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DESIGN OF WHEEL ALIGNMENT MEASURING SYSTEM USING INFRARED TRANSMISSIONS

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***Abstract*— Wheel alignment technology advances continuously with the introduction of new makes and models of vehicles, engines, transmissions/ transaxles, steering and electronic suspensions. Two wheel alignment is quickly becoming obsolete and four wheel alignment is rapidly being incorporated on many of the new models. This work concentrates on the parameters like caster angle, camber angle, toe in and toe out angles. In this work simulation is carried out by using Infrared (IR) transmission through transceiver pair. The output voltage is observed with change in angular displacement of IR transmitter. This voltage is converted into software interfacing language using arduino board. The visual basic.net software is used for programing and mathematical calculations of output voltage into measured angle in degrees. It is then verified by the results obtained from actual wheel alignments model used in showrooms. The proposed method shows high sensitivity towards minute changes in angles. Also the system can be made available at very low cost, and results can find similarities with the actual system.**

***Index terms*- match sticks, Coir, manufacture of matchsticks.**

I. INTRODUCTION

Over the past 3 decades, we know that the automation has played a key role in enhancing product quality and the productivity of the automotive manufacturing industry. The development of automobile technology impacts directly on automobile travelling speed and also increased but the automobile travelling safety is also proportionally decreased. For safety purpose if we consider wheel alignment, it is again important topic to discuss. Now a days passenger vehicle usually has wheel alignments both for front wheel and rear wheel. The most influencing parameters in almost all automobile wheel are Toe, camber, steering axel inclination (SAI) and caster.

II. EFFECTS OF WHEEL ALIGNMENTS

These wheel alignments will change gradually during usage. Many problems could be caused because of uneven alignment of wheel such as front wheel swinging during travelling, rapid tire wear, decreasing of the directional stability after steering, steering wheel vibration, etc. Tire wear is a part of economic calculations and also has an impact on energy consumption and the environment. Wheel alignments examination and adjustment should be carried out regularly so as to achieve vehicle travelling stability, travelling safety and other performance.

III. LITERATURE REVIEW

Jigar Senjalia (1) had developed a new measurement technique for the contact-less type

detection of measurement of wheel alignment, by means of a vision system which consists on a digital camera and a laser line pattern device. This system can identify very small misalignment within second free mode which is less than 10-15 degrees of angle. The main advantage of this technique is to be an alternative method for measuring the angular position of wheel in regard to existing techniques using known pattern objects attached with wheel rim for this application. A new method is developed and presented for dynamic alignment of the wheel hub and wheel by Vinayak A Prabhua (2). He also explained that, a light-controlled factory by optical measurement using infrared light and depth imaging is used to aid automation. The proposed method has the potential to enable the automated wheel loading operation and the automation of most assemblies in motion thereby having a significant impact on improving the efficiencies and productivities of global automotive manufacturing companies. Sonali Chatur (7) explained, computer based wireless wheel alignment using accelerometer is explained, with the advantages of simple electronic circuit, low cost, high resolution, high operational reliability and high measuring precision. In the calculations some correction factors are also introduced to obtain the actual angles. The angles are obtained with respect to gravity, it is observed during the practical implementations of the alignment system. To transmit the data between measuring unit and computer wireless communication

method is adopted which helps in easier system operation. The system practical inspection shows that its performance meets the design requirements. LI Wenhao (6) deeply studied the method of measuring the four-wheel alignment parameters and optimizes the existing model to make it more congruent with realistic measurement environment .Also, a new method to obtain the wheel axle direction vector is proposed. The proposed method has the advantages of high measurement speed, simple operation, no need to repeat calibration and worth developing and using. By using depth information a new technique of Machine vision can be used to measure the parameters of an object. This project thus successfully uses the concepts of stereo vision in the field of wheel alignment, this concluded by Akshay Padegaonkar (5). Jie Liang (4) proposed

a wireless optical wheel alignment measuring system based on PSD is presented, which has the advantages of simple electric circuit, low cost, high operation reliability, high resolution and high measuring precision, etc. Measures are taken to eliminate the influence of the background light also the dark current to system measuring precision. Wireless infrared communication method is used to carry out the command and measurement data transmission between the master computer and the slave computer, which make the system operation much easier. Meng Qingguo (3) explained the response surface models between the optimization objectives and alignment parameters are established by the orthogonal test method. That is benefit to the alignment parameters of front wheel optimization design.

IV. Experimental Approach Flow chart for Project Work

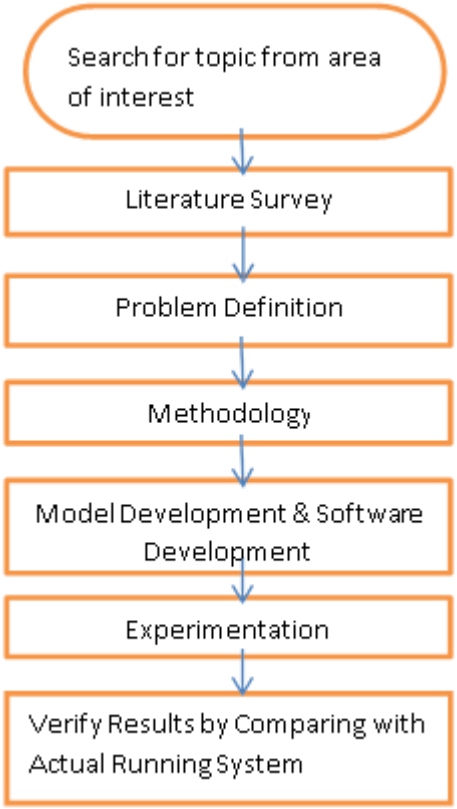

Fig. 1 Flow chart for project work

V. Problem Description

A robo wheel of 80mm diameter was considered in this research. Infrared transmissions were emitted by transmitters mounted on wheel and received by receiver placed on the opposite side of wheel, when supply was connected. This was done to observe the IR transmissions when toe, caster and camber angles are changed with minimum difference from (0□ to 15□) and also for major values of angles.

VI. Block Diagram Adopted

An innovative technique is developed in this project. Simple block diagram explaining the process of measuring system is as shown in fig.
2 this technique is used to convert infrared radiations into digital signals.

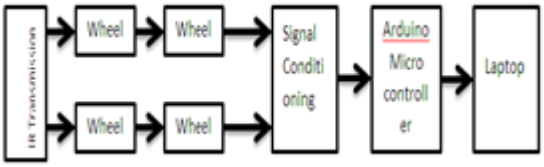

Fig. 2 Block diagram of measuring system

VII. Experimental Set up

In the below fig. 3 proposed wheel alignment system is shown. It consists of IR – Receiver Transmitter pair. Transmitters Attached on robo- wheel which is free to move in upward, downward, horizontal and vertical direction. Transmitter will emit infrared rays which are received by Receiver, placed on another side in front of wheel. Outputs of IR rays are given to the aurdino Board for signal processing. At end, using USB interface, wheel alignment system get connected with display unit via VB.net.

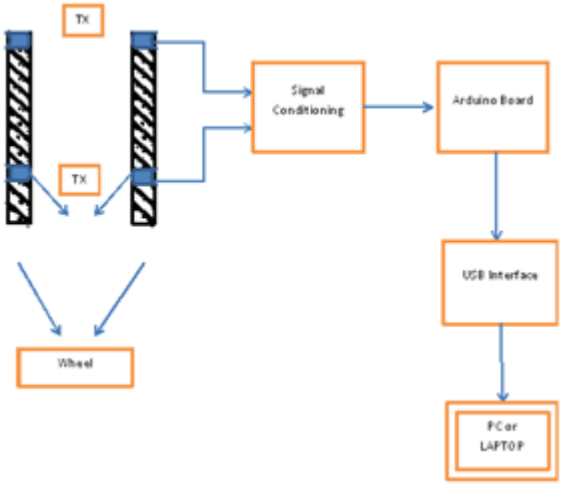

Fig. 3 Block diagram of wheel alignment system

Fig 4 shows the hardware and circuit used for Transmitter and receiver.

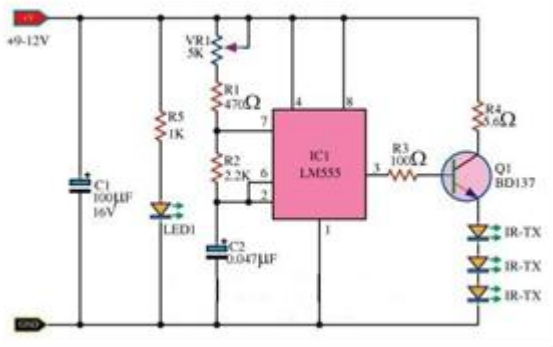

Fig. 4 IC 555 circuit for wheel alignment system

VIII. SOFTWARE DEVELOPMENT

Program is designed for measuring caster, camber and toe angles. Program is designed using C++ coding. In this, output from IR receiver is used to convert signals into caster, camber, toe angles.

Program is designed for obtaining view of angles, so that we can visualize caster, camber and toe angles.

Aurdino board output is used for this technique, also VB.net coding is used to visualize the angles on laptop. Angle measured in degrees.

To display all available data monitoring page is viewed. Using monitoring page, we can make decision about wheel alignment.

Photographs during experimentation are shown in fig. 5

Fig. 5 Experimental Set up

Results

Wheel alignment angle measurement is one of the advanced and costly system. As IR transceiver are very sensitive to changes in angle and can identify angles upto 15□ very precisely. During practical whenever wheel is rotated about x and y axis, camber and toe are recorded by the IR Sensors and digitalized on the display using Microsoft visual studio programming. The set up is calibrated for accurate readings. And software output (i.e. angles in degrees) are validated using protractor fixed around the wheel. Every time noticing same accuracy of readings. Positive toe and negative toe is calculated with the alert message of tyre wear in percentage. Also an alarm is generated when normal settings are obtained.

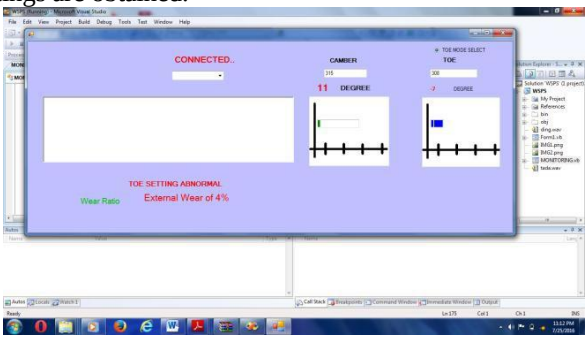

Fig. 6 Photograph showing result taken on the instrument

Conclusion

The presented wheel alignment system used to perform the real time system. This system also present how the proposed system is better than existing system. In this system the IR transmissions are used for wheel alignment, it has advantages cost effective, superior than existing system, less time consuming. This system can be implemented for almost all types of four wheelers where the wheel alignment is necessary, and also find all types of misalignment by using only IR transmissions.

References

[1] Jigar Senjalia1, Parinda Pandya2, Harsh Kapadia3, "Measurement of wheel alignment, using Camera Calibration and Laser Triangulation", 2013.

[2] Vinayak A Prabhua, b *, Ashutosh Tiwaria, Windo Hutabarata, John Throwera, and Christopher Turnera, "Dynamic alignment control using depth imagery for automated wheel assembly" , 8th International Conference on Digital Enterprise Technology - DET 2014.

[3] Meng Qingguo, Zhang Lei, Dong En'guo, "Research on Front Wheel Alignment Parameters Based on Response Surface Model", 2010 International Conference on System Science, Engineering Design and Manufacturing Informatization.

[4] Jie Liang, "Design of an Automobile Wheel Alignment Measuring System Based on Position Sensitive Detector", International Conference on Automation and Logistics Qingdao, China September 2008.

[5] 1 Akshay Padegaonkar, 2 Madhura Brahme, 3 Mohit Bangale, 4 Alex Noel Joseph Raj, "Implementation of Machine Vision System for Finding Defects in Wheel Alignment" , IJCAT International Journal of Computing and Technology, Volume 1, Issue 7, August 2014.

[6] LI Wenhao1, GAO Yan1, ZHANG Rong2, "Research on the Machine Vision System for Vehicle Four-wheel Alignment Parameters", Proceedings of the 30th Chinese Control Conference July 22-24, 2011, Yantai, China.

[7] Sonali Chatur, "Computer based Wireless Automobile Wheel Alignment system using Accelerometer" , IJES || Volume || 4 || Issue || 9 || Pages || PP -62-69 || 2015 ||

[8] Rocco Furferi1,*, Lapo Governi1, Yary Volpe1 and Monica Carfagni1, "Design and Assessment of a Machine Vision System for Automatic Vehicle Wheel Alignment" , Department of Mechanics and Industrial Technologies, University of Firenze, Italy, Received 2 Jul 2012; Accepted 18 Jan 2013.