kinnon – Chief Executive Officer (CEO)

Aron M^{c}Kinnon is graduating in 2010 with a concentration in Electronic Engineering Physics from Simon Fraser University. Aron has an extensive background managing
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teams of researchers to develop cutting edge electronic products, including flexible LCD screens. He has also worked on teams developing nano-technology, flexible lithium batteries, a safety system at a particle accelerator in Switzerland, and with advanced research and design team at Rim designing blackberry cellphones. He is also the president and owner of a Vancouver based home automation company, Van Media Install. These projects have brought him great success throughout his undergraduate career. Aron's technical know-how and leadership experiences make him the ideal candidate to lead the IChecked Inc. group to success.

Barry Li – Chief Finance Officer (CFO)

I am a sixth year Electronics Engineering student at Simon Fraser. In past courses, I gained valuable knowledge in semi-conductors, analog and digital communications, and real-time and embedded systems. I am also concurrently taking a course on electronics system design. I had co-op position working with occupational health and safety in manufacturing environment, which will give me a better sense of the safety aspect this project may require. Integrating safety with automated manufacturing was the main challenge of my work term, and I became more aware of the importance the roll of safety plays in our daily life. My minor degree in communication has assisted me when dealing with the human factor of a project, and it will once again be very helpful in completing this project.

Victor Chen – Vice President of Marketing (VP Marketing)

I am a fourth year Systems Engineering student at Simon Fraser University. I have programming experience in object-oriented design (C++) and Assembly language. I am familiar with the operations of most electronics equipment used in the lab. I also have experience with the design of robotic agent and did both hardware and software implantation of an ice-hockey robot with three degree of freedom. As well, I am able to design and implement circuits at the logical switch and transistor levels. Further, I am familiar with the operation of different kinds of sensors, actuators, motors, generators, and feedback systems. Above all, I have good communication and team-work skills.

Elyas Sepasi – Vice President of Operations (VP Operations)

I am a fifth-year Electronics Engineering student at Simon Fraser University, with knowledge on C/C++, Java. I have taken courses and projects required working and programming with Matlab and C++, also configuring and operating electronic circuitries, and financial accounting. And also I have experience in SolidWorks and Adams for mechanical design and simulation.

9. Conclusion

Drivers know that they are required to shoulder check before they merge into neighboring lanes, but the reality is not so. Many people are injured in car crashes involving lane change accidents that may have been prevented with a proper blind spot warning system. iChecked Inc. is determined to minimize these loses through proper design of our blind spot safety system. The potential market is vast and we aim to market directly to all car owners through auto parts dealers such as Canadian Tire.

The schedule and funding section shows our commitment to finish this project on time and on budget. The key to the success of the project lies in its team members with diverse backgrounds and strengths suited to motion detection and computer algorithm design. Our group is comprised of strong programmers and circuit designers. With our current resources and a well defined strategy, we are confident that the project will proceed with success from start to finish.

If time permits we would like to expand our project to include a Bluetooth adaptor that would allow use of our device on motorcycles, and develop a market ready prototype for a car.

10. References

[1] Center for the Study of Responsive Law. “Innovation and Stagnation: Innovation in automobile industry report Washington DC,” 2006. Availabe: http://www.csrl.org/reports/Innovation.pdf [accessed: Jan 16, 2010]

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[4] Keyence Canada, “Compact Laser Sensors,” 2010. Available: http://www.keyence.ca/products/sensors/lasercompact/lasercompact.php [accessed: Jan 17, 2010]

[5] Smartmicro, “Radar Sensors”, 2009. Available: http://smartmicro.de/content/index.php?option=com_frontpage&Itemid=1 [accessed: Jan 16, 2010]