



RainWorks Innovations

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January 19, 1999

Subject: ENSC 370 Project Proposal – *Automated Windshield Wiper Control System*

Dear Dr. Rawicz

The enclosed document, *Automated Windshield Wiper Control System Proposal*, outlines RainWorks Innovations project for ENSC 370. Our project is to fully automate the windshield wiper control by designing a sensor that will detect the amount of rainfall and control the wipers accordingly.

The attached proposal outlines the motivation for this project and provides an overview of the project. The company profile, project timeline, budget and design considerations will be discussed as part of this overview.

The members of RainWorks Innovations consist of four 3rd year Engineering Science students in the Electronics option. This four-member team includes Vincent Yen, Roger Stock, Dennis Lee and Kevin Kan. Should any questions arise, please contact Roger Stock at 945-5078 or by e-mail: rstock@sfu.ca.

Sincerely,

Vincent Yen, Roger Stock, Dennis Lee and Kevin Kan

Encl: *Automated Windshield Wiper Control System Proposal*



Automated Windshield Wiper Control System Proposal

Submitted by: RainWorks Innovations:
Vincent Yen, Roger Stock,
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Date: January 19, 1999



Executive Summary

RainWorks Innovations is a group focused on providing solutions for rain oriented automotive products.

The current project of RainWorks Innovations involves the automation of windshield wipers for automobiles. The project aim is to develop an automated windshield wiper control system that will activate upon sensing rain and vary the wiper speed accordingly. With the automatic wiper system implementation, there will no longer be any need for user input. However, the user still has the option of a manual override.

Currently, RainWorks Innovations intends to custom design a rain sensor for this project. However, a rudimentary, but effective rain sensor has been developed by a previous ensc370 group, BMJ Innovations. This inexpensive and non-intrusive sensor from BMJ has immense potential to be further developed for the automated windshield wiper control system. In addition, a microcontroller will be implemented into the automatic wiper system to enhance versatility and robustness. The control involved will be simple, requiring only a relatively inexpensive and low-powered microcontroller. With the parts in mind, the overall system is predicted to be extremely cheap and present an attractive option for car manufacturers or as a car kit for modification enthusiasts.

A fully functional prototype will be installed into a Toyota Tercel by April. 5 1999. The project cost will be within \$140.



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Introduction

Automobile windshield wiper systems on the current market are completely dependent on user input. Existing windshield wiper systems require user control for different rain conditions, as well as system activation and deactivation. Given various rain conditions that might occur within a short period of time, windshield wiper control may pose a cumbersome task for the driver as well as a dangerous distraction. An inexpensive automated windshield wiper control system, which activates, deactivates and varies the wiper rate depending on rain conditions presents an viable alternative to existing wiper control systems. In addition, the utilization of non-intrusive sensors, inexpensive and customizable microcontrollers and easy installation procedures will make this product an attractive option for car manufacturers or as a car kit for modification enthusiasts. A recent informal poll among students from 19-21 indicates a high interest among young drivers for innovative car accessories. Currently this product is only available in luxury and prototype vehicles, making our inexpensive car kit an accessible alternative for the general public. This document outlines the proposal for this concept.

Overview

Figure 1 shows the high level block diagram showing the basic function of our wiper control system.

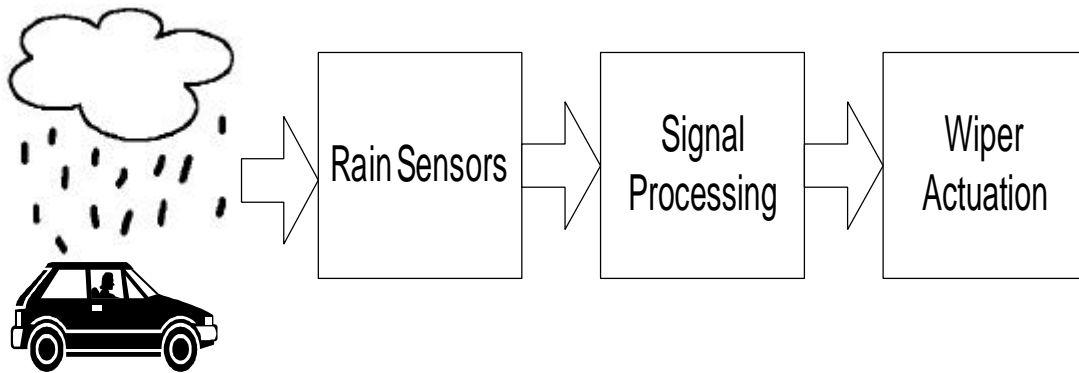


Figure 1: System Overview

Sensing

The sensor for this project needs to detect the presence of rain, as well as the rate of rainfall upon the windshield. In addition, the sensor must differentiate between various amounts of moisture on the windshield resulting from heavy rainfall to light mist. The sensor should be robust enough to distinguish between moisture and other substances that may accumulate on the windshield. The material of the sensor should be able to withstand normal abuse from the elements.

Actuation

The device will utilize existing windshield wiper actuation. The device will bypass the wiper control provided by the automobile and directly handle the actuators. Therefore, future upgrades involving our device will require very little modification of the vehicle.



Control

The control system will need to be able to take sensor readings and determine the amount of rainfall present. Based on sensor input, the controller will activate or deactivate the wipers accordingly. During wiper operation, the controller will dictate the wiper rate as a function of rainfall.

End Product Quality

Our system will be implemented in an automobile. Therefore, robustness and aesthetics are primary considerations. The sensor should not interfere with driving operations. The user interface should integrate with the interior design of the automobile.

Company Profile

RainWorks Innovations, was formed from the desire to see our ENSC 370 project idea materialize with potential as a marketable, real-world product - the automated windshield wiper control system.

The team consists of four third year engineering students in the electronics option – Vincent Yen, Denis Lee, Kevin Kan, and Roger Stock. As a group, we believe we have the skills and abilities needed to complete the project ahead of us. We also feel we will be able to acquire any additional knowledge needed from courses we are currently enrolled in and through our own studies and research.

Collective skills among our team members include:

- Microcontroller operations / programming
- Mechanical design / implementation resources
- Automobile electronics
- Digital hardware design and debugging
- Analog / Digital system interfacing
- High Level software programming
- System verification and testing
- Engineering materials

Refer to Appendix A for references to the resumes of all team members.

Because there is generally an overlap of skills among our team members, no member will be locked on one task. Teamwork and a variety in assignments will be encouraged to provide learning and new experiences.

Budget

The following is the tentative budget for the windshield wiper system. This figure excludes the cost of the automobile.

Rain Sensor	\$60
Wiring	\$10
Microprocessor / Debugger	\$30
User Interface	\$30
Windshield Wiper	\$10
<hr/> Total	<hr/> \$140

Funding

The funding for this project is expected to come from the EUSS endowment funds and individual contribution of the group members. Plans are currently underway to aggressively approach major car manufacturers for funding. In addition, we will also be in contact with hardware stores such as Canadian Tire and electronic stores such as Future shop for potential sponsorship.

Schedule

The following is our proposed schedule;

Task Name	January				February				March				
	4	11	18	25	1	8	15	22	1	8	15	22	29
Write Proposal	█												
Functional Specifications					█								
Functional Specification documentation					█								
Component Selection					█								
Component Purchasing					█								
Design					█								
Design Documentation					█								
Research	█												
Implementation/ Build prototype									█				
Testing/Debugging									█				
Installation									█				
Write ProcessReport									█				

The corresponding milestones are listed below:

Task Name	January				February				March				
	4	11	18	25	1	8	15	22	1	8	15	22	29
Project Proposal	◆												
Progress Report #1					◆								
Functional Specifications					◆								
Design Specifications									◆				
Progress Report #2									◆				
Testing Complete									◆				
Product Installed									◆				
Web Site									◆				
Process Report									◆				

Conclusion

RainWorks Innovations is dedicated to creating superior personalized automobile accessories. Our current product is expected to enhance driver safety and enjoyment by eliminating potential road distractions. Rather than competing for existing market share with established products, RainWorks will create a niche market by developing an innovative alternative. Currently this product is only available in luxury and prototype automobiles, making our inexpensive car kit an accessible option for the general public. In addition, RainWorks is fully dedicated to expanding the application of our technologies. Preliminary developments are underway to test the feasibility of our proposed rain sensor technology in aviation and military applications. With our experience and available resources, we fully expect to complete our project with a working prototype within the proposed schedule given in the Gantt chart.



Appendix A: Resumes