

Automatic Rain Sensing Windows



ELET 4308
TEAM 4

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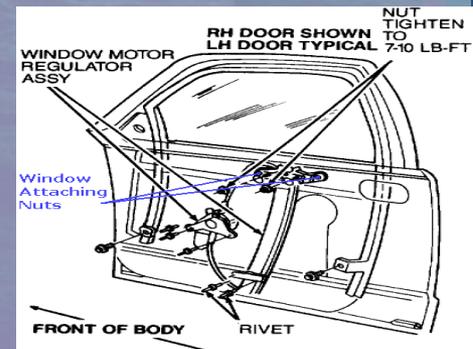
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Outline

1. Purpose
2. Background
3. Opportunities
4. Market Summary
5. Business Concept
6. Features
7. Hardware Design
8. Software Design
9. Circuit Design
10. Cost
11. References
12. Questions

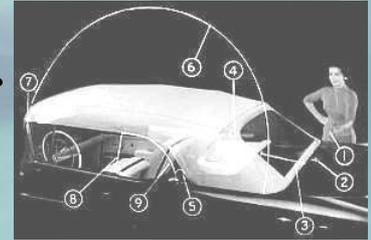
1. Purpose

- Create a device that will allow car windows to roll up automatically when it rains
- Prevent interior destruction
- Make device safe for consumers
- Market to vehicle manufacturing companies



2. Background

- In 1958, the Cadillac Motor Car Division of General Motors experimented with a water-sensitive switch that triggered various electric motors to close the convertible top and raise the open windows of a specially-built Eldorado Biarritz model, in case of rain
- Rain guard



3. Opportunities

- No such product exist that uses motion detectors
 - 7,506 (thousands) vehicles sold in 2004 and has increased dramatically in 2005
 - If 15% of the total amount of cars were convertibles, then roughly one could expect a market anywhere between 5% - 9%.
 - That translates into 375 – 675 (thousands) vehicles to market to!!!!

4. Market Summary

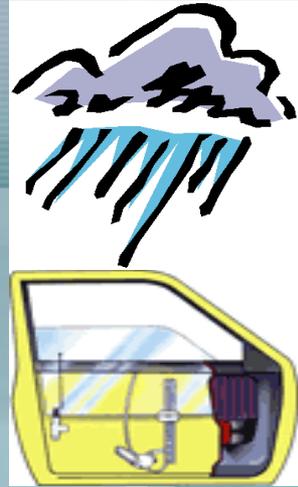
- Current Technology
 - Automatic Rain Detection System
 - Automatically starts window wipers whenever rain is detected.
 - Windows for buildings such as lofts where there are hard to reach windows.

5. Business Concept

- COST EFFICIENT
 - Self built sensor from copper wire.
 - Will use the vehicles own window and convertible top motor to close components.
 - Will use vehicles built-in computer system for rain detection.
 - Final product will need no more that the addition of the sensor and programming to work.

6. Features

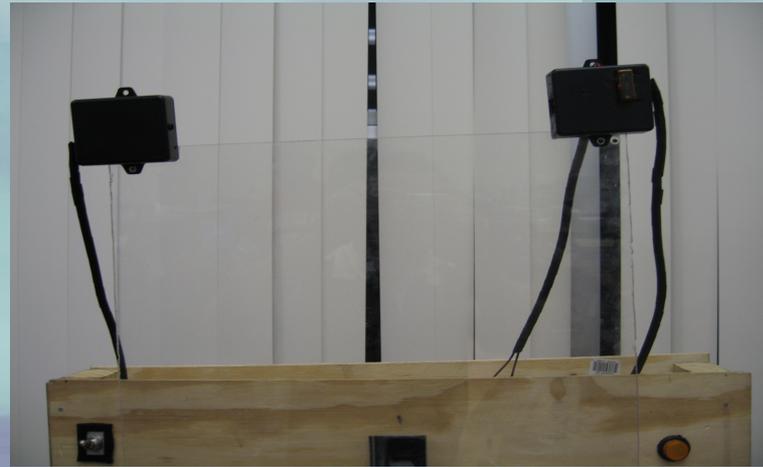
- Rolls up windows in unattended vehicle when it begins to rain
- Only activated when car ignition is off
- Window stops if obstruction in path of window.
- Easily interfaced with power windows in vehicles



7. Hardware Design

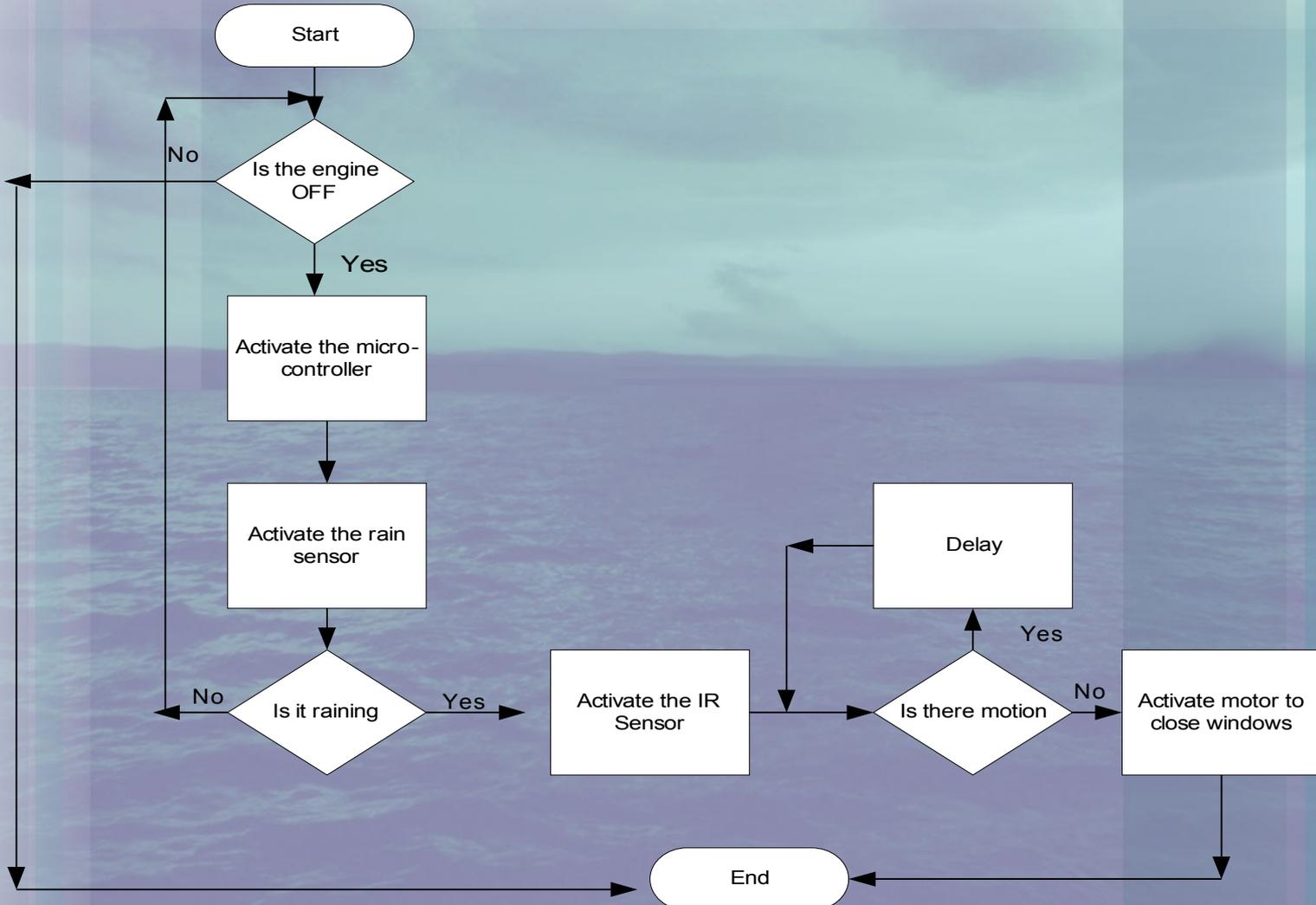
- Making a prototype device to simulate and demonstrate window rolling up when it rains
- Platform constructed out of wood
- Plexi-glass used as the window
- Using infrared sensors as safety device
- Powering of device from car battery
- Window motor from junkyard car
- Rain sensor interface to microcontroller to motor

Hardware Design (cont'd)



8. Software Design

Flowchart 8-1

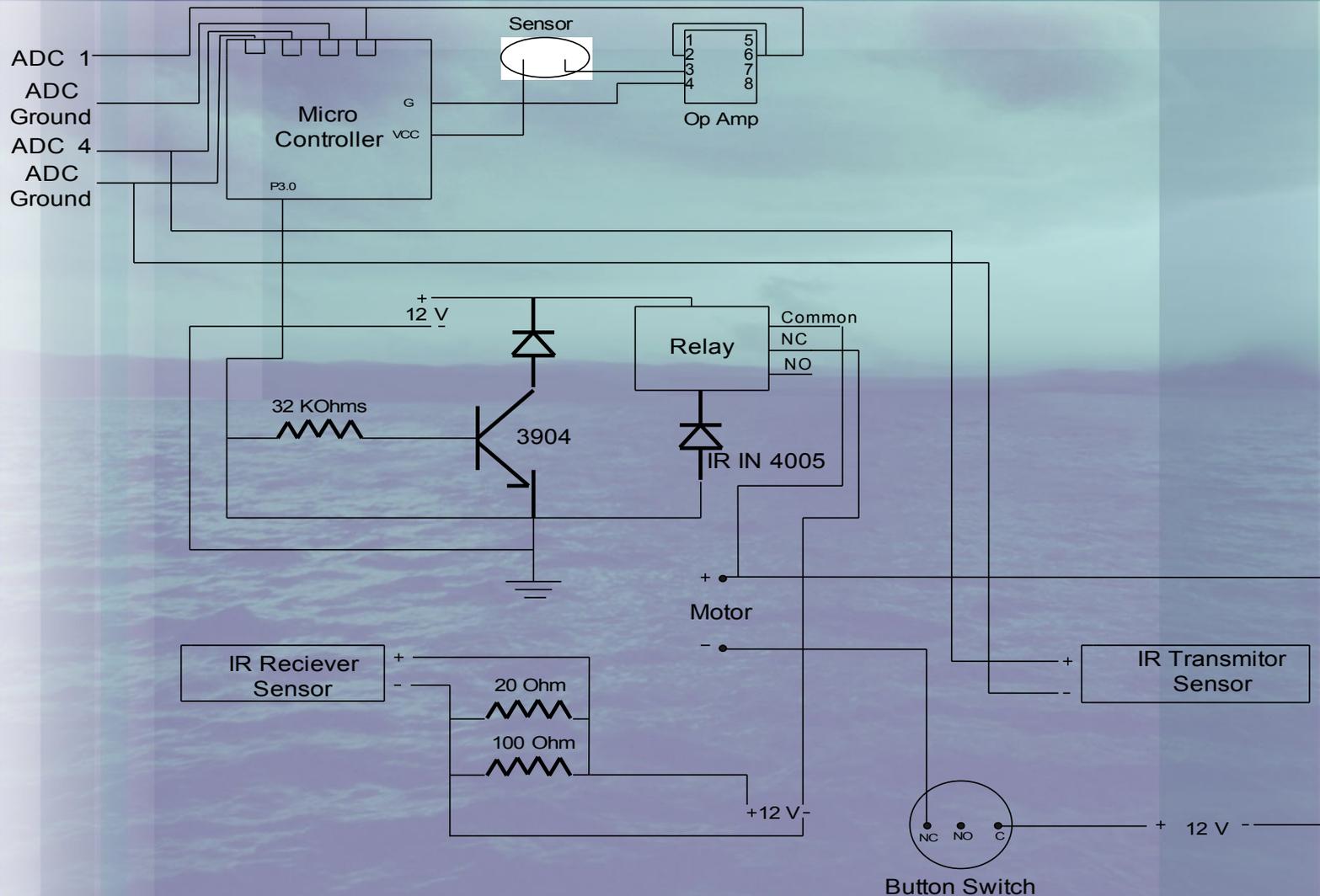


9. Circuit Design

- Used 8051 microcontroller
- Infrared transmitters, receivers, and switches interfaced to the 8051
- Voltage from rain sensor amplified with op-amp to 8051
- Window powered by relay activated by microcontroller.
- Sensor to stop window when obstruction or reaches all the way to the top
- Switch for simulation of when ignition is off

Circuit Design (cont'd)

Flowchart 5-2



10. Cost

Cost of Parts with Resources

Table 10-1

Item/Type	Quantity	Source	Est. Cost	Act. Cost
8051 Microcontroller	1	School	\$69.00	\$69.00
Training Kit	1	School	\$62.00	N/A
Rain Sensor	1	EPO	\$75.00	N/A
Motion Sensor/	2	EPO	\$38.00	\$55.90
DC Motor	2	EPO	\$29.90	\$13.90
Battery Voltage Supplier	1	EPO	\$16.50	\$16.50
Switches	2	EPO	\$3.00	\$8.25
Plastic Racks	2	N/A	\$20.00	\$0.00
Wires/Wire Connectors	4	EPO	\$8.00	\$18.25
Wood	1Block+2Sheets	Home Depot	\$25.00	\$0.00
Hard Plastic Glass	1	Donated	\$0.00	\$0.00
Capacitors/ IC-Trans./ H-Bridges	8/ 8/ 2/	EPO	\$2.00	\$36.10
<u>Miscellaneous</u> Loom Black/ Super Glue/ Cable Tie/	36 feet/ 1/ 1 Pack	EPO	N/A	\$21.64
Window Motor	1	Donated	N/A	\$0.00
Breadboard	1	EPO	N/A	\$25.95
TOTAL	N/A	N/A	\$348.40	\$265.47

Cost (cont'd)

Cost of Lab Equipment

Table 10-

Item	Quantity	Source	Est. Cost	Act. Cost
Dc Power Supply	1	Class	\$399.50	\$0.00
Digital Multimeter	1	Class	\$695.00	\$0.00
Electric Saw	1	Class	\$69.00	\$0.00
C Compiler	1	Class	\$69.99	\$0.00
Oscilloscope	1	Class	\$1600.00	\$0.00
TOTAL	5	N/A	\$2833.49	\$0.00

Cost of Services

Table 10-3

Item	Quantity	Source	Est. Cost	Act. Cost
Carpenter Shop	N/A	Class	\$150.00	\$0.00
Travel Expenses	N/A	N/A	\$100.00	\$0.00
TOTAL	N/A	N/A	\$250.00	\$0.00

Cost (cont'd)

Labor Cost

Table 10-4

Team Member	Title	Salary	Est. Hours	Est. Cost ¹	Act. Hours	Act. Cost
Phillip Campbell	Project Manager	\$26/hr	130	\$8,450.00	130	\$0.00
Amer El-Afifi	Hardware Engineer	\$20/hr	130	\$6,500.00	130	\$0.00
Ben Mathew	Tester/Market Mgr.	\$20/hr	130	\$6,500.00	130	\$0.00
John Richard	Software Engineer	\$23/hr	130	\$7,475.00	130	\$0.00
TOTAL	N/A	N/A	520hrs	\$28,925.00	520hrs	\$0.00

Total Project Cost

Table 10-5

Cost Name	Table #	Est. Cost	Act. Cost	Differences
Parts and Hardware	Table 10-1	\$348.40	\$265.47	\$82.93
Lab Equipment	Table 10-2	\$2833.49	\$2833.49	\$0.00
Services	Table 10-3	\$250.00	\$250.00	\$0.00
Labor Cost	Table 10--4	\$28,925.00	\$28,925.00	\$0.00
TOTAL COST		\$32356.89	\$32273.96	(\$82.93)



Actual cost of Automated Rain Sensing Windows : \$ 265.47

11. References:

- <http://www.bipom.com/minimax51c2.shtm>
- [http://forum.icnea.biz/empreses/E6001/ftp/Rj-03\(English\).pdf](http://forum.icnea.biz/empreses/E6001/ftp/Rj-03(English).pdf)
- <http://www.fadisel.com/ing/proamp.aspx?codi=286>
- http://www.car-nection.com/yann/Dbas_txt/Drm58.htm

Any Questions ?!

