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Audio Visual Driver Guidance System

Sumit S. Surve[1], Pratik R.Kasalkar[2] ,AniketTambe
[1](Department of Automobile Engineering, RMCET, Ambav, India)
[2](Department of Computer Engineering, University of Mumbai, India)

Abstract: *The main effort of this work is to provide a concrete accuracy and precision to any vehicle using less expensive components which are reliable and consistent.The foremost purpose of this work is to determine if the recently offered Hall Effect current sensors could provide better performance than the existing ones, so that it could be substituted for deriving performance and cost benefits. The idea proposes the use of components and devices like Microcontrollers (e.g. Arduino), Hall Effect Sensor, Audio schemes and LED's which are cost effective. They are easily available in Indian Market. The principle of magnetic field detection by the Hall Effect sensor has been extensively used to make sure that the driver receives proper auditory and visual responsefrom the microcontroller according to the rpm of the shaft which delivers the driver exceptionally firm idea of the speed of the vehicle and provides a safety factor for the avoidance of any kind of accident or mishap. The system has been designed in such a way that the reliability is not compromised in any kind of inconvenience. The components are arranged in a manner that the circuit should work in the most efficient manner and provide optimum performance.*

Keywords: *Accuracy, Auditory, Extensive, Microcontroller, Reliability.*

I. Introduction

The need of precision, speed and sharpness demands the necessity of an innovative system to keep the driver notified about vehicles acceleration. The existing console or the speedo meter consumes the driver's attention. The visual procedure requires the driver to look into the console, then judge the reading, and then execute required action.

Our system notifies the driver of the speed and acceleration in an audio format in addition to the visual presentation. The system includes a buzzer mounted inside the driver's helmet. The pitch and tone of the buzzing changes with respect to the vehicles speed. The speed of the vehicle is estimated by using an LDR that detects the rpm of the shaft. The tone of the buzzing changes linearly with rpm.

In addition to this, the system includes a visual led array which looks like an audio equalizer bar. As rpm increases, the LEDs light up. In a linear array of 9 LEDs, all ten LEDs will light up at Max rpm, similarly one or two LEDs will light up at low rpm.

With sufficient practice and understanding the driver can judge the speed and acceleration while entering a turn. This system saves the time, attention and effort there by aiding the drivers ability to enter and exit a turn at optimum speed, avoiding the chances of overturning and drifting. With time and experience a driver need not look into the speedometer to judge the speed of the vehicle.

II. Literature Review

2.1 Literature Survey

The Hall Effect was discovered by Dr. Edwin Hall in 1879 while he was a doctoral candidate at Johns Hopkins University in Baltimore. Hall was attempting to verify the theory of electron flow proposed by Kelvin some 30 years earlier [1]. Current sensing is one of the most important functions in power electronic applications and space applications such as different power consuming modules of a spacecraft subsystem.[2]

In order to assess their performance, different Hall Effect geometries were tested for Hall voltage, sensitivity, offset, and temperature drift. The residual offset was measured both with an automated measurement setup and by manual switching of the individual phases. [3]

2.2 Components

The system consists of the components and devices which can be replaced by similar functioning components. The components we are going to use are strictly according to the market survey and information analysis of the current scenario. All the components are easily available in Indian market at a very reasonable cost. Following components and devices will be used for optimum working of the project.

2.3 Hall Effect Sensor: The Hall Effect has been recognized for over one hundred years, but has only been put to obvious use in the previous three decades. In 1950's, the first real-world application (outside of laboratory experiments) as a microwave power sensor. With the bulk manufacturing of semiconductors, it became reasonable to use the Hall Effect in high capacity products. MICRO SWITCH Sensing and Control modernized the keyboard industry in 1968 by presenting the first solid state keyboard using the Hall Effect. For the first time, a Hall Effect sensing component and its concomitant electronics were pooled in a sole integrated circuit. Today, Hall Effect devices are comprised in many products, extending from computers to stitching machines, motors to aircraft, and mechanism tools to medical equipment.

The motives for using a specific technology or sensor differ conferring to the application. Price, performance and accessibility are always attentions. The features and welfares of an assumed technology are aspects that should be considered along with the precise necessities of the application in making this decision.

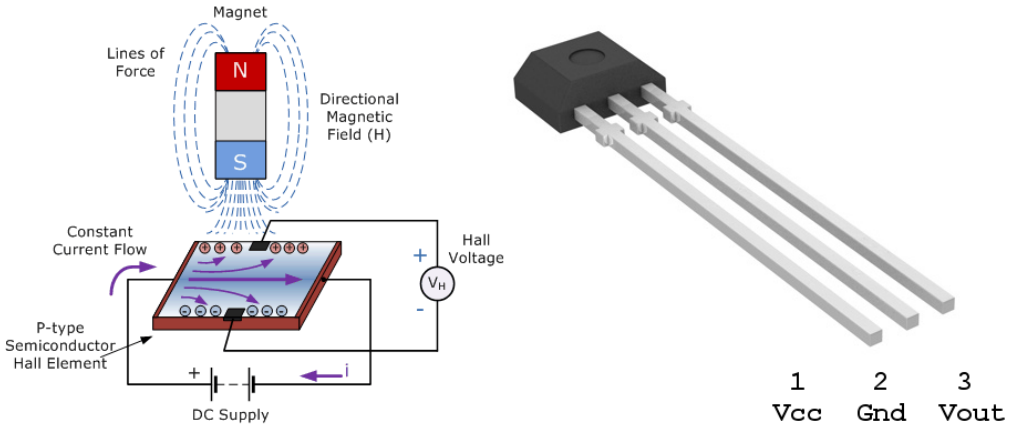

Fig. 2.1 Working and Component diagram for Hall Effect Sensor

2.4 Microcontroller: A microcontroller is an assembly of the all the mandatory components which are used in computer on a single integrated circuit containing an input/output peripherals, processor core and programmable and memory. The circuit includes program memory in the form of OTP ROM or NOR flashes and Ferroelectric RAM. Stereotypically, it also consists of small amount of RAM.

Embedded applications use Microcontrollers which are designed suitably. In various automatically controlled products and devices, such as appliances, power tools, implantable medicinal devices, distant controls, automobile engine control systems, office machineries and other embedded systems. A microcontroller is very cost-effective as it avoids the cost of a separate input/output devices, microprocessor and memory. Microcontrollers make it inexpensive to digitally control even more devices and processes.

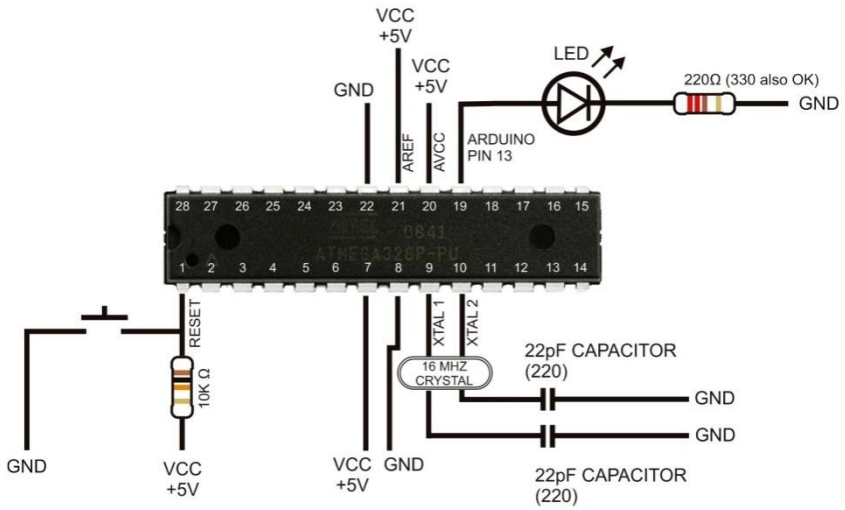

Fig. 2.2 Basic Microcontroller (ATmega328, used in Arduino UNO)

2.5 3.5mm Audio Female Socket: A 3.5mm Audio female socket is a communal family of electrical connector stereotypically used for analog signals, primarily audio. It is cylinder-shaped, archetypally with two, three, four and, lately, five contacts. There are minimum four diverse variabilities of 3.5 mm plugs and jacks, each with its own purpose and application. Three-contact versions are recognized as TRS connectors, where T stands for "tip", R stands for "ring" and S stands for "sleeve". Similarly, two-, four- and five- contact versions are called TS, TRRS and TRRRS connectors respectively.

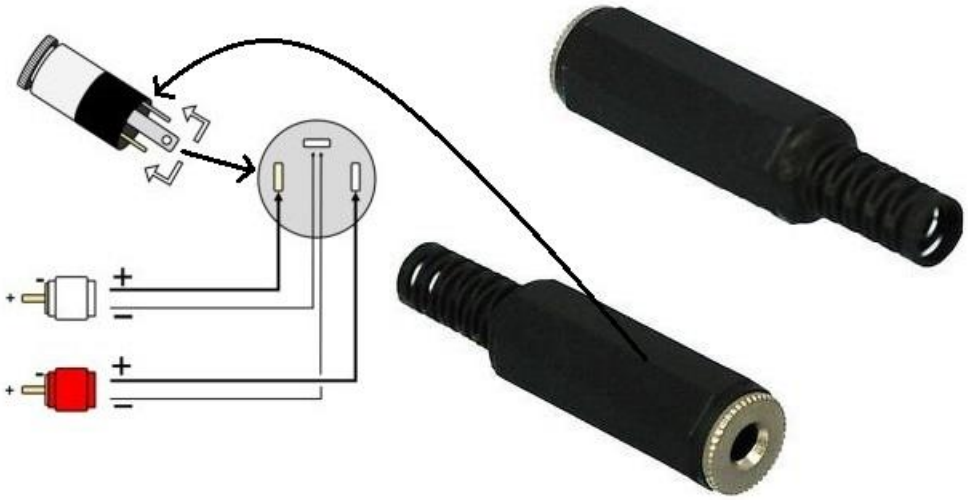

Fig. 2.3 3.5mm Audio Female Socket and its connection

2.6 High-Power Magnets: A magnet is a material or object that produces a magnetic field. This magnetic field is invisible but is responsible for the most distinguished property of a magnet: a force that pulls on other ferromagnetic materials, such as iron, and attracts or repels other magnets.

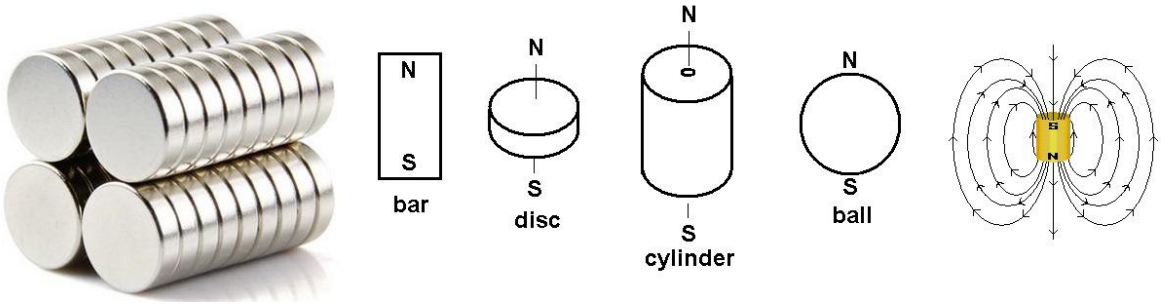

Fig 2.4 Cylindrical Magnet and Magnetic Field

Tri Color LED Array: LEDs are used for the visual assistance for the driver.

III. Proposed System

3.1 System Block Diagram

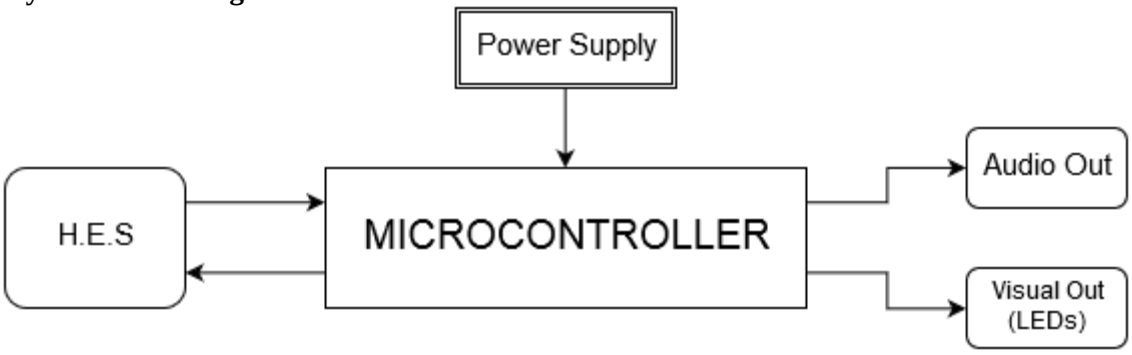

Fig. 3.1 Block Circuit Diagram

3.2 Working of the system

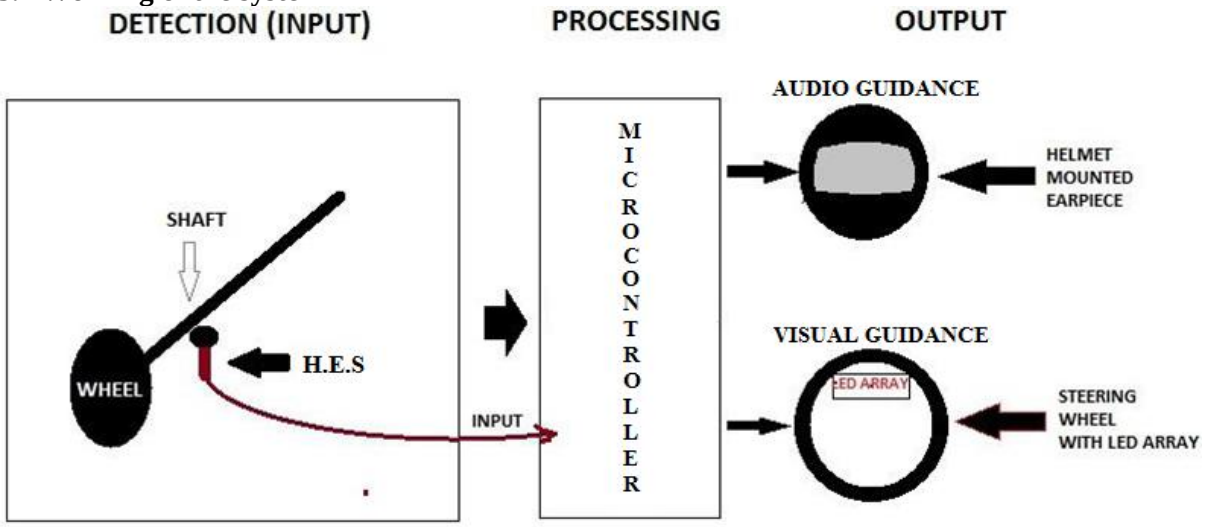

Fig. 3.2 System Working Diagram

This system basically works in three segments whose working is explained below –

3.2.1 Detection (Input)

- Hall Effect Sensor: The Hall Effect sensor receives power from the microcontroller. As discussed above, whenever a magnetic field is applied in a direction perpendicular to the flow of electric current in a conductor, a potential difference is induced. This voltage can thus be used to detect whether the sensor is in the proximity of a magnet or not. Hall Effect sensor senses the poles of the magnets which is attached to the shaft which is placed somewhere on the frame of the vehicle. As the shaft rotates, the magnets on them rotate varying the magnetic field. The Hall Effect sensor sends signals to the microcontroller tracking the each rotation calculating the RPM of the shaft.

3.2.2 Processing

- Microcontroller: Microcontroller will receive the detections made by the Hall Effect sensor in the form of signals. The calculations will be done using coding on the microcontroller. The according to the rpm, the microcontroller will emit signals to the audio socket (output) and the LED placed on the steering wheel.

3.2.3 Output

- Audio Female Socket: The signals which will be received from the microcontroller will be variable depending strictly the rpm of the shaft. The driver can use any earphone with 3.5mm to listen the sound from the audio jack. Distinct ranges of the rpm will be responsible for the emission of high frequency sound which will help the driver to predict the rpm of the shaft.
- LED Array: As per the RPM of the shaft, the LED's of the array on the steering wheel will glow. If the rpm is very high, red LEDs in the LED array glow. Similarly yellow and green LEDs will glow if the rpm is high and normal respectively.

Advantages And Disadvantages

Advantages -

1. Provide more accuracy to the driver.
2. Lowers the chances of accidents.
3. It is more reliable as compared to current systems.
4. In future we can use as an extra facility.

Disadvantages –

It can provide false readings in case of more than one magnetic field detection.

IV. Conclusion

The system we propose will acquaint the driver about the speed and acceleration in an audio format in addition to the visual presentation which will provide better accuracy and precision and enhance his driving skills. This system is applicable mostly for the race-spec vehicles. AVDG can turn out be really useful in case of high speed races.

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