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AN EMBEDDED BASED SMART ADVANCED VEHICLE MONITORING SYSTEM

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ABSTRACT—*In today's fast and crowded world, road accident is major problem. The accidents occur on the curved roads during the night time. Also the glare problem due to focus of headlight is dangerous. Even the improper indications given to the nearby vehicle increases chances of accidents. In order to facilitate all the vehicles running on road with lightning system, this work aims to design and develop a cheap and effective Automatic Headlight System. Here we explain the vehicle monitoring system consisting of Adaptive steerable headlight system, Headlights intensity control, Automatic indicator on and off system, Anti-collision mechanism, Vehicle to vehicle communication, Smart parking system. Proposed System is cost efficient and reliable.*

Keywords: *Adaptive Headlight, Headlight intensity, Anti-collision, Indicator, Curved Road, Parking system, steering.*

INTRODUCTION

Road transportation has offered many advantages both to society and to people by providing movements of goods and individuals and making easy access to various social and economic services. The quick rise in motorization along with expansion of road network has brought with it the challenge of facing adverse factors such as the increase in road accidents. Even with the fact that having lower traffic volume, 42 percent of all traffic accidents occur after dark, whereas 58 percent are fatal accidents and 67 percent are pedestrian casualties. Therefore vehicle detection during night time holds a great importance for implementation of safety features in vehicles.

In order to deal with all the problems we have proposed a smart vehicle system solution. There are many scenarios we have considered for our application as follows,

- Adaptive steerable headlight system
- Headlights intensity control
- Automatic indicator on and off system
- Anti-collision mechanism
- Vehicle to vehicle communication
- Smart parking system

In adaptive headlight system headlights will rotate on the basis of steering. This head light movement will gives us better visibility on the curved roads. Here we also controlled the light intensity depends upon sunlight by using LDR sensor. When the sunlight is dim at any time that means either night time or day time headlight intensity will changes automatically. To deal with the glare problem intensity of headlight can be controlled automatically using LDR. Automatic dimmer and upper mode will be adjusted when any vehicle passes from front side so that headlight focus will not cause glare problem for driver of front vehicle.It also eliminates the requirement of manual switching by the driver to switch back to lowbeam Automatic Headlight adaptor module is a unique solution to achieve the above objective.

To avoid false indication we are introducing auto indicator on and off system.And finally we have introduced the vehicle to vehicle communication to communicate using zigbee. By using zigbee one can send message to nearby vehicle. The other vehicle will receive the massage by zigbee receiver.

In this study we design a Smart Parking System (SPS) which enables the user to find the nearest parking area and gives availability of parking slots in that respective parking area. And it mainly focus on reducing the time in finding the parking lots and also it avoids the unnecessary travelling through filled parking lots in a parking area.

BLOCK DIAGRAM

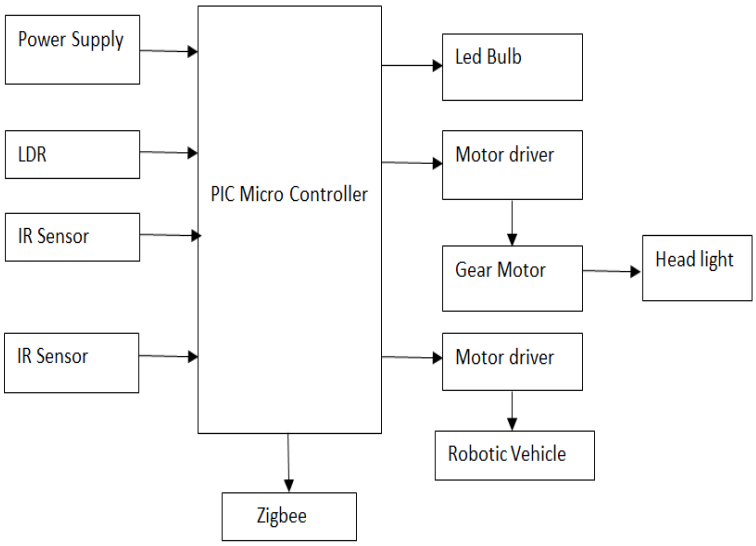

Figure 1 Master block diagram

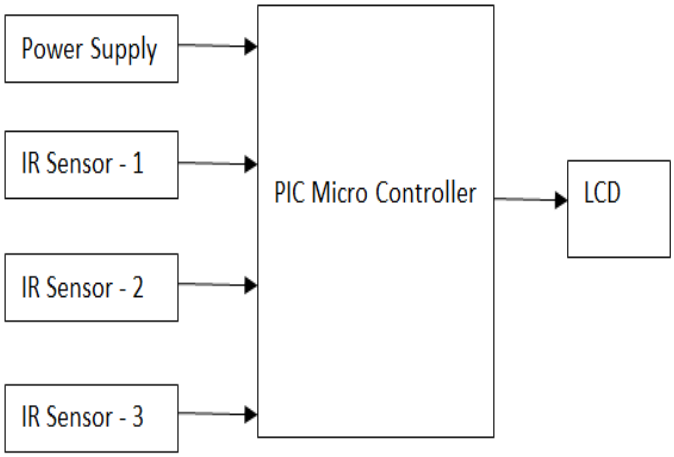

Figure 2 Slave block diagram

WORKING

Headlight intensity control: Firstly LDR on the windshield will sense the luminosity of surrounding. If it is less than specific value the headlight will automatically will turn on. Luminosity decreases during night time, inside tunnel, subways etc. So driver will not have to worry about turning on and off of headlight manually. Again to deal with glare problem we have LDRs near headlight in order to detect light intensity coming from headlights of vehicles coming from front side. If this intensity is more than specific value and distance measured by IR sensor is less than threshold value

then automatic dim beam will glow and high beam will remain off. Once the vehicle passes by again high beam will glow, this again saving driver's effort to manually switch upper/dipper headlight.

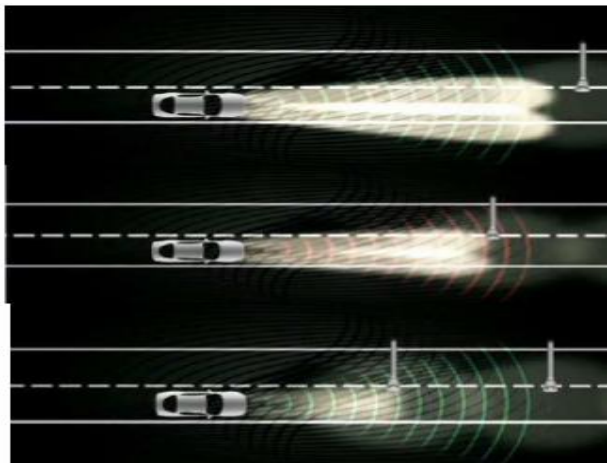

Figure 3 Headlight intensity control system

It keeps the headlights in high beams if there is no vehicle from the opposite direction. It dips the headlights automatically on encountering another vehicle from the opposite direction and restores the high beam at crossing points if the opposite driver also dips his headlights as shown in above figure 3.

Adaptive steerable headlight system:
Standard headlights shine straight ahead, no matter what direction the car is moving. When going around curves, they illuminate the side of the road more than the road itself as shown in below figure 4. Adaptive headlights react to the steering, speed and elevation of the car and automatically adjust to illuminate the road ahead. When the car turns right, the headlights angle to the right. Turn the car left, the headlights angle to the left. This is important not only for the driver of the car with adaptive headlights, but for other drivers on the road as well. The glare of oncoming headlights can cause serious visibility problems. Since adaptive headlights are directed at the road, the incidence of glare is reduced.

Figure 4 Adaptive steerable headlight system

Automatic indicator on and off system: Many times we forgot to switch of the indicators this tends to false indication to the other vehicles and cause to accidents. In our system we automatically switch ON/OFF the indicators while turning the vehicle. If vehicles turns to any direction at that time controller can turns ON the indicator respect of turn side. After taking turn successfully, the steering angle will be monitored continuously. If it is found near around zero constantly for specific time indicators will turn off automatically. This will save driver's effort to turn it off manually which is not done each time manually by driver. Obviously there will be manual option also available to turn indicators ON/OFF also.

Anti-collision mechanism: Microcontroller will works on echo signal system. For the echo we are used IR sensor at the front side. IR sensor detects the echo signal when the obstacle/ vehicle are detected. If micro controller receives signal from IR sensor it will activate the break system the vehicle will be stopped. It will reduces the collisions as show in below figure 5.5. When obstacle is detected by IR sensor controller can also warn to the driver by zigbee and also applying the breaks.

Figure5 Anti-collision mechanism

Vehicle to vehicle communication system: The communication is established by using zigbee is as show in below figure 6. The zigbee can send the message to nearby vehicle, For example on curved roads the vehicles are unable to recognize the opposite vehicles which are coming in front. On that time zigbee sends the message as "Right/Left/stop" then the opposite vehicle has to response to those messages.In addition to the vehicle to vehicle communication the zigbee also sense the obstacle such as animals, human being etc. which comes in front of the vehicle. In this case there is no communication between the obstacle and vehicle, hence the vehicle can be automatically controlled.

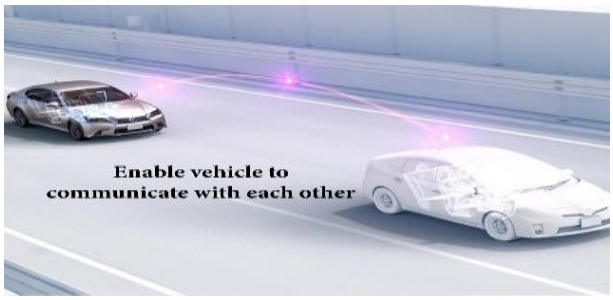

Figure 6 Vehicle to vehicle communication

Smart Parking System: The smart parking system using IR sensor is as shown in below figure 5.7, the user who wants to park the vehicle in a particular parking lot, The IR sensors send the status to the microcontroller where the data processing is done. The microcontroller sends information to the LCD display about the status of the slot to the user, which is placed in front of the parking area. This way the user can easily find a parking slot without any congestion and in less time.

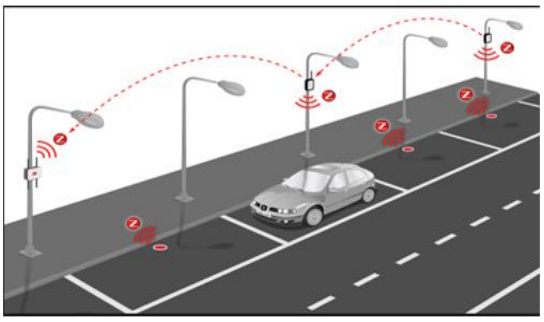

Figure 7 Smart parking system using IR sensor

FLOW DIAGRAM

For the analysis of the experimental setup and the working of the designed project a flow diagram is developed with respect to the working condition of the project. The system logic flow is shown in figure 8. When the driver starts the car LED will check the Sun light is falling or not, if sun light is falling means headlight will off, else headlight will on. If headlight intensity is maximum (high beam) means there is no opposite vehicles so far distance. If the headlight intensity is less than maximum (medium beam or less than high beam) means the opposite vehicle is coming in certain distance then headlight intensity of the respective vehicles automatically changes to medium intensity. The headlight intensity of the vehicles is minimum, when there is an opposite vehicles is too nearer to it.

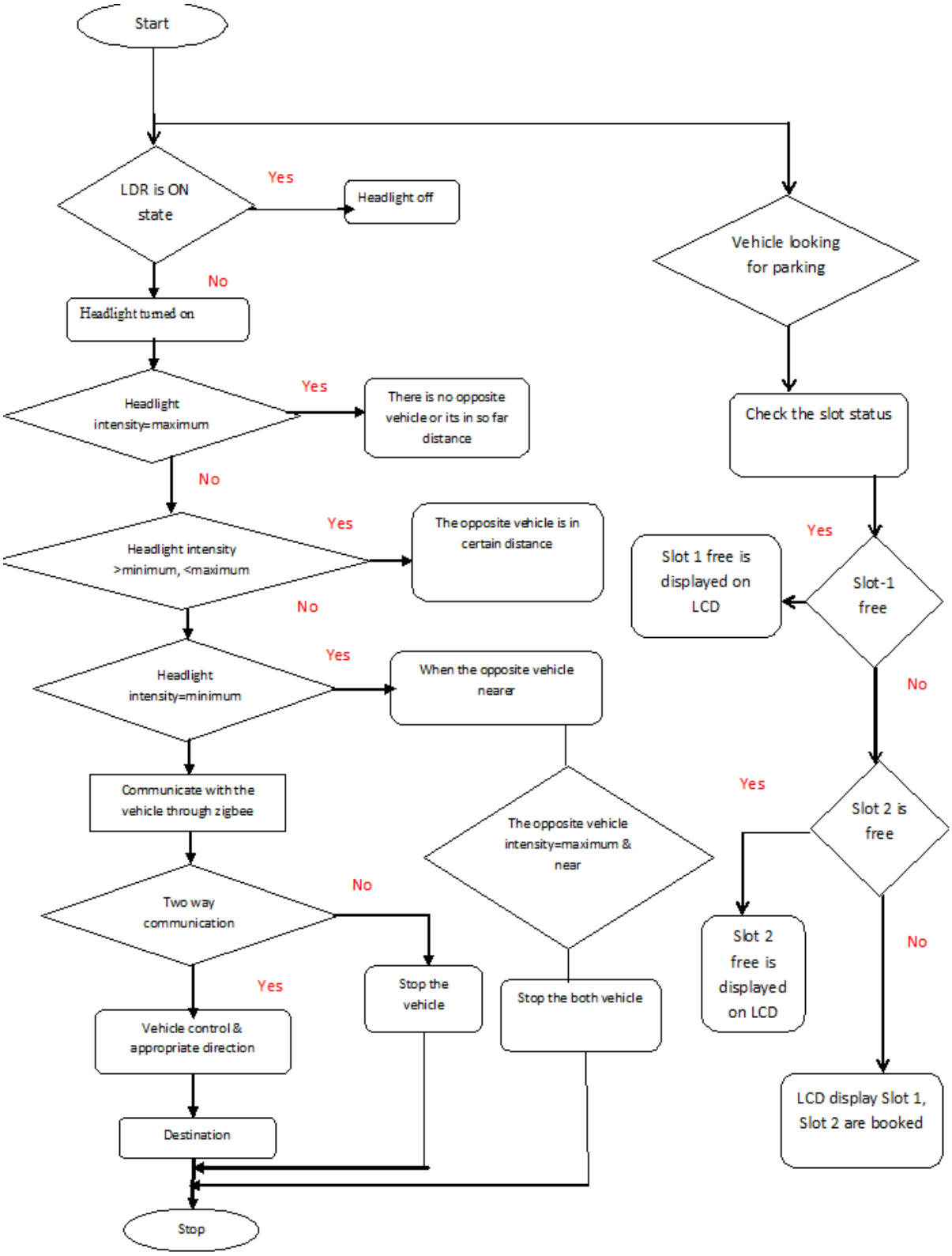

Figure 8 Flow Diagram

If the vehicles came up with high beam nearer to the surrounding vehicles then zigbee can communicate with respective vehicles in order to control the vehicle accidents. And it control the vehicles by stop the vehicles itself. Suppose if the vehicle comes nearer to the transmitter vehicle, both the vehicle can control through the zigbee. The zigbee communication is in the form of symbols like 'A', 'B' and 'C'. Here 'A' indicates that both the vehicles are in opposite direction and it responds to opposite vehicles to take the left side direction to it. The symbol 'B' represents the right side direction, if the opposite vehicles are in left side. Similarly 'C' is used to stop the vehicles if the vehicles are

comes to nearer. Our project overcome the drawback like, if the communication are not possible from the obstacle, in that cases it wait for the communication from the opposite vehicles , if the communication messages are not came from the respective vehicles in the sense it will stop. This can be checked at two way communication checking loop at the flow chart.

The bellow flowchart includes the flow and execution of the entire operation or working of the project. Here both the Master and Slave circuit operation can also be explained in the flowchart. In slave circuit we have to check whether the vehicle is looking for the parking, suppose if it is true means check for the slots status of the each slots. First check the status of the slot 1, if it is free then lcd display slot is free otherwise it displays it is booked.

ADVANTAGES

- Automatic controlling of headlights and its intensity and indicators
- Accidents will be reduced
- It can be easily maintained on any car or bus or on Sports bikes
- Quick response time.
- Increases visibility of the driver on curved roads and intersections.
- Response time of driver becomes good.

APPLICATIONS

- In Automobiles Four wheeler like cars
- In two wheeler like sports bikes etc.
- Smart Vehicles required for smart city
- In heavy traffic cities. In driving learning vehicles

EXPERIMENTAL RESULTS

The experimental setup consists of transceivers section as shown in the figures

The two transceiver section of the proposed system is consists of robotic vehicle, PIC16F77A, LDR,4 IR sensor, Zigbee, two motor driver, gear motor , LED's and LCD display. This section is responsible for doing various parameters such as Adaptive steerable headlight system, Dual control of the steering and headlight, Headlights intensity control, Automatic indicator on and off system, Anti-collision mechanism, Vehicle to Vehicle communication, and Smart parking system. These parameters are done using LDR, Zigbee, and IR sensor. Here one motor driver is connected to gear motor that is connected to the headlights and the another motor driver is to run the robotic vehicle. LED's are used

as headlights. LDR, IR sensor, Zigbee, two motor driver, gear motor, LED's and LCD display all are connected to the PIC1677A.

In order to control the intensity of headlights during day and night time the automatic LDR (light dependent resistor) is used for this application. LDR will sense depending on the radiation from sun. Next to deal with the glare problem intensity of headlight can be controlled automatically using LDR. The angle of the headlights are depends on the position of the steering. For example if we turn the steering to right side automatically the headlights are also turn to right. Automatic dimmer and upper mode will be adjusted when any vehicle passes from front side so that headlights focus will not cause glare problem for driver of front vehicle this is done by IR sensor. To avoid false indication we are introducing auto indicator on and off system. We are also including anti-collision system with the help ultrasonic sensor which will continuously sense the distance as well as headlight intensity of front vehicle, and when the distance between two vehicle decreases bellow specific level and intensity increases above specific level the vehicle will first give indication and later automatically apply breaks for accident avoidance. The vehicle to vehicle communication is communicating through zigbee. The zigbee can send the message to nearby vehicle. For example if zigbee sends the message as "Right" then the opposite vehicle has to take to left side.

In parking system we are using IR sensors, PIC controller and LCD. The IR sensor is used to sense the occupied space and sends the message to the LCD, the space is available or not. The experimental result of the parking system as shown in below figure.

CONCLUSION

The system is inexpensive, simple and dependable assembly. This system provides the ability to illuminate the road at sharp turns or corners continuously corresponding to angular rotation of sensor which is attached to the steering. Auto indication off system helps in false indication. Due to increasing traffic, anti-collision system, the wrong indication to nearby vehicles and also on curved roads, head light intensity and also drivers insignificant to observe circumferential.. taking major role to avoid accidents. Also intelligent vehicle to vehicle communication is to be implemented. Every measure to avoid accidents is taken in our system. And most importantly whole work is focused towards low-end vehicles hence a low budget and reliable system. Thus implementation of this device in all the vehicles in future will not only avoid accidents but also provide safe and comfortable driving. Hope so all of us will travel through the vehicle equipped with our proposed model.

FUTURE ENHANCEMENT

The proposed system is responsible for doing various parameters such as Adaptive steerable headlight system, Dual control of the steering and headlight, Headlights intensity control, Automatic indicator on and off system, Anti-collision mechanism, Vehicle to Vehicle communication, and Smart parking system. Our future aim is to create a common base station for all the vehicles in order to avoid accidents and also providing the pre security for the vehicles.

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