

MECHATRONICS BOOK SERIES SYSTEM DESIGN AND SIGNAL PROCESSING VOLUME 1

Editors

**Asan G. A. Muthalif
Amir Akramin Shafie
Siti Fauziah Toha
Iskandar Al-Thani Mahmood**



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CHAPTER 9

Design and Development of Intelligent Wiper for Vehicle Windshield : Mechanical Design

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9.1 Introduction

Windshield wipers play a key role in assuring the driver's safety during precipitation. The traditional wiper systems, however, requires driver's constant attention in adjusting the wiper speed and the intermittent wiper interval because the amount of precipitation on the windshield constantly varies according to time and vehicle's speed. Because the manual adjustment of the wiper distracts driver's attention, which may be a direct cause of traffic accidents, many companies have developed automatic wiper systems using some optical sensors with various levels of success [1]. An innovation for a standard intermittent windshield wiper is the concept of smart wiper that automatically turns itself on or off and adjusts its wiping cycle according to the intensity of rain. Here, the development of smart windshield wiper system using sensor and mechanical system to control the speed of the wiper is discussed. The first part of the discussion focuses on the mechanical design of the system. More importantly, the detailed design of the smart water collector is presented.

The history of the windshield wiper began with the invention of the automobile. Most transportation vehicles did not have wipers. The glass was not needed to protect the driver or passengers or to act as a windbreak. The first windshield wipers were brushes. Inventor, J. H. Uppjohn came up with a method of moving two brushes up and down on a vertical plate glass windshield in 1903. In the same year, Mary Anderson devised a swinging arm that swept rain off the windshield when the driver moved a lever located inside the car. Anderson patented her invention of the mechanical windshield wiper in 1905, and it became standard equipment by 1913. Electric motors were not used yet to power automobile devices, and Anderson's device had a drawback. Without a power source, a driver had to use one hand to move the lever. The driver's other hand steered the car and worked the stick-mounted gear shift and brake grips standing on the floor of the car.

In 1905, rubber strips replaced brushes as the cleaning tools on wipers. Unfortunately, the dangerous need for drivers to wipe windshields while driving was not eliminated until 1917. The solution was to use an electric motor to move a single wiper with a long rubber blade back and forth. Hawaiian dentist Dr. Ormand Wall invented the automatic wiper by placing an electric motor in the top center of the windshield so the wiper arced down over the hood of the car in a semi circular or rainbow shape. Wipers were one of the first electrical devices in automobiles after the electric starter was developed in 1912. Most wipers on cars before 1930 were paired and hung down from the top of the windshield. They were moved to the base of the windshield as electrical systems became more complicated.

9.2 Mechanical Design of Windshield Wiper

Windshield wipers are designed and made to clear water from a windshield. Most cars basically have two wipers on the windshield and some of them may have one on the rear window. The wiper parts which are visible from outside the car are the rubber blade, the wiper arm holding the blade,