The Auto-Dim of Vehicle Head Light using RF-waves

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Abstract— The paper is about developing a cost effective and simple way to auto dim the head light of automobile using RF communication approach. Vehicles travelling at night usually face a problem of distraction for the drivers when an opposite vehicle(s) with high-beam switched on come about 200 meters apart from each other's vehicle. This project is about automatically diming the head light of opposite vehicles which has high-beam switched-on from high-beam to low-beam. This is done using the RF wave to communicate the proximity of the on-coming vehicles and also a photodiode to detect the overall intensity of the high-beam to the driver. Each vehicle is fitted with the RF transmitter and receiver to detect the proximity of the vehicles. A photodiode is to detect the intensity of the high-beam of the opposite vehicle, after confirming the proximity of the vehicle. Consider Two vehicle 'A' and 'B' travelling opposite direction to each other during night with their high beam switched on, once 'A' and 'B' come to about 200 meter to each other (this triggers the RF communication, the high beam of the 'A' vehicle start affecting the driver of the 'B' vehicle or vice-versa, this is detected by photo diode (which is activated only when RF communication is triggered. To prevent this distraction of the driver, the high-beam of the opposite vehicle is dimed to low-bea**m.**

Index Terms: Auto-dim, automotive, Glare, High Beam, Photo Sensor, RF communication

1 INTRODUCTION

THE project idea is to implement the auto dim light using RF waves in our mind seeing the problems caused by the high-beam lights used by the vehicles travelling on highway, usually on two-lane highways. By eliminating the complex processing methods used earlier, this innovation provides solution by communicating between the vehicles and directly dims the light of both vehicles approaching each other. This system leads path for safe and comfortable ride for both the vehicles. The device will help all the long distance and overnight drivers on the highways all over the world by providing a comfortable driving experience and safer ride during night. The main goal is cost optimization and best performance. The devices used are of the best cost for performance category, likes of microcontroller-MSP430G2553, used with Launch pad and transceivers CC110l used with Aneran AIR BOOSTER PACK etc. The power consumption is kept to lowest by running the device in optimum frequency of 1 MHz and 3.3 Volt as bias voltage. Device is made to go to "low-power mode 0" when every the device is in idle condition.

The goal of our project is to build is a device fitted on every vehicle. The device on one of the vehicle detects the presence of other vehicle in the vicinity (using RF transceiver) then detects weather 'HIGH' beam switched-on, on the vehicle using photodiode and DIMS the HIGH beam to LOW beam. Similarly the other vehicles too have the same device which detects the oncoming vehicles and DIMs the light from HIGH beam to LOW beam. Thus the problem caused by the HIGH beam head light on high ways can be minimized.

The project is not extension of any ideas. This is completely new idea, where communication is used to solve the problem of high-beams during night driving. This innovation gives a simple solution for the stated problem, which is being searched for more than 4 decades in this specific application.

1.1 TECHNICAL BACKGROUND

This idea, to lower the high-beam of opposite vehicles to reduce the distraction caused by the opposite vehicle high beam was formulated many years ago. The older method used image processing, light detection etc.
These methods have complex algorithm and in effective results, below are the few draw backs in previous methods.

There are many disadvantages for image processed dimmer and light detector based dimmer. They are,

First: most of the car manufactures have come up with workarounds for glare that can control the bearer's headlights. This technology uses expensive cameras and image processing to calculate the conditions of the car's surroundings to make adjustments or dim.

Second: These conventional Algorithms are seldom flawless and respond to other sources of light like street lamps. As the image processing can't differentiate between different sources. Thus the device is very complex to make it do so. Thus the complexity and efficiency is very low.

Third: and main disadvantage is that In conventional method with all expensive equipment affects only to its own vehicle not to the opposite vehicle by diming its own headlight, which is of more importance .thus the vehicle having the device do not benefit that vehicle but the opposite vehicle.

Thus you end up paying for technology which is of no use for you, but help others.

Advantages of our technology: This technology is cheap and algorithm is very simple, but on other hand is also very effective when compared to other older technology let's look into it in brief.

The algorithm is to keep track of RF transmitter and receiver, and once it detects a RF wave; trigger a sequence to detect the light; this makes the algorithm very simple.

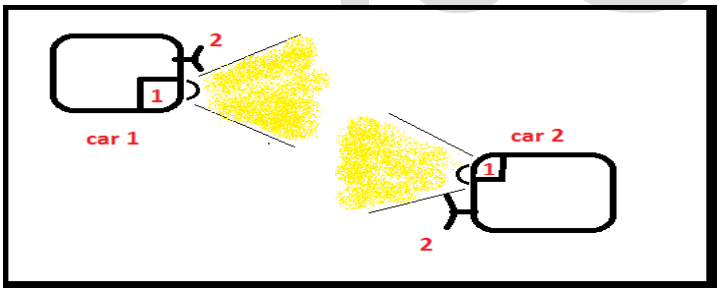
This RF communication helps us to solve the problem of detecting if the light source from a car or other light source like street light etc. because the RF used by all the cars will be a single frequency and thus if that particular frequency is detected then that must be a car then only the device checks for the light intensity. Even if other sources are present the device won't check unless it detects that particular frequency RF waves.

And tackling the main problem, as this is communication based system, both the car has this device, and even though after detecting the RF wave and then light the device dims its own vehicles head light, the lights of both the vehicles will dim together as both vehicle would have detected each other's high beam.

Thus even though your device dims your own car head light, the device in other car makes sure that other car **too** dims its head light.

Thus this technology is a fool proof method to implement it on every car to get better and safe ride in the night.

1.2 Proposed Solution

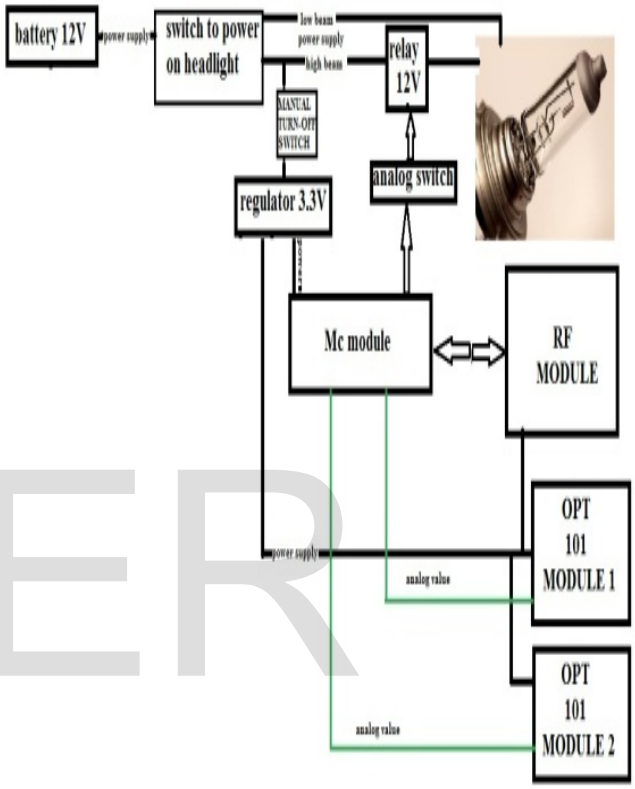


The above block diagram represents scenario of 2 cars approaching each other with Auto dim system fitted. The inputs to the system are photodiode and RF receiver (representing 1 and 2 in the above diagram). The output from the system is given to the headlights of the vehicles approaching and the lights are dimmed.

1.3 Organization of the Report

- System level block diagram and its explanation
- Hardware implementation
- Software implementation
- Results obtained from project
- Conclusions
- References
- Acknowledgements

2 Proposed Solution

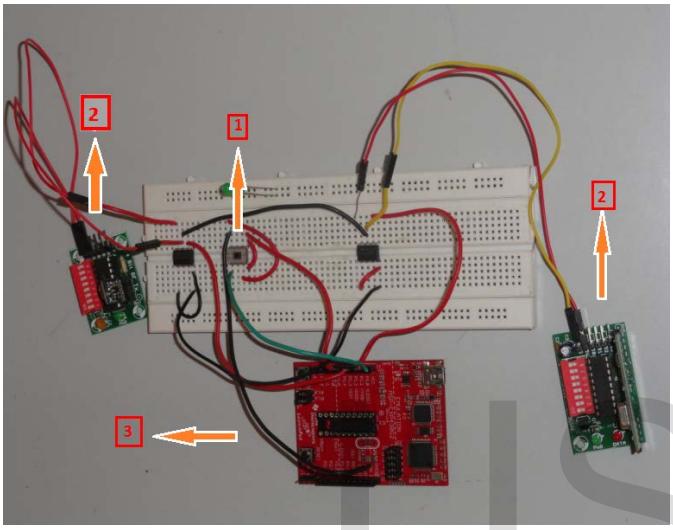


Whenever a vehicle from opposite comes within the range of another vehicle, the RF module triggers an interrupt to microcontroller. Then microcontroller then takes the reading of photodiode, which gives the value of light intensity. Depending on the intensity of the light the MC decides if it has to dim the high beam of the light. This system is better because the interactive communication helps both the vehicle to dim there head light.

None of the publications up to date have come up with communication between the vehicles to dim the head light. The head light diming was done through image sensing, which never gave us accurate result of the source of the light, but this system will give you the accuracy needed because the RF module will trigger the interrupt which then checks of the light intensity. Thus our system is unique than any other system so far

3.1 Hardware Implementation

The system contains of 3 major block, RF module, Microcontroller unit and light sensors. RF module used is 343 MHz frequency range. The microcontroller interface between RF modules, it shifts the module form TX mode to RX mode continuously using pin P1.2, and analog switch and a relay. Once the Rx receives data, it gives interrupt to the microcontroller to P1.4. This makes microcontroller to go to service interrupt. Here the photodiode reading is taken using ADC and if the set level of intensity is there then the dim takes place using the pin 1.1 and a relay.



Opt 101 (1) – In this project OPT 101 is used for measuring the intensity of light and it act as one of the input to the system.

RF Transmitter, Receiver (2) – RF transmitter and receiver which acts as communication device between the auto dim systems fitted in different vehicles

MSP 430 G2553 (3) – Micro controller is used for controlling, manipulating, operation and to give necessary output based on the input given to the system.

The below image shows two vehicles fitted with our system coming opposite to each other

3.2 SOFTWARE IMPLEMENTATION

Flow Chart of the software implementation

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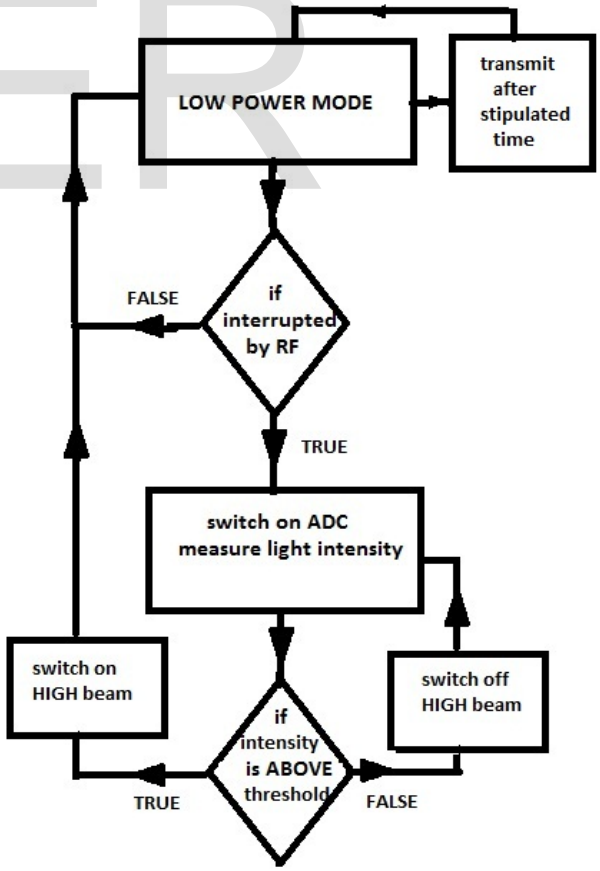

When HIGH beam is switched on, the microcontroller will

be powered up and will switch to LOW power mode, at regular interval the data is transmitted, and when the receiver receives the data the microcontroller will switch on ADC and will measure the light intensity, and will switch off the HIGH beam, if the light intensity will fall below threshold then the HIGH beam is switch on and microcontroller will go back to low power mode, and the procedure is repeated.

4. RESULTS

The system was able to communicate between the systems approaching each other over a wide range and effectively High beam lights were dimmed to low beam. The System was able to measure the intensity of light using photo diode (OPT-101) and using that as one of the reference input and accordingly light was dimmed. Now finally we were able to consider both photodiode and RF output as inputs and using microcontroller the high beam light was dimmed to low beam accordingly.

5. CONCLUSIONS

Achieved the main goal which is to dim the headlights of vehicles when they are in a particular range in which the high beam light affects the opposite vehicle driver. The future scope of our project is to implement our system in real time vehicles with more efficient design of the system by taking help of automobile industry experts.

Limitations: A particular frequency has to be kept aside for this application and Manufacturers of the car and government have to jointly make it a rule, such that this device is compulsory implemented in all the vehicles.

Future-Scope: Made more power and cost effective, Implement it in real environment and test its effectiveness.

6. ACKNOWLEDGEMENTS

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Last but not the least we would like to thank our parents and our friends without whom this Project would have never seen its end.

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