PLANNING AND FABRICATION OF AUTOMATIC INDICATOR SYSTEM FOR AUTOMOBILES

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Abstract

The aim of this paper is to analyze the current state of the Indian automotive industry and its standard and to introduce a concept vehicle that can improve today's safety and comfort standards by keeping current information in mind in Indian automobile industry as opposed to automatic indicator device present in the market today this system is not designed by sensors instead we are using electronic circuit breaker and few other mechanical devices. The device work by measuring the styling angle with that making and breaking of the electric circuit by turning on and off the indicator respectively. The overall system was implemented at the end of the design and testing processes with a constructed work, testing work and perfectly functional. All systems developed with the Indian automotive industry and human effort, safety and engagement in driving in mind.

Key Words: Automatic Indicator System

1. Introduction

The Society of Automotive Engineers (SAE) noticed drivers fail to use their indicators almost half the time they change lanes (48%) and only one in four turns (25%). It is believed that human behavioral factors, including incorrect signals of turning, are responsible for as much as 97% of road deaths.

The SAE says "smart" signs will warn drivers to signal and switch them off automatically when the turn or lane shift is completed. The device will work using vehicle sensors and software controls that are already being used in electronic stability control that is now used in every new car sold in Australia.

It would also end the mechanical switch that switches off indicators and has been in vehicles since the 1940s. Fatality Free Friday and speaker Russell White, writer of road safety, says the idea of automatic indicators "sounds fine." "But I'm wondering how the changes in the lane would go," he says. "It must be expected that you would still have to do that in advance somewhere unsure how the car might realize that was about to happen and could send a few flashes before moving.

On the one hand it sounds like an advantage and could be good, but it could also potentially dumb down the art of driving to some degree "But it is vital that technology is not used to remove the duties that we have as drivers, such as signaling before switching lane, turning or making other maneuvers and remembering to cancel the indicators afterwards".

Making the technology ' smart ' enough to cover all the different situations in which drivers would need to indicate their intentions to change lanes or directions safely is not just a challenge but unlikely to be full proof of the system making the right predictive decisions, which is why we as drivers must have the right skills to maintain proper vehicle control at all times

2. Review of Literature

- **Vehicle navigation system turn indicator by James Walker (2015)**

  A vehicle navigation system is disclosed to provide better notification of future turns along a given route. These turn alerts ideally include turning signal indications inside or outside the vehicle in response to switching the navigation system's alert signals. Such pre-existing turn signals include dedicated turn signals normally present in or on the vehicle, such as turn signals on the instrument cluster on the dashboard of the vehicle; External turn signals are typically close to the vehicle's front and rear bumpers; turn signals are integrated with the side mirror or similar. Since pre-existing turn signals are used, turn signals are made simpler and more economical as there is no need for new indicators or indicator systems. In addition, the use of inside and outside indictors to the vehicle allows both the occupant of the vehicle and other vehicles in the vicinity of the occupant's vehicle to warn about the intended route of the occupant. Besides using pre-existing dedicated turn signals, a heads-up display can be used to display the turn notification, which is beneficial because it is substantially within the line of sight of the occupant [1].

- **Automotive lane change aid by Kenneth Schofield (2015)**

  A vehicle lane change aid system includes a detector that is operational to detect the presence of another vehicle adjacent to the vehicle, an indicator to indicate that the vehicle's lane change maneuver may affect the other vehicle, and a control that receives the vehicle's movement information. The control develops a position history of the vehicle at least as a function of the movement information. The control compares the detected presence of the other vehicle with the position history and provides an indication when a lane change maneuvers may affect the other vehicle [2].

- **A turn-signal device with auto cancellation feature (2014)**

  The invention belongs to the class of vehicles having a steering mechanism that is controlled by a handle operatively connected to the wheel (through a steering column). Still more particularly the invention pertains to turn-signal devices or direction indicators for such kind of vehicles. Once the vehicle has moved/turned in the indicted direction, it is desirable to switch off the turn signal. Failure to do so i.e. continued

  blinking even after taking the turn, would lead to confusion amongst the fellow motorists and pedestrians, which may also lead to accidents. It is an object of the present invention to overcome the aforementioned drawbacks and provide an auto cancellation turn signal device for handle bar

driven vehicles (including two wheelers and three wheelers).

It is an objective of the present invention to provide an auto cancellation turn signal device that cancels the indicator signal once the vehicle starts moving in a straight path after the turn.

It is a further objective of the present invention to include timer logic in the device so that the blinker is not cancelled if the turning is for lesser time than the pre-set time in the circuit. It is a further objective of the present invention to have a manual override to the automatic cancelling turn signal.

To achieve the aforementioned objective and to overcome the drawbacks of the prior art, the present invention provides for a turn signal device with auto cancellation feature. This microprocessor driven device uses the microprocessor logic to switch on and off the indicator light bulb once a mechanically operated switch has given a signal [3].

3. Rationale and Scope of the study

The basic idea of this paper is come from the human comfort. Most of the time people don't put indicator on just because of laziness or sometime people forget to put on indicator at turning and lane changing.

Because we are not using any kind of sensor so It will be more cost effective means it will have low manufacturing and the setup cost and have low maintenance cost. It will reduce the human effort. It will also reduce the chances of accident.

Sensors have high maintenance cost, sometime indicators don't turn on at the right time because of sensor delay but in this case there is no sensor just an electric circuit which hold a low maintenance cost (cost effective).

As this era is of automation and advance technology which provide human comfort so in future, automatic indicator system in cars will also be the part of advance technology due to its effective cost reliability and low maintenance.

Many western countries are using automatic indicator system in cars that all are sensor based but in this case we are using almost no sensor, but a mechanical device. It will be helpful to reduce the road accident and provide less engagement while driving.

India is developing country. The technology revolution has begun. Very soon automatic car indicator system will take over the car industry market because study say many Indians are careless while they are driving and sometime they don't follow the traffic/highway rules which cause many accidents, so for those automatic turn indicator system will be very helpful.

4. Objective and hypothesis

Automatic car indication system will be helpful for turning the vehicle and changing lane. Indicator will operate on the rotation of steering wheel. It will be on and off on making and breaking the electric circuit of indicator. Generally, this setup completed in two stages.

Stage 1: Designing of minimum angle

Minimum angle at which circuit will be completed and turn on the indicator. Although it is completely a practical method. So considering lane change case, we rotate the steering wheel before some distance. Now suppose this distance is 30 meter and cover 3 meter offset distance from one lane to other. So angle change is given by

$$\text{Tan}(\alpha)=3/30 \qquad \text{(Eq. 1)}$$

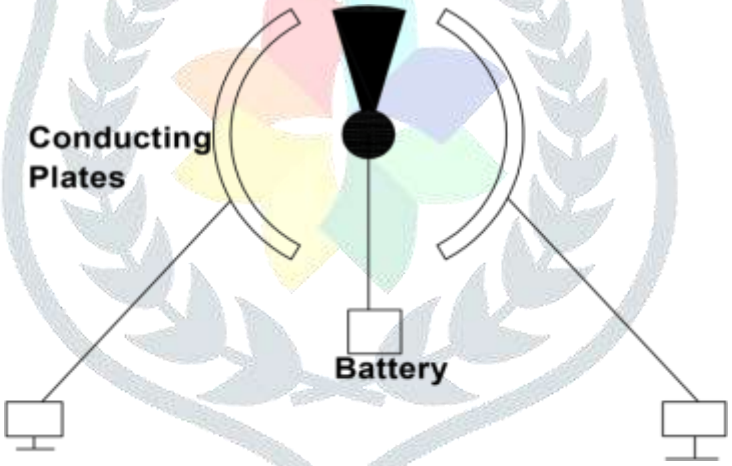
So, $\alpha=6$ degree

Now, to keep error in mind we will set this angle as 7.5(6+1.5) degree as minimum angle, now as we are using needle of 6 mm diameter and length of 60mm and then it will cover 3º at a single side so the total minimum angle will be 10.5 which circuit will be completed and turn the indicator on [4].

Stage 2: Making and breaking circuit

As minimum angle is 10.5 degree, as steering wheel rotate and cover 10.5 degree or more than that angle, needle will come in contact with fixed metal ring which will complete the circuit and pass the current to the indicator, it will turn on. And after turning as steering move towards the original position, needle will break the contact with fixed conducting metal and indicator will go off.

Figure 1(Assembly model)



Stage 3: Using micro controller system

We are using The Raspberry Pi, it is a series of small single-board computers where we are using coding and programing to the component which is connected to the navigation panel associated with google maps as we were connecting the circuit with the indicating system as while driving the car we predefined this destination so according to the movement and the geo-tagging the indicator will work automatically as the circuit will connect or break with changing the lane or turning the car to other lane or path [5].

Figure 2 (Raspberry Pi 3)

5. Materials and equipment used:

5.1. Metal ring

Mild steel is the metal that is most commonly used. It is also used in the various everyday objects we use in the industries. Mild steel is the most commonly produced metal that is price-free and not brittle. Mild steel is not tempered or hardened readily, but it has sufficient strength.

Mild steel contains-carbon 0.16 to 0.18 percent (maximum allowable 0.25 percent)

Manganese 0.70 to 0.90 percent maximum

Silicon 0.40 percent maximum

Sulfur 0.04 percent maximum

Phosphorus 0.04 percent maximum.

The lowest carbon steel or mild steel grade contains a very low carbon content of 0.05 to 0.26%. Mild steel is an outstanding electricity conductor. So in the welding process it can be used quickly. Unlike structural steel, mild steel is very suitable. Various car manufacturers also use mild steel to make the vehicle's body and parts [8].

Figure 3 (Metal ring)

5.2. Indicator:

A car is equipped with several signaling devices-indicators, brake light, warning light of hazard, headlights, light reversal and horn of the car. A driver uses these signaling devices to communicate what they intend to do to other road users. They are helping drivers "read the road." Signals alert other road users in advance that you are attempting a move. It is important to give appropriate signals at the right time and location for the safety of all road users and to properly interpret the signals from other road users. Your signals must be issued in good time before you begin your maneuver and as long as their meaning is clear to other road users. Don't signal too early as it could result in confusion [7].

Figure 4 (Indicator)

5.3 Battery:

An automobile battery is a rechargeable battery that provides a motor vehicle with electrical current. The main purpose of the engine is to feed the starter. Once the engine runs, the alternator provides power for the electrical systems of the car. Starting discharges usually less than 3% of the battery capacity. SLI batteries (Start, Light and Ignition) are designed to release a high current burst and then recharge quickly. These are not equipped for deep discharge, and the lifetime of the battery can be shortened by a complete discharge. Electric battery vehicles are powered by a high-voltage electric vehicle battery, but they typically also have an automotive battery, enabling them to use regular automotive batteries designed to run on 12 V [6].

Figure 5 (Battery)

5.4 Raspberry pi:

A single-board computer (SBC) is a complete computer built on a single circuit board with microprocessor(s), memory, input / output (I / O) and other usable computer functions. Single-board computers are designed as systems for demonstration or development, for educational systems or for use as integrated computer controllers. Many types of home computers or laptops integrate all their functions into one single circuit board [10].

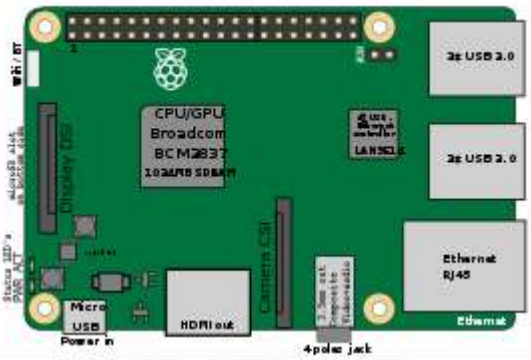


Figure 6 (Raspberry Pi prototype)

Types of raspberry pi:

The various models of raspberry pi follow

- Raspberry Pi 1 B
- Raspberry Pi 1 A
- Raspberry Pi 1 B+
- Raspberry Pi 1 A+
- Raspberry Pi Zero
- Raspberry Pi 2
- Raspberry Pi 3 B
- Raspberry Pi Zero W

Steering rod:

The basic goal of steering is to make sure the wheels point in the direction they want. Typically this is done through a sequence of connections, rods, pivots and gears. One of the fundamental concepts is the caster angle–which wheel is steered ahead of the wheel with a pivot point; this makes the steering appear to be self-centered in the direction of travel [9].

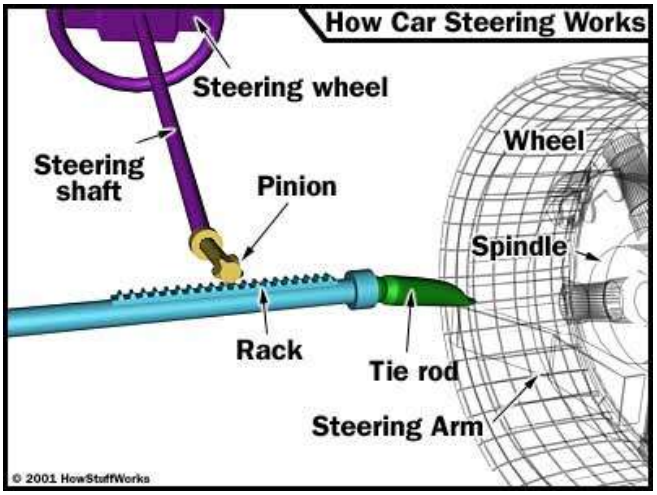


Figure 7 (Working of Steering)

The worm and industry was an older design, used in vehicles such as Willys and Chrysler, and the Ford Falcon (1960s). To reduce friction, a roller or rotating pins on the rocker shaft arm can replace the field.

Speed-sensitive steering is an outgrowth of power steering, where the steering is heavily assisted at low speed and assisted at high speed. Automakers consider that, when maneuvering for parking, drivers may need to make large steering inputs.

There can be switches to turn off the rear steering wheel and options to drive only the rear wheels independent of the front wheels.

6. Research Methodology

Although it is completely a practical based paper but for basis calculation which is to design the minimum angle or to measure the steering wheel angle, we will use trigonometric formulas. As we know that manual steering transmission (rack & pinion) had gear from where we could calculate the angle of shaft analytically by analyzing the gear motion or gear ratio.

But nowadays technology is advanced we use power steering instead of manual so there is no rack and pinion gear transformation this is totally operated by hydraulic pump. So all the turn angle calculation can be done by analyzing the steering wheel motion. We have to design minimum angle by analytical method.

So, the need is to develop a system which can be used to operate the car indicators automatically. This paper involves system including two conductive plates and a battery attached to the middle one if the steering revolves. Then there is a needle which actually comes in contact to the conductive plates so the needle is a positive charge and the conductive plates are negative charge so we have approximately taken 15 degrees of radius to change a lane. There is also a contact breaker through the conductive plates when it requires if there is an emergency of rotating the steering more than the required angle.

This is all about the working methodology and automatic indicating system which is used in automobiles for turning and Changing of lanes. This whole system is a simple way to indicate the turning signal without using any human effort for changing the lanes. This system has wide range of upgrade options and uses throughout the future. System can be achieved through census also but in a simple way by the two conducting surfaces we can achieve less human effort indicating system for the car and the automobile machinery this may have agreed chance of affecting human driving experience and chance to reduce fatalities on the Road this system we are going to consider it as simple automatic indicating system for the automobiles.

Metal Ring:

The Metal ring with an Angle of 11 degree so that it engages with rotation of steering wheel of the system the ring is mostly made up if steel so that it is good conductor of electricity.

Metals ring that is made up of steel and good conductor of electricity so that it engages with the contact of needle on the steering rod the engagement of the needle then completes the circuit.

The Ring has less maintenance when compared to sensor and less delay when compared to sensors.

Figure 8 (Metal Ring)

METAL NEEDLE:

The needle of engagement on the steering that it engages the needle with ring the and engages the ring the maintains the system so that the completes the circuit and engages the respective side indicator so that the system is complete.

The steering system is the simple and that engages the system and the system of failure is negligible most of the cars use this system to turn off the indicating signal which is already turn on but we are achieving it turning on and turning off with this system.

It is also the important component in this system it is only one complete the circuit while rotating the steering wheel, these are use of the steering needle [9].

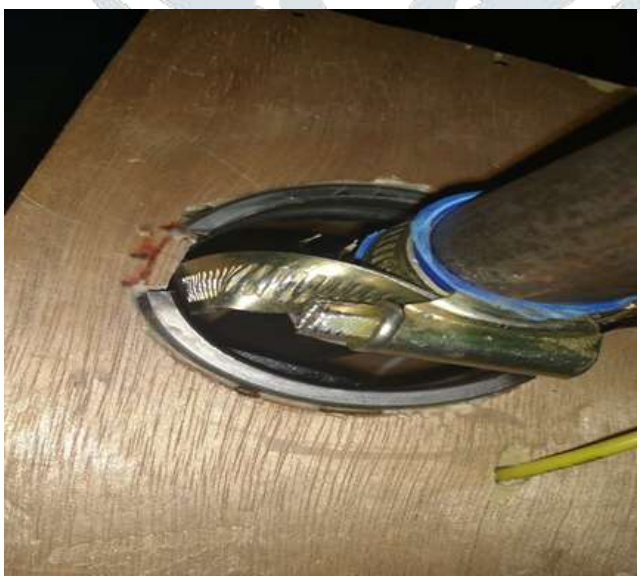


Figure 9(Metal needle)

7. Research and Experimental work done

Few researches and work have been done on vehicle indicator automation. Some are only for lane changing, some for parking and some are for turning vehicle. Now a days many vehicle using indicator automation e.g. Mercedes Benz, Audi, Baleno etc. Somewhere it is not fully automated so keeping this point in mind we did lot of work on that to make it easy, cost effective and reliable.

Two conductive metal ring pieces are used at an angle of 22°. These pieces will be kept in plastic or rubber casing of same diameter as the ring diameter which will provide the insulation of outer ring surface. This set up would be fixed on the steering rod and a needle is attached to the steering rod. As the vehicle turn and steering wheel will cover 11°, no indicator will turn on but beyond this angle needle, which possess positive charge come into contact with ring piece, which holds negative charge and thus it will complete the electric circuit and indicator will goes on respectively.

It can work only for lane changing and parking but at turn it got fail. After a lot of research, we came up with the idea of minicomputer. As everybody know that now a days in every advance car electric control panel is used so we thought to make it more efficient and multitasking by using minicomputer in which a program was coded to access the navigation. As you enter the destination it will show the best possible routes, select it and before 50 fit of every turning point it will turn on the indicator respected to the turn. This is all we worked on to make the automation in vehicle indicator system successfully it would be cost effective, easy, safe and reliable.

The system was designed in general, and the actual implementation was performed with the method's prototype. All the turn angle calculation can be done by analyzing the steering wheel motion. The automatic indicating system-based in the steering rotation is quite complex about the angle of engagement but the once is placed the average chance of failure is quiet less, we can decide that is negligible.
The car which is mostly uses is Audi this vehicle is creating new generation cars to future with auto pilot system which follows internet for the routes and scan the environment to the maximus to predict the driving system as it uses and operates mostly by sensors that achieves the automatic indicating system.
Then there is a needle which actually comes in contact to the conductive plates so the needle is a positive charge and the conductive plates are negative charge so we have approximately taken 11 degrees of radius to change a lane.

Figure 11(Prototype of Real Model)

8. Results & Discussion

The automatic indicating system is more for the cars because the steering system that is used in the system for cars more effective for automatic indicating system. The automatic indicating system-based in the steering rotation is quite complex about the angle of engagement but the once is placed the average chance of failure is quiet les we can decide that is negligible. The system that is less maintenance. There are more ways for automatic indicating system

1. Automatic indicating system based on wheel rotation
2. Automatic indicating system based on sensors
3. Automatic indicating system based on live route option (e.g., Google Maps)
4. Automatic indicating system based on steering rotation

The automatic indicating system based in steering system we use only for the turn off the turning signals but what if we use the same for the turning on indicating signals we successfully achieved the system placed in the moving vehicles like go cart and solar cart.

The overall function of the process and performance depends on the presence or turns of a car moving from one lane to another.

Any desire to implement this design in a vehicle would not require any additional space or space. The system was designed in general, and the actual implementation was achieved with the method's photo type. All the turn angle calculation can be done by analyzing the steering wheel motion. Automatic Indicating System will reduce the human effort. It will also reduce the chances of accident.

Very soon automatic car indicator system will take over the car industry market because study say many Indians are careless while they are driving and sometime they don't follow the traffic/highway rules which cause many accidents, so for those automatic turn indicator system will be very helpful. It will be helpful to reduce the road accident and provide less engagement while driving.

Pre-existing turn signals are used; turn signals are made simpler and more economical as there is no need for additional indicators or indicator systems. The present invention aims to provide an auto cancelation and turn-on signal device that cancels and engages the indicator signal once the vehicle begins to move in a straight or curved track after turn.

We basically think about humans so that live is more value than power loss there are more ways to generate power but less ways to save a life. We actually think about for the comfort of the human life to ease the simple thing can reduce the chance of stress on the humans. The thing is, which more for the important is for the people.

Automatic turn indicator system will be very helpful. While they are driving and sometime they don't follow the traffic/highway rules which cause many accidents.

Table 2 (Component and there Function Chart)

Component	**Function**	**Material**
Indicating bulb	Emitting of light for signal	Glass and tungsten filament
Casing for bulb	Bulb for external effects	Plastic and fibres
Metal ring	Completion of circuit and engaging the indicators	steel
Contact Needle	Touching the Ring for engaging the indicator signals	Conductor metal, steel
Battery	Power supply	Lithium ion
Raspberry pi	Engagement of indication with Google maps	Micro computer

9. Conclusions and Summary

The paper we worked under is automatic indicating system and we completed the paper in full mechanical way such that it is controlled and operated in fully mechanical so that no need of external interference for the indicating systems and the paper we created is giving the more importance to the human live than losing the power that is why we may be able to modify the system in such a way that a single manipulation that is change to manual to the parking system.

The automatic indicating system we presented earlier is basically parking purposes so that it contains best steering for the indicating signals that it gives the best results for the parking vehicles.

The automatic indication system that are using is more complicated and costly such that it uses most of the high-end vehicle's and mostly sensors. The car which is mostly uses is Audi this vehicle is creating new generation cars to future with auto pilot system which follows internet for the routes and scan the environment to the maximum to predict the driving system.

The it uses and operates mostly by sensors that achieves the automatic indicating system but to even own this type of car it make a life time value for a average human that is why we head up for the creation of automatic indicating system in low cost and more efficient manner.

Work done by the system is the we are powering the system in such a way that the system the we are attaching the steering rod with a conductor over the insulator and with some voltage by this it completes the half of the circuit the we place the rings top so the conductor and the dial touches the conductor and therefore completes the circuit and the indication in on with the completion of circuit.

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