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HILL TOP BRAKING SYSTEM IN ELECTRONIC BIKES

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ABSTRACT: *This paper presents the design development and fabrication of the module for driving the two wheelers in the hill station .This braking system is automated for the upward moving vehicle. In this paper there are two phases the first phase deals with slope of bike which is observed using micro -electrochemical systems (MEMS).Motor speed is controlled in the second phase using the data from the sensor. Sensor is interfaced with microcontroller. This system also works on the principle of cadence braking.*

Keywords : Mems sensor, speed control , 12c protocol.

INTRODUCTION

In the advanced world we are all living a machine life. From the sunrise to sunset we are busy with our schedule. We are in need of relaxation time .To fulfil the need we are planning the trip to hilly areas .A four wheeler may be more safety and comfortable for our usage but the time taken for the travel in the hilly area is more compared to two wheeler. There are more accidents occurring in two wheelers mainly in hill station.

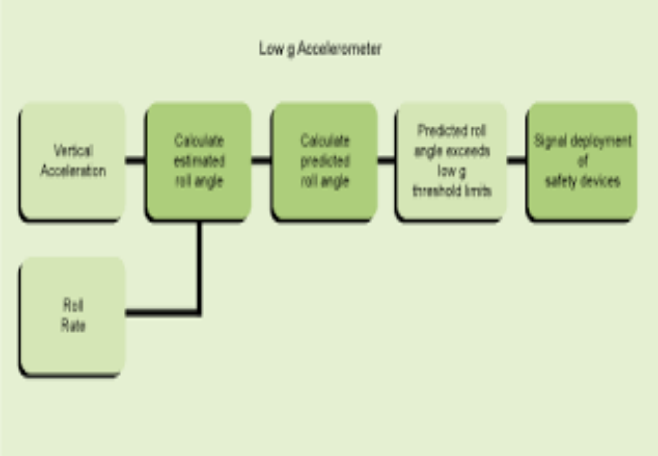
These accidents are occurring mainly due to skidding of wheels and this system prevents from occurring accidents. This system works when the bike is in inclined direction. In this system we used 12c protocol to interface the sensor with the microcontroller.

SYSTEM DESIGN

This system device represents the components in hill top braking system. Every sub divisions are explained separately has follows.

MEMS SENSOR

Micro- electrochemical systems are mainly used with microscopic devices. Particularly those with moving objects .This sensor used in single chip. These sensor used in automotive industry in various fabrication .they have reached great success in various other fields. We have equipped this micro electrochemical system technology in our system. Mems based sensors are now used in phones. Mems technology have enabled inertial sensor to become available on the micro size for the consumer satisfaction. Acceleration is measured in accelerometer, to convert the acceleration into velocity it has to be integrated in the position.



MICROCONTROLLER

In our system we use ATmega32 microcontroller this controller low power CMOS 8bit microcontroller which works on the RISK architecture. By executing powerful instructions in a single clock cycle microcontroller achieves throughputs. Approaching the system designed to the optimize power consumption versus the processing speed. The rich sets of instructions are combined with 32 general purpose working register in the AVR core. All the 32 registers connected to the automatic logic unit (ALU). This allows to independent registers to be access in single clock cycle. This architecture is more efficient than conventional microcontroller in CYSC architecture.

ATmega32 FEATURES

- 32k bytes in programmable flash memory
- 1024 bytes EEPROM
- 2k bytes SRAM
- 32 general purpose registers
- JTAG interface
- serial programmable USART
- 2wire serial interface
- 8 channel

- 10 bit ADC
- programmable watch dog timer
- SPI serial port

ACCELEROMETER

In this system we are using AdxL355 accelerometer. The accelerometer is very small, thin and in compact size . it works in very low power supply. This measures the acceleration in the full scale range . it can also measure the static acceleration of the gravity in the inclined applications.

QUADRUPLE HALF H – DRIVERS

L293 and L293D are the two quadruple high current half H-drivers are used in the system. They are bidirectional drive current of up to 1 ampere at voltages from 4.5 v to 36 v. It is also designed for the bidirectional drive current drive which drives up to 6000 MA at voltages from the 4.5v to 36v.Both the devices are used in the high power applications similar like the solenoids, dc and bipolar stepping motors, as well as high power applications, relays and also in the high power load voltage supply. Every output is totem pole drive circuit, the pseudo Darlington source sinks with the Darlington transistor. When the inputs are high the associated drivers are enabled. And also tha outputs are active with the phase of the inputs. When the proper inputs are given the two pairs are joined to make the full H (bridge) reversible drive which suits the motor

POWER SUPPLY

Reference to source of the electric power 2.5 power supply unit power is recommended. This section is used to transform the AC signal to DC signal. It also reduces the amplitude of the signal.

This transformer converts 230v AC signal to 12 v AC signal.

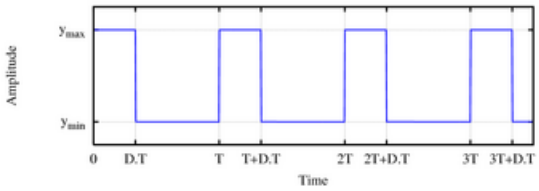
Equation of transformer

$$\frac{V_S}{V_P} = \frac{N_S}{N_P}$$

Ideal Power Equation of a Transformer
P Incoming = IpVp = POutgoing = IsVs

MODULATED PULSE

Pulse-width modulation (PWM) of power source involves the modulation of its duty cycle, to convey information over a communications channel . Pulse-width modulation uses a square wave. pulse width is modulated resulting in the variation in the waveform. It also control the amount of power sent to the load



we know that waveform f(t) with the lowest value of Ymax and average value of duty cycle

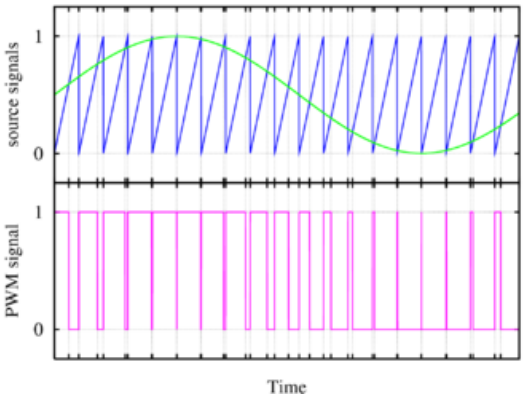
$$\bar{y} = \frac{1}{T}\int_0^T f(t)\,dt.$$

F(t) is a square wave form,Ymax is

$$0 < t < D \cdot T$$

The above expression becomes as the

$$\begin{aligned} \bar{y} &= \tfrac{1}{T}\left(\int_0^{DT} y_{max}\,dt + \int_{DT}^{T} y_{min}\,dt\right) \\ &= \tfrac{D\cdot T\cdot y_{max} + T(1-D)y_{min}}{T} \\ &= D\cdot y_{max} + (1-D)\,y_{min}. \end{aligned}$$



WORKING

Power Supply is given to the System. The step down transformer converts 230V AC supply to 12V AC supply. Then it is sent to bridge rectifier that converts the 12V AC to a 12V DC supply. This DC supply is converted from pulsating DC to a pure DC supply by passing through the filer . Voltage regulator regulates the 12V DC supply is converted to 5V DC supply. This 5V DC supply is given to 40th pin of the Microcontroller, 9th pin is used for the RESET button, LCD segment and driver IC (L293D). The port C in the microcontroller is connected to a pull up resistor and also interfaced with LCD display. MEMS sensor is given to Port A and the L293D driver IC is

connected to port D. MEMS sensor are interfaced to micro controller using I2c protocol. Microcontroller receives the data from the sensor and processes the data according to the sensor .Appliances are operated. The output sensor is given to the Microcontroller. It converts into digital data. The output from the microcontroller is in the LCD display and accordingly the driver IC help in driving the motor. The driver IC is connected to the port D of the microcontroller. The direction of the motors and the speed control of the motors are controlled by the driver circuit. The motor are connected to the wheels of the vehicle and as the speed changes the vehicles starts moving. As the vehicle moves sensor displays the difference in the acceleration in the LCD.. As the bike climbs up the hill the speed of the motor speed changes as there is a change in the acceleration, values in the X and Y plane. This speed is changed as it is already mentioned in the source code .Accordingly when the given acceleration values are reached the braking system is applied by decreasing the speed of the vehicle.

OBSERVATION

This hill top braking system is only used when the bike is in the inclined direction and also in the time of skidding. The MEMS sensor is used to measure the inclined angle in the x and y direction and it also measures the value of the acceleration and sends to the microcontroller. And those data are processed by the microcontroller. The output is displayed on the LCD across the values of the speed of the motor in the x and y directions. Motor speed is measured in the RPM

CONCLUSION

The design, development and fabrication on the hill top braking system are completely a working prototype. This prototype is fabricated with the existing hardware components in the market. Every components used is explained and reasoned for the best performance. In future this may prevent the bike from the accidents and the regenerative braking can be used in the braking.

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