Measurement of Wheel Alignment using IR Sensor

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ABSTRACT: Measurement of wheel alignment using a desirable element of many proposed vehicle active safety system (e.g., caster, camber, and toe alignment). This paper is based on wired and wireless automobile wheel alignment measurement system using IR Sensor, which has the advantage of simple circuit, cost effective, high resolution with high working reliability. In this system wireless transmission techniques are adopted to transmit data between wheel of vehicle to the arduino board and output obtained on PC/laptop using USB cord which is connected to aurdino board i.e. wired system. The causes and effects of improper wheel alignment by traditional methods are analyzed in the model. Using this proposed system one can easily find the misalignment of the wheel with greater accuracy

KEYWORDS*: IR Sensors Wheel, caster, camber, toe

I. INTRODUCTION

With the development of automobile technology, the automobile traveling speed is getting higher and higher, and the influence of automobile operation stability to automobile safety is getting larger and larger. The purpose of these adjustments is to reduce tire wear, and to make sure that vehicle of wheel travel is straight and right. All the vehicles are dispatched from the factory with their alignment first checked, tested and adjusted. But the cost of the system is in corer so that anyone can not afford the system. In this paper the proposed system is cost effective than other systems.

In this paper wheel alignment measurement is performed using IR sensors. IR sensor presented in hardware and software. The IR transmitter is fit on wheel of vehicle once the input (i.e misalignment) is start at same time the LED glow on the receiver part its indicate the receiver receives the data from transmitter and the output shows on laptop through USB cord. Any type of misalignment can be overcome by only IR sensor. It's very cost effective because of visual studio 2010 software, minor misalignment is shown. [1]

A. Effects Of Various Alignments On Wheel Performance

The process of tire wear is very complex. Tire wear can effects on life of vehicles. It can be caused by a number of factors. Some of these include incorrect inflation, alignment issues, vehicle over-loading and worn out shocks and struts. In the conventional research, the tire wear is estimated by experiments. Otherwise, the tire wear is predicted by the tire vibration and model analysis. The effects of various toes setting on wheel alignment can be seen in figure
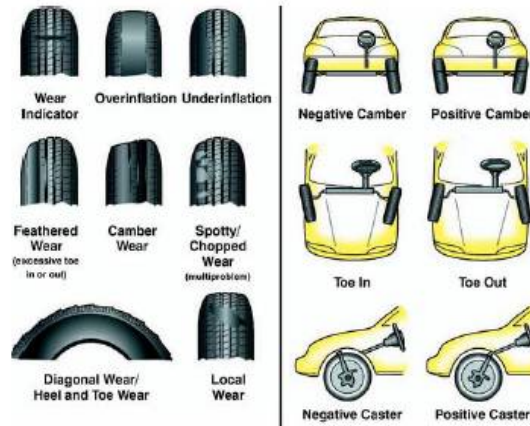
Fig. 1 Effects of various alignment angles on wheel

II. RELATED WORK

In [1] authors used wireless system transmission techniques are adopted to transmit data between measuring unit and computer. Accelerometer is use for Toe and camber alignment. In [2] driver state assessment is considered in the context of a road departure warning and intervention system. A system identification approach, using vehicle lateral position as the input and steering wheel position as the output, is used to develop a model and to update its parameters during driving. In [3] uses three infrared sensors to measure the inside, center, and outside temperatures across the tire. The capture and communication of information is controlled by a microcontroller.

III. PROPOSED ALGORITHM

A. Design Consideration
- **IR Sensor-**

Measuring unit of the system consist of IR Sensor, an infrared sensor is an electronic instrument which is used to sense certain characteristics of its surrounding by either emitting infrared radiation. IR sensors are a modern technology used to pick up an area of the light spectrum that the eyes are not capable of seeing. An advantage of IR sensors is their ability to be applied to a large area. Sensors can be used in much the same way that eyes can to survey an area and pick up the IR section of the light spectrum. In this paper IR Sensor plays an important role find the misalignment of wheel, not only find the misalignment but also give proper value of change exact accurate results.
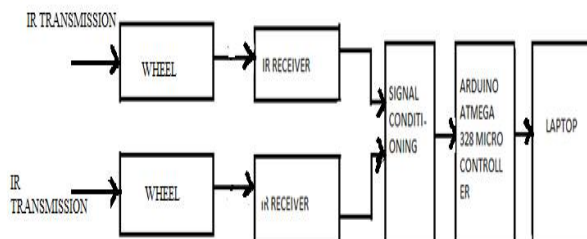

Fig. 2 Block Diagram of wheel alignment measurement system using IR sensor

Above fig. shows the block diagram of Wheel alignment measurement system using IR Sensor, in this system first IR transmitter fit on wheel in proper direction (i.e. x & y axis of wheel) two IR transmitter is use one for TOE and other for CASTER then the output obtain one portion which is perfectly fixed and parallel to the wheel obtain on Receiver

part through LED. If light of LED is bright then alignment is proper. Degree of accuracy obtains on laptop which is connected to aurdiuno board via USB Cord.

- **Hardware Environment:**
  1. Arduino Microcontroller ATMEGA328P

The entire system is developed using ATM 328 microcontroller. Microcontroller is the heart of the system; it's also called as the processing unit. It's a high performance, low power AVR 8 Bit microcontroller advanced RISC architecture. In the arduino kit microcontroller ATM 328 is used thus it satisfies selection criterion. Output of signal conditioning is IR radiation is applied to the analog inputs A_0-A_1 of Arduino board. An Arduino Board is AVR microcontroller based board which follows the standard arduino schematic and is flashed with the arduino boot-loader; the arduino is referred as open source hardware. All arduino boards should be compatible with the arduino IDE which can be used to program the arduino boards. It's a High performance, low power, Advanced RISC Architecture and 1 clock cycle required for performing 2 instructions. In this system arduino board receive the output from signal conditioning through A0-A1 pin, the function of arduino 328 microcontroller read this 2 signal come from IR transmission. ATM 328 Microcontroller read this signal through C++ coding and converts this analog input into decimal. And final output of the system view on laptop its 2-D view of wheel alignment. In this code simply assign i/o ports and serial ports.

IV. SOFTWARE ENVIRONMENT

Software is divided into two parts, read the system and view the system.
  A. Design Steps For Software Implementation
Step 1: Program design for Reading the camber, caster and Toe angles
Step 2: Program design for obtaining the 2D view of caster, camber and Toe angle
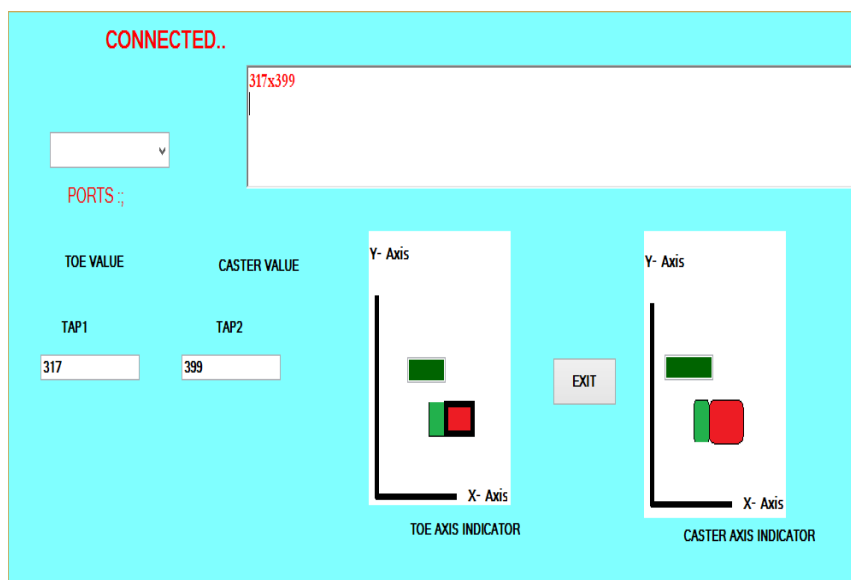Step 3: Monitoring page design

Fig 3: Proper alignment of wheel

As survey on the output of wheel alignment here the alignment is proper, Ports block is COMP 3 which shows the location of USB cord. TAP 1 & TAP 2 block shows the value of TOE and CASTER resp. on which value the proper alignment get. If the TAP 3 & TAP 4 is dark green shows the normal alignment once it become orange misalignment is occur
Step 1: Program design for Reading the camber caster and toe angles

The data come from IR receiver and applied to ATM 328 microcontroller using C++ coding the signal read and finalized whether the IR radiations are caster camber or toe alignment.

Step 2: Program design for obtaining the 2D view of caster, camber and Toe angles

Output of Arduino board is fed in to laptop through USB Cord it's wired communication techniques and using VB.Net coding seen the 2D view of the wheel alignment on laptop and also achieving the desired angles it is observed that in VB.Net platform the angles were in degree of radiance . By using simple calculation the angles are obtained in degree.
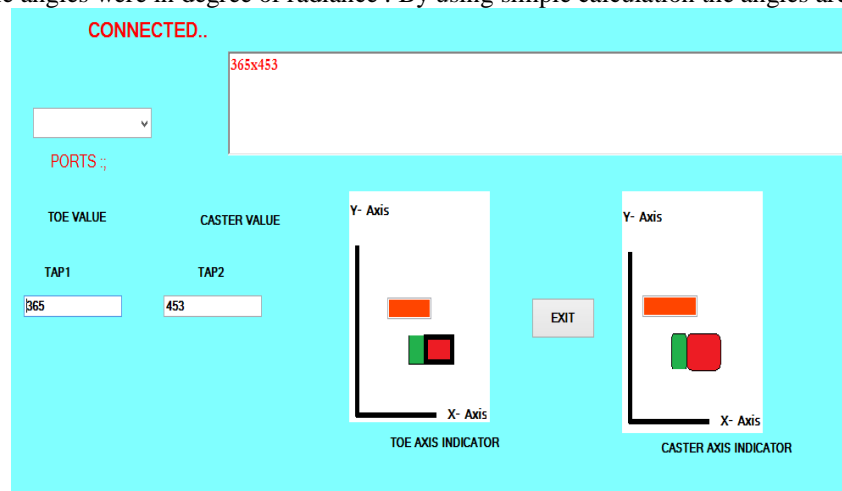

Fig.4 Misalignment of wheel

As survey on If the dark green color become orange as alignment is occur, fig one shows the TOE axis indicator and other fig. Shows the Caster axis indicator.

Step 3: Monitoring page decision the role of monitoring in reducing risk and uncertainty, so that the monitoring page decision played an important role. All the developments in the available data displayed in the text boxes.

IV CONCLUSION

The proposed wheel alignment system is used to perform the real time wheel alignment of vehicle. In order to maintain automobile performance, regular examination and adjustment of wheel alignment angles are needed by means of wheel alignment system. In this system the IR Sensors are used for wheel alignment, it has advantages of cost effective, superior than existing system, less time consuming. The proposed system can be implemented for almost all types of four wheelers where the wheel alignment is necessary. Furthermore, the proposed system can also use to find all types of misalignment by using only IR sensor.

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BIOGRAPHY

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