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AI Based Smart Electric Vehicle System

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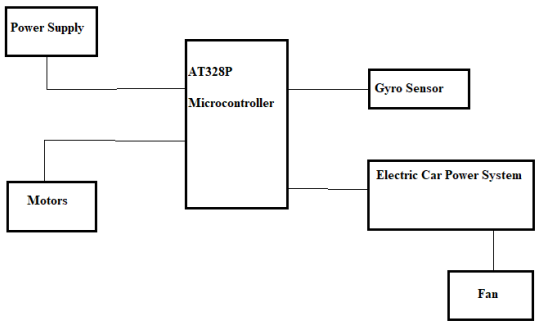
1.ABSTRACT:
This research deals with the design and manufacturing of the smart electric vehicle, which can automatically shift the power transmission from the internal system to the wheels and vice versa by using a gyroscopic sensor and microcontroller in a controlled manner. Nowadays the era of electric vehicles has just started and it will boost up the automobile industry, in such a way that contemporary fossil fuel vehicles are going to become obsolete in next future. The most important thing is that they are environmentally friendly in nature which reduces harmful emissions. The objective of the project is to develop a smart car which automatically shifts its power transmission. For this purpose, we have used the CATIA software (CAD), to design the mechanical components of the system. We used the 12volt regulated power supply circuit, 12volt DC motor. 12volt DC fan, AT328P microcontroller. After that the comparative analysis will be carried out between the experimental and analysis results and after that the result & conclusion will be drawn.

Key Words: Electric vehicle, Smart system in vehicle, AI in electric vehicle

2.INTRODUCTION

Electric cars have several benefits over conventional internal combustion engine automobiles, including a significant reduction of local air pollution, as they do not directly emit pollutants such as particulates (soot), volatile organic compounds, hydrocarbons, carbon monoxide, ozone, lead, and various oxides of nitrogen. Depending on the production process and the source of the electricity to charge the vehicle, emissions may be partly shifted from cities to the material transportation, production plants and generation plants. The amount of carbon dioxide emitted depends on the emissions of the electricity source, and the efficiency of the vehicle. For electricity from the grid, the emissions vary significantly depending on your region, the availability of renewable sources and the efficiency of the fossil fuel-based generation used.
Gyroscope is a device used for measuring or maintaining orientation and angular velocity. It is a spinning wheel or disc in which the axis of rotation (spin axis) is free to assume any orientation by itself. When rotating, the orientation of this axis is unaffected by tilting or rotation of the mounting, according to the conservation of angular momentum. Gyroscopes based on other operating principles also exist, such as the microchip-packaged MEMS gyroscopes found in electronic devices, solid-state ring lasers, fiber optic gyroscopes, and the extremely sensitive quantum gyroscope. Applications of gyroscopes include inertial navigation systems, such as in the Hubble Telescope, or inside the steel hull of a submerged submarine. Due to their precision, gyroscopes are also used in gyro theodolites to maintain direction in tunnel mining. Gyroscopes can be used to construct gyrocompasses, which complement or replace magnetic compasses (in ships, aircraft and spacecraft, vehicles in general), to assist in stability (bicycles, motorcycles, and ships) or be used as part of an inertial guidance system. MEMS gyroscopes are popular in some consumer electronics, such as smartphones.
A microcontroller (MCU for microcontroller unit) is a small computer on a single metal-oxide-semiconductor (MOS) integrated circuit chip. In modern terminology, it is similar to, but less sophisticated than, a system on a chip (SoC); an SoC may include a microcontroller as one of its components. A microcontroller contains one or more CPUs (processor cores) along with memory and programmable input/output peripherals. Program memory in the form of ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications consisting of various discrete chips. Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems.

3.WORKING METHODOLOGY:



The required objective of our system is that when the vehicle is tarted to travel on the inclined roads, the complete power supply must be supplied to the tires of the car by automatically turning off the fan (cooling system designed for the traveler). The frequency and amplitude of on and off of the fan depends on the inclination angle of the road. Hence when the slope is very steep controlling is done in such a way that the maximum power is to be supplied to the wheels. Similarly, when slope is very gentle accordingly minimum extra power is supplied to the rear wheels.

We have done our setup in such a way that, the frame of the vehicle has the gyroscopic sensor. When vehicle starts taking inclined path it sends signal to the microcontroller. The microcontroller is programmed in such a way that it will automatically cuts off the power supplied to the fan, and all the

power supply is concentrated at the wheels. There is also an arrangement made where the driver can turn off the above designed system so that power can be transferred to both fan and wheels.

4.COMPONENTS USED:

a) Frame

The frame is usually made of mild steel. It is strong enough to withstand all types of loads in working condition. All other parts are fitted to the frame. Frame is helping the supporting of the various light load support. Frame shows the good aesthetic loop. every machine should have required the good frame design. Frame material should have high strength because frame balancing of another machine load. in ours project the frame showing important role. the vertical pulley and sprocket are mounted on vertical support of the frame. Main whole project assembly our project mounted on frame. The proper selection of material for the different part of a machine is the main objective in the fabrication of machine. For a design engineer it is must that he be familiar with the effect, which the manufacturing process and heat treatment have on the properties of materials. The Choice of material for engineering purposes depends upon the following factors: Availability of the materials. Suitability of materials for the working condition in service. The mechanical properties of the metals are those, which are associated with the ability of the material to resist mechanical forces and load. We shall now discuss these properties as follows: Strength: It is the ability of a material to resist the externally applied forces Stress: Without breaking or yielding. The internal resistance offered by a part to an externally applied force is called stress.

Properties of Mild Steel: M.S. has a carbon content from 0.15% to 0.30%. They are easily wieldable thus can be hardened only. They are similar to wrought iron in properties. Both ultimate tensile and compressive strength of these steel increases with increasing carbon content. They can be easily gas welded or electric or arc welded. With increase in the carbon percentage weld ability decreases. Mild steel serves the purpose and was hence was selected because of the above purpose

Basic Frame

The hollow square pipes of material of mild steel are selected for the frame. The pipes are cut into required size by cutting machine. The end of the pipes cut into 45 degree (angle) to form rectangular frame. After cutting, the end of the square pipes is grinded so that it became smooth and convenient for welding. The square pipes are welded together to form a rectangular basic frame.

b) Shaft

A shaft is rotating machine element which is used to transmit power from one place to another. The power is delivered to the shaft by some tangential force and the resultant torque (or twisting moment) set up within the shaft a set up within the shaft permits the power to various machines linked up to the shaft. In order to transfer the power from one shaft to another, the various members such as pulleys, gears etc., are mounted on it. These members along with the forces exerted upon them causes the shaft to bending. In other words, we may say that a shaft is used for the transmission of torque and bending moment. The various members are mounted on the shaft by means of keys or splines. The shafts are usually cylindrical, but may be square or cross shaped in section. They are solid in cross section but sometimes hollow shafts are also used.

Material used for shafts

The material used for shaft should have the following properties:

- It should have high strength.
- It should have good machinability.
- It should have low notch sensitivity factor.
- It should have good heat treatment properties.
- It should have high wear resistant properties.

Specifications:

Material: Mild Steel

Form: Rod

Outer Diameter: 12mm

Length: 1000mm

c) Arduino:

Nowadays, with Microcontrollers being relatively cheap and readily available in the market, making a purchase decision on a suitable one to pick might a hard task to handle. However, there's one particular model that's good to start with for users. That model is the ATmega328p, an 8-bit AVR microcontroller. ATmega328P is a high performance yet low power consumption 8-bit AVR microcontroller that's able to achieve the most single clock cycle execution of 131 powerful instructions thanks to its advanced RISC architecture. It can commonly be found as a processor in Arduino boards such as Arduino Fio and Arduino Uno.

Features:

High endurance non-volatile memory segments

- In system self-programmable flash program memory
- Programming Lock for software security

Peripheral features

- Two 8-bit Timer/Counter with separate prescaler, compare mode.
- One 16-bit Timer/Counter with separate prescaler, compare mode, and capture mode
- Temperature measurement
- Programmable serial USART and watchdog timer with separate on-chip oscillator

Unique features compared to other microcontrollers (ARM, 8051, PIC):

- Power-on reset and programmable brown-out detection
- Internal calibrated oscillator
- External and Internal interrupt sources
- Six sleep modes: Idle, ADC noise reduction, power-save, power-down, standby, and extended standby

Advantages:

- Processors are simpler to use, with the usage of 8bit and 16bit instead of 32/64bit which are more complex
- Readily usable without additional computing components with 32k bytes of onboard self-programmable flash program memory as well as 23 programmable I/O lines
- Code Efficient, all 31 registers are directly connected to the arithmetic logic unit (ALU), making it 10 times faster than conventional CISC microcontrollers

Optimized for AVR enhanced RISC instruction set

d) MAA-KU DC12025 Axial Case Cooling Fan. Size(12x12x2.5cm), Supply Voltage: 12VDC

- Supply voltage: - 12 VDC / Power: - 3 watts / Current: - 0.25 ampere
- Model No: - DC12025 / Color: - Black / Speed: - 2400 RPM
- Air volume: - 85 CFM / Noise level: - 35 db
- Fan size: - (4.72 inches square) (120mm x 120mm x 25mm) (12cm x 12cm x 2.5cm)
- Power Connection: - 2-pin.

A fan is a powered machine used to create flow within a fluid, typically a gas such as air. A fan consists of a rotating arrangement of vanes or blades which act on the air. The rotating assembly of blades and hub is known as an impeller, rotor, or runner. Usually, it is contained within some form of housing or case.[1] This may direct the airflow or increase safety by preventing objects from contacting the fan blades. Most fans are powered by electric motors, but other sources of power may be used, including hydraulic motors, hand cranks, and internal combustion engines.
Mechanically, a fan can be any revolving vane or vanes used for producing currents of air. Fans produce air flows with high volume and low pressure (although higher than ambient pressure), as opposed to compressors which produce high pressures at a comparatively low volume. A fan blade will often rotate when exposed to an air fluid stream, and devices that take advantage of this, such as anemometers and wind turbines, often have designs similar to that of a fan.

e) Viper Motor:
- Windshield wiper motors are components in the car, that function on a power supply- with the task of moving wiper blades in a smooth and systematic motion. Just like other motors, the wiper motor functions to rotate continuously in one direction once it is converted to a back-and-forth motion.
- The standard voltage requirement for the wiper motor is 12 volts DC. The electrical system in a running automobile usually puts out between 13 and 13.5 volts, so it's safe to say the motor can handle up to 13.5 volts with no problem.
- Wipers are powered by a small electric motor, usually mounted on the firewall or under the cowl (the area under the windshield's base). The motor activates linkage that moves the wiper arms back and forth. On vehicles with a rear window wiper, a separate motor powers the one in the rear.

Specification
- 12V operating voltage
- 55rpm speed
- 2A free running current
- 10A stall torque
- 120W motor power
- 100m shaft diameter
- 29mm shaft length
- Shaft diameter: 10mm

f) Relay:
The relay consists of a solenoid and a mechanical contactor. When the current is high enough on the input terminal, the solenoid becomes magnetized which forces the contactor to close the power circuit. The multi-channel modules, as the name suggests, have several relays, which allows you to control different electrical devices.

The 4-channel relay module has one row of input pins. The GND pin connects to the ground of the power supply and to the ground of the microcontroller. If the grounds are not connected correctly, the control signals will not be taken into account. The VCC pin connects to the 5V of the power supply and the INx pins are connected to the microcontroller outputs.

g) Gyro sensors:
Gyro sensors, also known as angular rate sensors or angular velocity sensors, are devices that sense angular velocity. The MPU-6050 IMU (Inertial Measurement Unit) is a 3-axis accelerometer and 3-axis gyroscope sensor. The accelerometer measures the gravitational acceleration, and the gyroscope measures the rotational velocity. Additionally, this module also measures temperature. This sensor is ideal for determining the orientation of a moving object.

h) Chain and Sprocket:
Sprockets are rotating parts that have teeth and can be used with a chain and another sprocket to transmit torque. Sprockets and chain can be used to change the speed, torque or direction of a motor. For sprockets and chain to be compatible with each other, they must have the same thickness and pitch.
Roller chain is used to connect two sprockets together and transfer torque. Roller chain is made up of a series of inner and outer links connected together which forms a flexible strand.

5.TYPES OF COST ESTIMATION:
1. Material cost
2. Machining cost

Material Cost Estimation
Material cost estimation gives the total amount required to collect the raw material which has to be processed or fabricated to desired size and functioning of the components. These materials are divided into two categories.
1. Material for fabrication:

In this the material in obtained in raw condition and is manufactured or processed to finished size for proper functioning of the component.
2. Standard purchased parts:

This includes the parts which was readily available in the market like allen screws etc. A list is forecast by the estimation stating the quality, size and standard parts, the weight of raw material and cost per kg. For the fabricated parts.

Machining Cost Estimation
This cost estimation is an attempt to forecast the total expenses that may include manufacturing apart from material cost. Cost estimation of manufactured parts can be considered as judgment on and after careful consideration which includes labor, material and factory services required to produce the required part.

6.BILL OF MATERIAL

COST:

The general procedure for calculation of material cost estimation is after designing a project,

1. A bill of material is prepared which is divided into two categories.
    a. Fabricated components
    b. Standard purchased components
2. The rates of all standard items are taken and added up.
3. Cost of raw material purchased taken and added up.

PROCEDURE FOR CALCULATION OF MATERIAL

7.CONCLUSION:

In this semester, we successfully completed a research paper on smart EV vehicles with the help of research papers. Design and 3D modeling of smart EV vehicles is completed using catia software calculation is done with respect to catia model. The manufactured model was tested and the working of the mechanism was demonstrated successfully.

8.REFERENCES

1] Jihu Zheng, Xin Sun, Lijie Jia, Yan Zhou, "Electric passenger vehicles sales and carbon dioxide emission reduction potential in China's leading markets" published by Journal of Cleaner Production 243 (2020) 11860.

2] Enrico Ferrero, Stefano Alessandrini , Alessia Balanzino , "Impact of the electric vehicles on the air pollution from a highway" published by Applied Energy 169 (2016) 450–45.

3] Shachar Tresser, Izhak Bucher, "Balancing fast flexible gyroscopic systems at low speed using parametric excitation" published by Mechanical Systems and Signal Processing 130 (2019) 452–46.

Sr. No	Material	Material of construction	Quantity	Cost per Unit Rs.	Total cost in Rs.
1	Frame	MS		2000	2000
2	Chain and Sprocket	MS		1200	1200
3	Viper motor	DC 12 Volt	01	1200	2400
4	Battery	12V,5A (Lead acid battery)	01	1200	1200
5	Wheel		04	200	1000
6	ARDUINO		01	800	800
7	Relay	5V	01	250	250
8.	Gyroscope		01	300	300
9.	DC Fan	12V	01	150	150
				Total	**9300**

9.DEMO