ABSTRACT

Automobiles have been used to move human beings or things and the automobile technology has been developed within the last few years. The traffic accidents are increasing as automobile production has been increasing. The number of casualties during the vehicle accidents is very large as compared to the other causes of death. It is important to prevent accidents and to protect the driver and pedestrian when accidents occur. Though there are different causes for these accidents but proper technology of braking system and technology to reduce the damage during accident (such as pneumatic bumper system) can be effective onthe accident rates. Therefore, pre-crashing system is demanded. Automotive safety has gainedan increasing amount of interest from the general public, governments, and the car industry. The pre-crash system is to prevent accidents on roads with poor visibility by using sensor network to find invisible vehicles, which are to be detected by autonomous on- vehicle sensors.The pre-crashing system is processing the sensor data and controlling the vehicle to prevent accidents and accidents caused by careless driving. The pneumatic system is simple and easy in operation and hence can be used in automation industry.

In this project we have tried to develop a demonstration model for the pneumatic bumperand braking system

INDEX

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

The technology of pneumatics has gained tremendous importance in the field of workplace rationalization and automation from old-fashioned timber works and coal mines to modern machine shops and space robots. It is therefore important that technicians and engineers should have a good knowledge of pneumatic system, air operated valves and accessories.

The aim is to design and develop a control system based on intelligent electronically controlled automotive bumper activation system is called "AUTOMATIC PNUEMATIC BUMPRR ".

This system is consisting of IR transmitter and Receiver circuit, Control Unit, Pneumaticbumper system. The IR sensor is used to detect the obstacle. There is any obstacle closer to thevehicle (within 4 feet), the control signal is given to the bumper activation system. The pneumatic bumper system is used to product the man and vehicle. This bumper activation system is only activated the vehicle speed above 40-50 km per hour. This vehicle speed is sensed by the proximity sensor and this signal is given to the control unit and pneumatic bumper activation system.

CHAPTER 2

LITERATURE SURVEY

The author, **Mr. S. N. Sidek and M. J. E. Salami** [1] has published paper "Hardware implementation of intelligent braking system". In this paper it is concluded that, TMS320LF2407 is an efficient processor to handle the task to control the intelligent braking system. The on-board peripherals reduce the cost of additional component and the architecture allows real time control. The performance of the processor can be enhanced if there is special fuzzy logic instruction set available in the software kernel of the processor.

The author, **Milind S. Deotale, Hrishikesh Shivankar** [2] has published paper "Review on Intelligent Braking System". The have reviewed, Road accidents are a commonplace in today's scenario. Accident prevention has been one of the leading areas of research. In Indian scenario normally vehicles are equipped with ABS (Anti-Lock Braking System), traction control, brake assist etc. for driver's safety. This paper focuses on a system known as 'Intelligent braking system' (IBS) which employ several sensors to respond when emergency conditions occur. The system includes an infrared wave emitter provided on the front portion of the car. An infrared receiver is also fitted to receive the signal. The reflected wave gives the distance between the obstacle and the vehicle. Then a microcontroller is used to detect the pulses and apply brakes to the vehicle.

The author, **G.V. Sairam, B. Suresh** [3] has published paper "Intelligent Mechatronic Braking System" In this paper author has given, currently vehicles are often equipped with active safety systems to reduce the risk of accidents, many of which occur in the urban environments. The most popular include Antilock Braking Systems (ABS), Traction Control and Stability Control. All these systems employ different types of sensors to constantly monitor the conditions of the vehicle, and respond in an emergency situation. In this paper the use of ultrasonic sensors in safety systems for controlling the speed of a vehicles proposed. An intelligent mechatronic system includes an ultrasonic wave emitter provided on

The front portion of a car producing and emitting ultrasonic waves frontward in a predetermineddistance. An ultrasonic receiver is also placed on the front portion of the car Operatively receiving a reflective ultrasonic wave signal. The reflected wave (detected pulse) gives the distance between the obstacle and the vehicle. Then a microcontroller is used to control the speed of the vehicle based on the detection pulse information to push the brake pedal and apply brake to the car stupendously for safety purpose.

J. T. Wang General Motors Corporation [4] United States, Paper No.050144, An extendable and retractable bumper (E/R bumper) is presented in this paper. The IR bumper is intended to automatically extend in situations in which there is a high risk of frontal impact to prepare the vehicle for crash and retract when the risk subsides. A functional demonstration vehicle and two experimental vehicles were built with the E/R bumper. Analytical and nonlinear finite element models were used to aid in the design of these vehicles, and to predict their crash performance in full, offset and oblique impact tests. While the functional demonstration vehicle was used to study its control and operation sequences, the experimental vehicles were crashed in a 56kph rigid barrier impact test and a 64kph 40% Offset Deformable Barrier impact test. These crash tests, together with nonlinear finiteelement analysis, showed that the additional crush space realized by extending the bumper could reduce the severity of the crash pulse and the amount of structural intrusion to the vehicle compartment.

Mr. Nivesh Thepade [5] in almost all of the cases of vehicle accidents, the basic reason cited is failure to apply the brakes at the right time. If the brakes are applied ate right time the accidents can be prevented. Automation can assure higher reliability of braking as compared to fully manual braking. The use of pneumatic system can prove to be useful in automation due to its simplicity and ease of operation. So, the aim is to design and develop a system based on automatic control of vehicle. So, we aim to design "Intelligent Braking system with Pneumatic Bumper".

CHAPTER3

Problem Statement:

There is various mechanism operated for breaking the system like ABS, pneumatic breaking, hydraulic breaking etc. but all this mechanism which given above its totally manually operated. Whenever the obstacle come in front of vehicle the man presses the brake pedal by which the car stop that is all breaking mechanism receive input from the driver so it called manual operated. But man is failing to give power input because whenever the obstacle comein front of vehicle the man is unable to stop the car. He becomes mazy and he unable to judgment therefore the breaking mechanism is unable to work properly and the car driver is unable to decreases the car damage. Now we use the pneumatic bumper. The pneumatic bumper having a specific capacity when the force of accident is very high that time bumper isunable to protect the car damage. So, this system is unable to reduce the damage of human being and cars.

Figure 3.1 Car damage due to non-availability of bumper

Figure 3.2 Car with bumper system

OBJECTIVES: -

- To decreases the rate of car accident.
- To increases the response of braking system.
- To increases the sureness of people who fear from accident.
- We are trying to protect car damage from road accident.

SCOPE:-

- This system is suitable for all types of vehicles like cars, trucks, bus, etc.
- Vehicle will stop at r
- Right time by this mechanism and prevent from accident.
- System also able to protect the car before collapse and protect the life of people.

Need for This System

1. **Accidents:**

Accidents are resulting in loss of invaluable lives, materials and money. So far, the accident preventing systems are not very efficient and the loss of lives is continuing. There are many systems like air bags, GPS, robot driven cars, tracked cars etc. which can avert accidents to some extent.

Causes of Accidents:
There are many causes of accidents. Some of them are

- Ignoring traffic rules
- Drunk and driving
- Dream driving
- Mechanical failures in the vehicle
- Mistakes of the drivers

In all these cases the basic reason cited is failure to apply the brakes at the right time. In all the above cases if the brakes are applied at the right time the accidents can be averted. If a system is developed, which applies the brakes at the time of accidents automatically will avert accidents, which are caused by all the above reasons. This project aims to overcome themistake made by the drivers and at the time of accidents the system takes control of the vehicleand brings the vehicle to stop before colliding.

Our Vision

Braking distance of a vehicle for a particular speed is the distance at which

The vehicle comes to a halt from the current speed from the point of application of the brakes. Here the speed of the vehicle is sensed and the corresponding braking distance is calculated using a microcontroller. The distance of the obstacle in front is also sensed. The microcontroller compares the two distances. If the distances are within critical limits, the microcontroller activates the brakes and slows down the vehicle or brings the vehicle to a haltbefore the obstacle thus avoiding the collision.

In the case of moving vehicles, if the vehicle goes very close to the vehicle in front, the system will apply the brakes and will maintain a safe distance between the two vehicles the concepts of microcontroller -controlled automatic braking system prevents accidents to great extent. The distance of the obstacle in the front is continuously sensed and it is given asinput to microcontroller. Simultaneously the speed of the vehicle is sensed and given to the microcontroller. The program in the microcontroller judges the position of the vehicle and if the vehicle is within the critical limits, then the brakes will be activated automatically.

CHAPTER 4

Proposed work in project

This project will undergo through following six phases

Phase I: Literature Survey

A detailed literature survey will be carried out in the related area. Majorly the selected project is come under Industrial field influence, so in this phase we will do industrial visit where these types of bearings are using is involved.

Phase II: Concept Generation

In this phase, we are going to do schematic arrangement design and drawing of major component which we can use for completion of our project. In this phase we will generate the schematic drawing on the basis of problem statement and feedback and suggestion received from end customer and vendors.

Phase III: Design calculations

In this phase we are going to do the design calculations by referring the standards, catalogue and reference books. In this work we will finalize the design and components dimensions. We are also select the material according to parts and components function and loading conditions. In this phase we will decide the size and shape of components and its position in the assembly. Also, we will decide the limit and tolerance between components and also machining methods required to select to manufacture the components.

Phase IV: Preparation of Drawings

In this phase we are going to prepare the design. The suitable component and assembly drawings will be prepared which will help visualize the actual project set up. In this phase we will prepare the drawing as per industrial format.

Phase V: Structural Analysis of the Critical Components

In this phase we will do analysis of one component which is under critical loading condition. And by doing analysis we can decide the final dimensions and material of the component.

Phase VI: Fabrication

- Manufacturing of various components and subassemblies will be carried out by using suitable manufacturing processes.
- The components will be assembled per the drawing.
- Working trials of the project will be conducted to confirm and testing parameters(Time and speed) we will decide for to get best quality of product.

Phase VII: Experimental Investigations

The fabricated platform will be tested for the suitability to the intended application.

Experimental set up:-

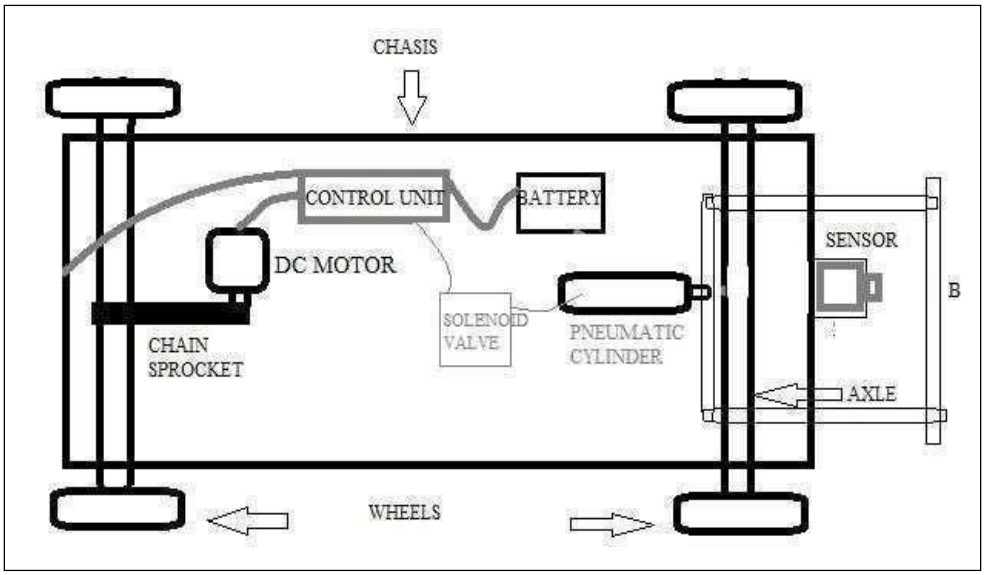


Fig: - 4. 1 Proposed project system.

Working Operation:-

The vehicle speed is sensed by the proximity sensor. The vehicle speed is above the 40-50 Km per hour, the control unit will activate the US sensor Unit. The **US TRANSMITTER** circuit is to transmit the Infra-Red rays. If any obstacle is there in a path, the Ultra Sonic waves reflected. This reflected Infra-Red rays are received by the receiver circuit is called "**US RECEIVER".** The US receiver circuit receives the reflected US waves and giving the control signal to the control circuit. The control circuit is used to activate the solenoid valve. If the solenoid valve is activated, the compressed air passes to the Pneumatic Cylinder. The compressed air activates the pneumatic cylinder and moves the piston rod. If the piston moves forward, then the bumper arrangement activated. The piston speed is varied by adjusting the valve is called **"FLOW CONTROL VALVE".** In our project, we have to apply this arrangement in one wheel as a model. The compressed air is drawn from the compressor in our project. The compressed air is flow through the Polyurethane tube to the flow control valve. The flow control valve is connected to the solenoid valve as mentioned inthe block diagram.

Specification

These machines are small enough to operate with PMDC (Permanent Magnet Direct Current) Motor.

1. **Function:** material handling trolley.
2. **Specification:**
   - **Type:** Mechanical mechanism with pneumatic interface.
   - **Power: -** Motor operated.
   - **Man power requirement:-** No Requirement
   - **Overall dimensions(Tentative):** 600 x 450 x 300 height mm
   - **General Information:**

The machine consists of a structure for holding and IR sensors for start and stop the motor.

CHAPTER 5

Theory

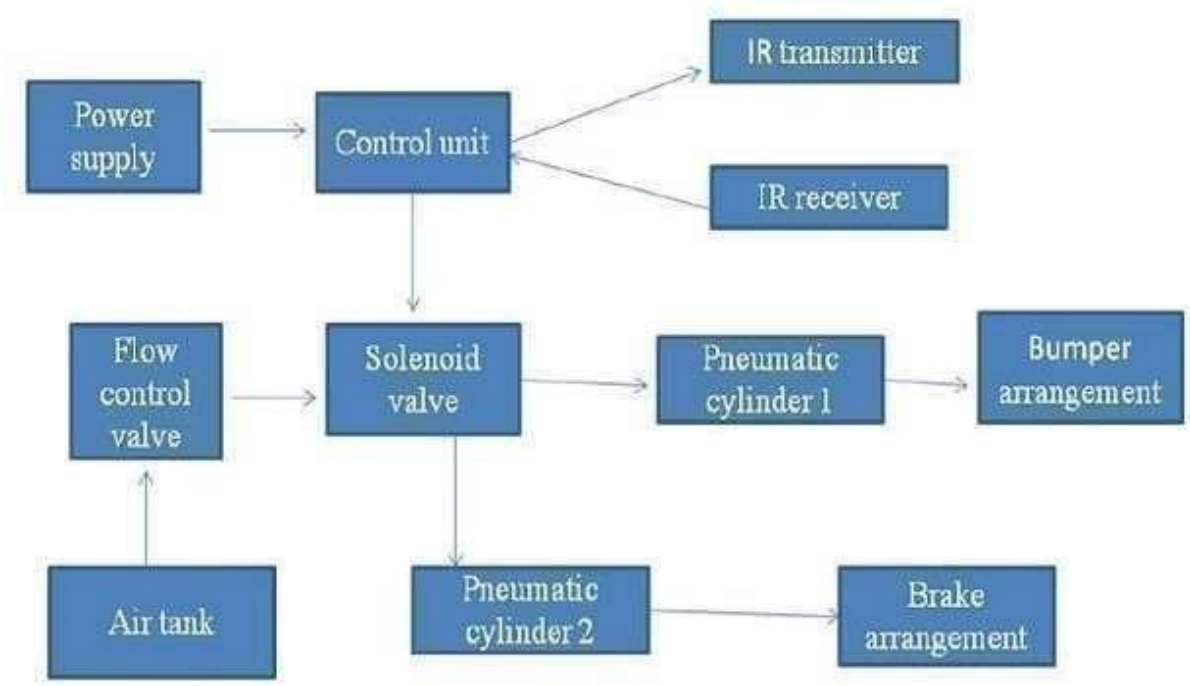


Fig. 5.1 Safety of System

Introductions to Safety System

The aim is to design and develop a control system based on pneumatic braking system of an intelligent electronically controlled automotive braking system. For comparison of iterative technologies / techniques. The final phase of the new modern vehicle shall include:

- Development of improved ABS control system
- Development and assessment of an electro-hydraulic system
- Individual wheel braking combined with traction control
- Assessing sensor failure and fault tolerant control system design
- Preliminary studies into an electrically actuated system
- Re-engineering using simplified models.

PNEUMATICS

The word „pneumatic" comes from Greek and means breather wind, for automation. Pneumatic systems operate on a supply of compressed air which must be made available in sufficient quantity and at a pressure to suit the capacity of the system. When the pneumatic system is being adopted for the first time, however it wills indeed the necessary to deal with the question of compressed air supply.

Components and description

Single acting pneumatic cylinder the cylinder is a Single acting cylinder one, which means that the air pressure operates forward and backward strokes. The air from the compressor is passed through the 3/2 solenoid valve which controls the pressure to required amount by adjusting its knob. A pressure gauge is attached to the air storage tank for showingthe pressure.

Figure 5.2 Single Acting pneumatic cylinder

Solenoid valve the directional valve is one of the important parts of a pneumatic system.A solenoid valve is an electromechanically operated valve. The valve is controlled by an electric current through a solenoid. In the case of a two-port valve the flow is switched onor off, in the case of a three-port valve, the outflow is switched between the two outlet ports.

Figure 5.3 solenoid valve

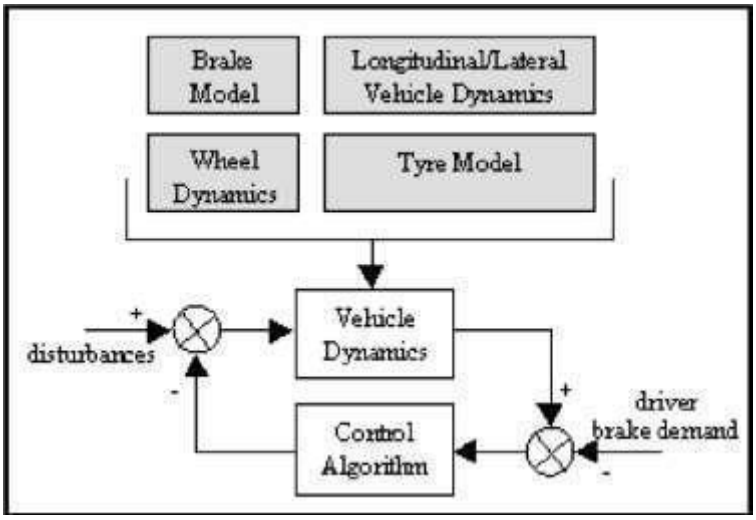


Figure 5.4 Automation

The volume expressed is that of the air at intake conditions namely atatmospherepressure and normal ambient temperature. The usual written asPV = C (or) $P_1V_1 = P2V2$

In this equation the pressure is the absolute pressured which for free.

Ultrasonic sensor

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonicpulses that relay back information about an object's proximity. High-frequency sound wavesreflect from boundaries to produce distinct echo patterns.

Figure 5.5 Ultrasonic sensor

Ultrasonic sensors work by sending out a sound wave at a frequency above the range ofhuman hearing. The transducer of the sensor acts as a microphone to receive and send the ultrasonic sound. Our ultrasonic sensors, like many others, use a single transducer to send a pulse and to receive the echo. The sensor determines the distance to a target by measuring time lapses between the sending and receiving of the ultrasonic pulse.

Characteristics of Optical Sensor:

The working principle of this module is simple. It sends an ultrasonic pulse out at 40 kHz which travels through the air and if there is an obstacle or object, it will bounce back to the sensor. By calculating the travel time and the speed of sound, the distance can be calculated.Ultrasonic sensors are a great solution for the detection of clear objects. For liquidlevel measurement, applications that use infrared sensors, for instance, struggle with this particularuse case because of target translucence. For presence detection, ultrasonic sensors detect objects regardless of the color, surface, or material (unless the material is very soft likewool, as it would absorb sound.)To detect transparent and other items where optical technologies may fail, ultrasonic sensors are a reliable choice.

Elements Distance measurement is based on the measurement of time-of-flight. The time between sending and receiving the reflected sound signal is calculated by the sensor. Ultrasonic distance sensors, like the MB7360 HRXL-Masonry-WR, are used as heightmonitors, in bin-level measurement and proximity zone detection applications.

US transmitter and US receiver

Much like a bat emits the ultrasonic chirp from its mouth and then hears the response with its ears, ultrasonic sensors also have a transmitter and receiver. Typically, these two are placed in close proximity to minimize any errors as the expectation is that the sound wave will be traveling in a straight line. Ultrasonic transceivers are another available option, whereboth the transmitter and receiver are combined into a single unit.

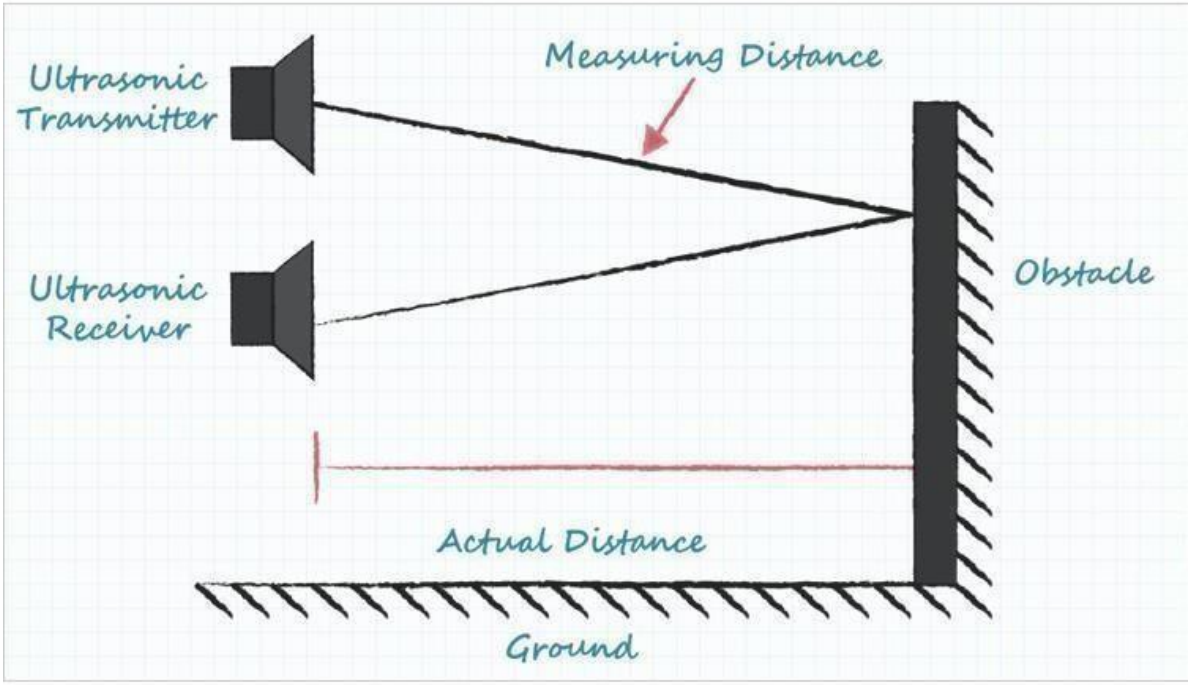


Figure 5.6 Ultrasonic Transmitter

COMPONENTS AND DESCRIPTION:-

I) Selection of Pneumatics:

Mechanization is broadly defined as the replacement of manual effort by mechanical power. Pneumatics is an attractive medium for low-cost mechanization particularly for sequential or repetitive operations. May be economic and can be advantageously applied to other forms of power).The main advantages of an all-pneumaticsystem are usually economy and simplicity, the latter reducing maintenance to a low level.It can also have outstanding advantages in terms of safety.

II) Pneumatic Components and Its Description

The pneumatic bearing press consists of the following components to fulfill the requirements of complete operation of the machine. 1. Pneumatic single acting cylinder, 2Solenoid valve 3. Flow control valve 4. IR sensor 5.unit Wheel and brake arrangement
PU connector, 7.reducer, 8.hose 9.collar 10.Stand 11.Single phase induction motor.

III) Pneumatic Single Acting Cylinder:

Pneumatic cylinder consists of A) Piston B) Cylinder the cylinder is a Single acting cylinder one, which means that the air pressure operates forward and spring returns backward.The air from the compressor is passed through the regulator which controls the pressure to required amount by adjusting its knob. A pressure gauge is attached tothe regulator for showingthe line pressure. Then the compressed air is passed through the single acting 3/2solenoid valve for supplying the air to one side of the cylinder.

IV) One hose take the output of the directional Control (Solenoid) valve:

They are attached to one end of the cylinder by means of connectors. One of the outputs from the directional control valve is taken to the flow control valve from taken to thecylinder. The hose is attached to each component of pneumatic system only by connectors.

Stroke length: Cylinder stoker length 160 mm = 0.16 m, Quantity: 1,

Seals: Nitride (Buna-N) Elastomeric,

End cones: Cast iron,

Piston: EN – 8

Media: Air

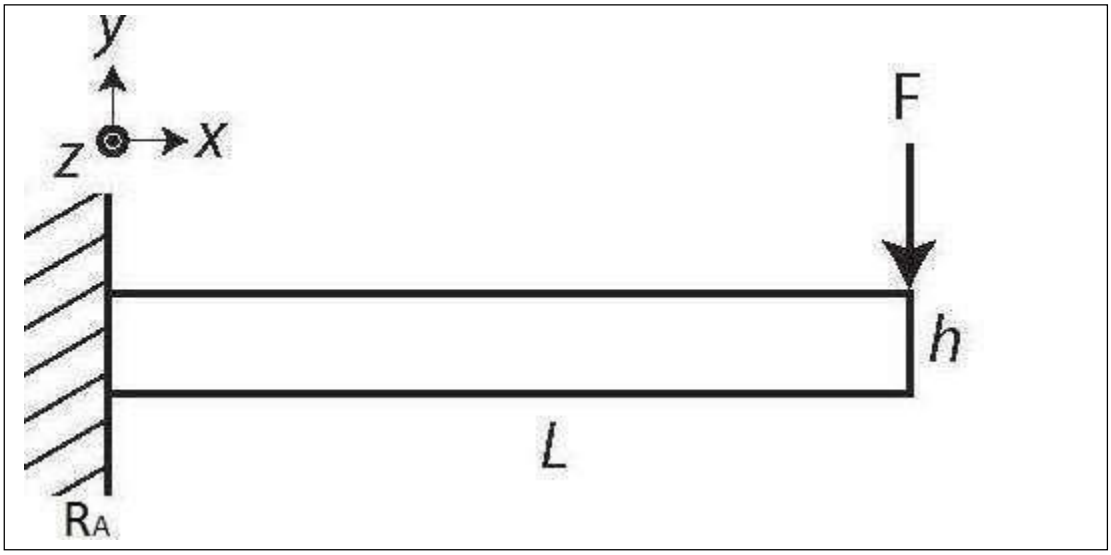
Temperature: 0 - 80 ºC

Pressure Range: 8 N/m².

CHAPTER 6

Design of experiment set up

6.1 Design of drive shaft:



In the proposed mechanism we have used two stub shafts, Stub shaft for to rotatewheels Load on shaft considered= 50 kg = 500N

Considered speed of machine N =30 rpmRadius of wheel = 50mm

6.1.1 Design of drive shaft.Selection of motor-

The load considered = 50 kg = 500NThesprocket Diameter D = 100mm

So Maximum Torque T = Effort x Radius of wheel Total torque on sprocket shaft = 500 x 50 = 25000 N-m

we know power

$$P = \frac{2\pi \times N \times T}{60}$$

P = 75 watt

By considering application and extra jerk and safe design prime mover power considered

= 180 watts

As per Design data book shaft material is selected Carbon steel

$C40 \Rightarrow Sut = 580\ N/mm^2 \quad Yield = 330 N/mm^2$

C40σ = 145 N/mm2 as

Per ASME code

0.3 X Yield strength N/mm2

0.18 X ultimate strength N/mm2} whichever is smaller

0.3 x 330 = 99 N/mm2 ..... (a)

0.18 x 580 = 104 N/mm2 ..... (b)

From equation (a) & (b) Allowable stress value will be 99 N/mm2If key ways willprovide to shaft then τ

= 99 x 0.75 = 74.25 N/mm2

Max torsional moment equation is given by

we know,

$$T_e = \frac{\pi}{16} d^3 \tau$$

Where T = 2500 N-mm

By using above equation drive shaft diameter d = 8.02 mm..... A

We know that,

Max bending moment equation is given by

we know,

$$M = \frac{\pi}{32} d^3 \sigma$$

The Radial load at end point is considered maximum considered = 150 N

As per ergonomically consideration the one person can apply the radial load = p = 150N P

= 150 N

FY =0 □

As per consideration total load on wheel will be = 150N RA =150I

The length of stub shaft = L = 100 mm

Calculation of bending moment at loading point P,BM at M = 150 x 100 = 15000 N-mm

we know,

$$M = \frac{\pi}{32} d^3 \sigma$$

б = 145 N/ mm2 considering factor of safety = 4

By using above equation drive shaft diameter d = 12.85mm ..... B

From equation A and B, we have selected the diameter of shaft = 20mm consideringextra jerk and for safe design.

According to maximum shear stress theory,

Equivalent Torque :-

$$T_e = \sqrt{(K_b M_A)^2 + (K_t T)^2}$$

From design data book service factor K_b & $K_t = 1$.

Equivalent bending moment

$$M_e = \frac{1}{2}\left[M + \sqrt{(K_b M_A)^2 + (K_t T)^2}\right]$$

Te = 16770 N-mmMe=23385N-mm

we know,

$$T_e = \frac{\pi}{16} d^3 \tau$$

we know,

$$M = \frac{\pi}{32} d^3 \sigma$$

ζ = 10.67 < 74 N/mm2

б = 93.25< 145 N/mm2

Design of Chain Drive:-

From below table we have determined which chain type is applicable for drive

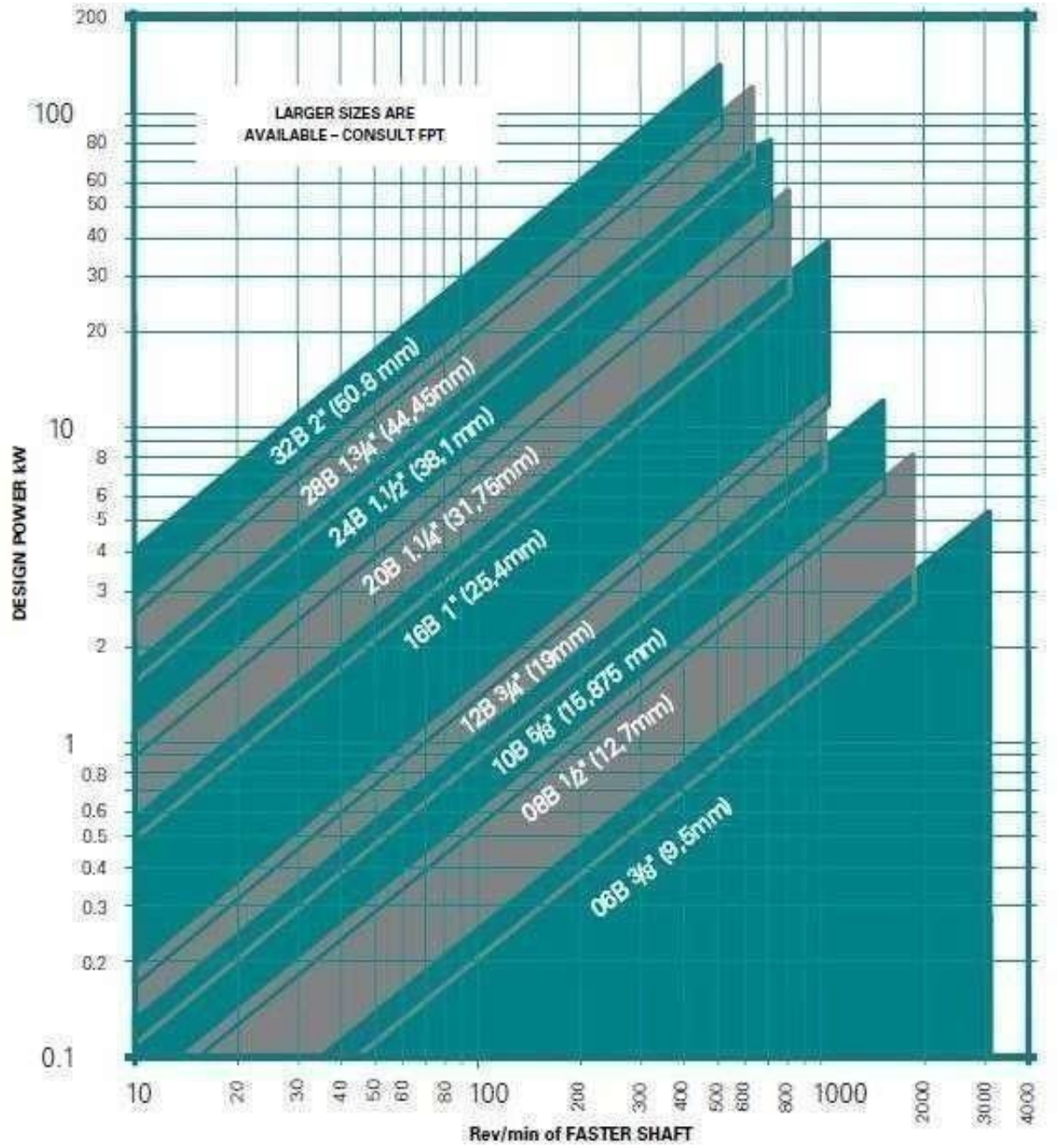
	TYPES OF PRIME MOVER					
	'Soft' starts			'Heavy' starts		
	Electric motors: A.C. – Star-delta start D.C. – Shunt wound Internal combustion engines with 4 or more cylinders. All prime movers fitted with centrifugal clutches, dry or fluid couplings.			Electric motors: A.C. – Direct-on-line start D.C. – Series and compound wound. Internal combustion engines with less than 4 cylinders.		
	Hours per day duty					
TYPES OF DRIVEN MACHINE	10 and under	Over 10 to 16	Over 16	10 and under	Over 10 to 16	Over 16
Light Duty Agitators (uniform density). Belt conveyors (uniformly loaded).	1.0	1.1	1.2	1.1	1.2	1.3
Medium Duty Agitators and mixers (variable density). Belt conveyors (not uniformly loaded). Kilns, Laundry machinery, Lineshafts, Machine tools, Printing machinery, Sawmill and woodworking machinery, Screens (rotary).	1.1	1.2	1.3	1.2	1.3	1.4
Heavy Duty Brick machinery, Bucket elevators, Conveyors (heavy duty), Hoists, Quarry plant, Rubber machinery, Screens (vibrating), Textile machinery.	1.3	1.4	1.5	1.5	1.6	1.7

Table 6.1 Types of Driven Machine

From above table as per application and speed, we have selected the service factor = 1.3

Design power required = 23.56 x 1.3=30.62 watt

By considering application and extra jerk and safe design prime mover power considered = 360 watts



Graph 6.1 Design of power by faster shaft

From chart 10B 5/8" chain drive is selected. Here in our project the speed reduction is not involved due to conveyor type application. The 30 rpm is considered. The chain selected Simplex, 19 teeth, 15.87 mm pitch is selected.

06B 3/8" (9,5mm) PITCH

Rev/min faster Shaft	19 Tooth Simplex	Duplex	Triplex	Type of Lubrication
20	0.06	0.10	0.15	1
40	0.11	0.19	0.27	
60	0.16	0.27	0.40	
80	0.20	0.34	0.50	
100	0.25	0.43	0.62	
200	0.46	0.78	1.15	
400	0.86	1.46	2.15	2
600	1.24	2.11	3.10	
800	1.60	2.72	4.00	
1000	1.96	3.33	4.90	
1200	2.31	3.93	5.77	
1400	2.65	4.51	6.62	
1600	2.99	5.10	7.47	
1800	3.33	5.66	8.32	
2000	3.66	6.22	9.15	
2200	3.99	6.78	9.97	3
2400	4.31	7.33	10.77	
2600	4.63	7.87	11.57	
2800	4.95	8.42	12.37	
3000	5.27	8.96	13.17	

08B 1/2" (12,7mm) PITCH

Rev/min faster Shaft	19 Tooth Simplex	Duplex	Triplex	Type of Lubrication
10	0.07	0.12	0.17	1
20	0.14	0.24	0.35	
30	0.20	0.34	0.50	
40	0.26	0.44	0.65	
50	0.31	0.53	0.77	
60	0.37	0.63	0.92	
70	0.42	0.71	1.05	
80	0.48	0.82	1.20	
100	0.58	0.99	1.45	
200	1.09	1.85	2.72	
300	1.57	2.67	3.92	2
400	2.03	3.45	5.07	
500	2.48	4.22	6.20	
600	2.92	4.96	7.30	
800	3.78	6.43	9.45	
900	4.63	7.87	11.57	
1200	5.45	7.27	13.62	
1400	6.26	10.64	15.65	
1600	7.06	12.00	17.65	3
1800	7.85	13.35	19.62	

10B 5/8"(15,875 mm) PITCH

Rev/min faster Shaft	19 Tooth Simplex	Duplex	Triplex	Type of Lubrication
10	0.13	0.22	0.33	1
20	0.25	0.43	0.63	
30	0.36	0.61	0.89	
40	0.46	0.78	1.15	
50	0.57	0.96	1.40	
60	0.67	1.13	1.66	
70	0.76	1.29	1.90	
80	0.86	1.47	2.15	
100	1.07	1.78	2.62	
200	1.96	3.33	4.90	
300	2.88	4.80	7.05	2
400	3.65	6.21	9.13	
500	4.55	7.60	11.17	
600	5.25	8.94	13.15	
800	6.81	11.58	17.03	
900	7.76	13.19	19.40	
1000	8.33	14.16	23.33	
1200	9.81	16.68	24.42	
1500	12.01	20.42	29.90	3

To find the Chain length in pitches, use the formula below.

$$L = \frac{2C}{P} + \frac{T + t}{2} + \frac{KP}{C}$$

L = Length of chain in pitches.
C = Centre distance in mm.
P = Pitch of chain in mm.
T = Number of teeth on large sprocket.
t = Number of teeth on small sprocket.
K = Factor from Table

From selected dimensions as per application:-C

= 900 mm P

= 15.87 mm f

= t =19 teeth

TABLE 3 – K FACTOR

T-t	K	T-t	K	T-t	K	T-t	K	T-t	K	T-t	K	T-t	K	T-t	K	T-t	K
1	0	11	3	21	11	31	24	41	43	51	66	61	94	71	128	81	166
2	0	12	4	22	12	32	26	42	45	52	68	62	97	72	131	82	170
3	0	13	4	23	13	33	28	43	47	53	71	63	101	73	135	83	175
4	0	14	5	24	15	34	29	44	49	54	74	64	104	74	139	84	179
5	1	15	6	25	16	35	31	45	51	55	77	65	107	75	142	85	183
6	1	16	6	26	17	36	33	46	54	56	79	66	110	76	146	86	187
7	1	17	7	27	18	37	35	47	56	57	82	67	114	77	150	87	192
8	2	18	8	28	20	38	37	48	58	58	85	68	117	78	154	88	196
9	2	19	9	29	21	39	39	49	61	59	88	69	121	79	158	89	201
10	3	20	10	30	23	40	41	50	63	60	91	70	124	80	162	90	205

Table 6.2 K Factor

From above table we have to select factor but there is no speed reduction so K = 1 assumed.

So, from above formula L = 208 pitches

L = 208 x 15.87L = 3300 mm

5.2 Selection of bearing:-

$$\frac{F_a}{F_r} = 0 \leq e$$

$$\text{so } x = 1 \ \& \ y = 0$$

Equivalent dynamic load

$$P = X F_r + Y F_q$$

P = RB = 150 N

Life in hrs. = 10000 hrs.

Life in million

$$L = \frac{60 n L_h}{10^6}$$

L = 36 millions of reva = 3 for ball bearing.

dynamic load capacity

$$L = \left(\frac{C}{P}\right)^{a}$$

From SKF bearing catalogue we have selected the bearing static capacity for shaftdiameter d = 20mm = Co = 2.32 KN

From above equation = C = 201 N

So calculated dynamic capacity C < bearing catalogue dynamic capacity C = 4.32KNHence from catalogue bearing selected = 61204

Factors Considered in designing: -

The Factors considered in designing the system are

1. Braking Distance
2. Distance of obstacle in front

The braking distance is the main factor considered in this system. Braking distance for a particular speed is the distance between the point of application of the brakes and thepoint at which the vehicle comes to a complete stop from the present speed. It is calculatedusing the following formula

Braking distance = V2 /2μg m Where V -Velocity of the vehicle (m/s) μ- Coefficient of friction of the road = 0.8 g -Acceleration due to gravity = 9.81 m/s2

In the formula the condition of the brakes and the road conditions are notconsidered for coefficient of friction.

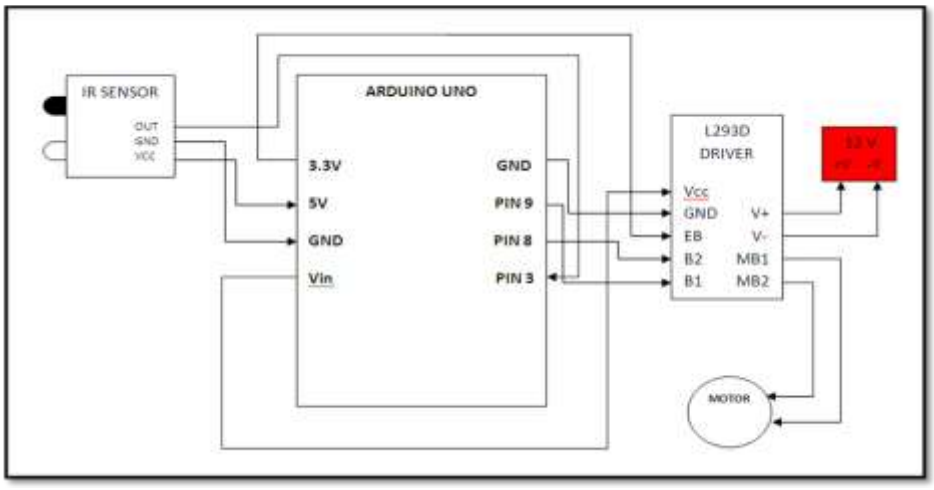


Figure 6.1 Circuit Diagram of ARDUINO UNO

Figure 6.2 Ultrasonic sensor

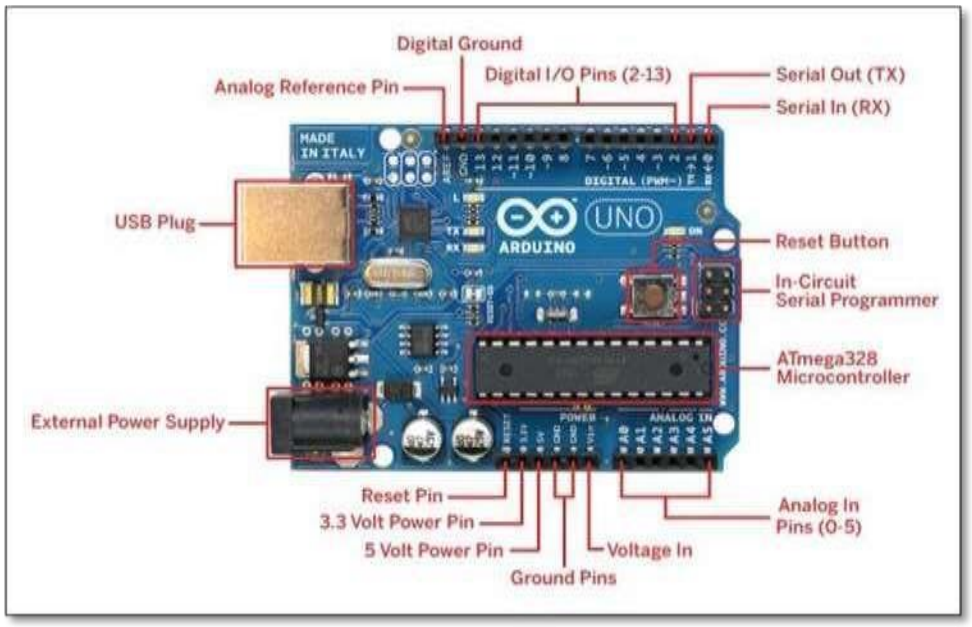


Figure 6.3 Assembled Adriano Uno

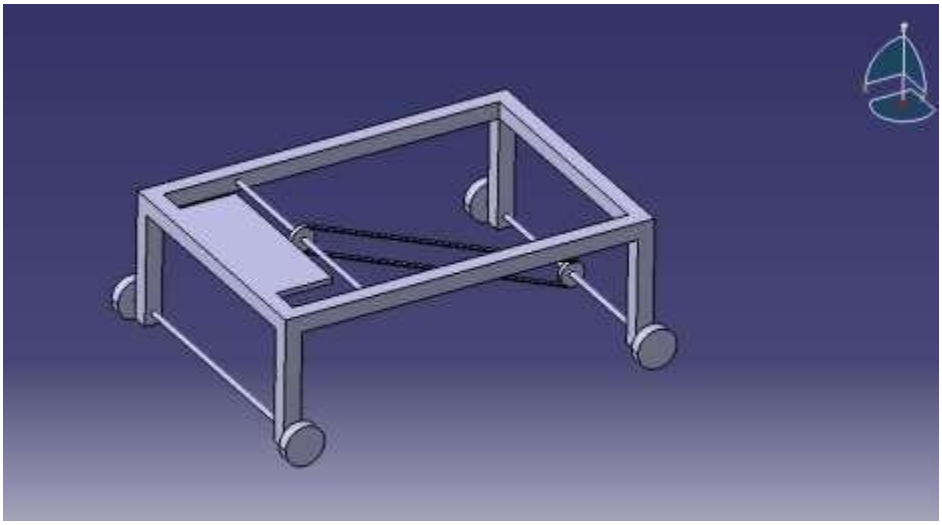


Figure 6.4 Mechanical arrangement for project

CHAPTER 7

Constructional detail

WIPER MOTOR:

In this project we have used wiper motor to move the device.

POWERING OF MOTOR

- **Voltage**:

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. I wouldn't recommend any voltages higher than that.

- **Current**:

Figure No.7.1 Wiper Motor

The minimum required current for the motor is 1.6 amps at 70 rpm,
0.9 amps at 41 rpm (and 4 amps if you elect to run it at 106 rpm, see note on thenextpage). These current ratings are for the motor spinning with no load. As you add mechanical load, these numbers can increase dramatically, doubling or even triplingunder a heavy load. (When testing for torque, I found the motorto draw close to 14amps in a stalled condition.)

This factor must be taken into account when selecting a power supply. Sincethe motor will only use what it needs when it comes to current, it's best to providesource with a higher current rating than you think you might need. I would recommend a 5 amp or greater supply to handle most circumstances.

Most power sources are labeled as to their output current. Y

- **MOTOR DRIVER:**

A motor driver is a little current amplifier; the function of motor drivers is to take a low-current control signal and then turn it into a higher current signal that candrive a motor**.**
In this project we have used **L293D** motor driver circuit.

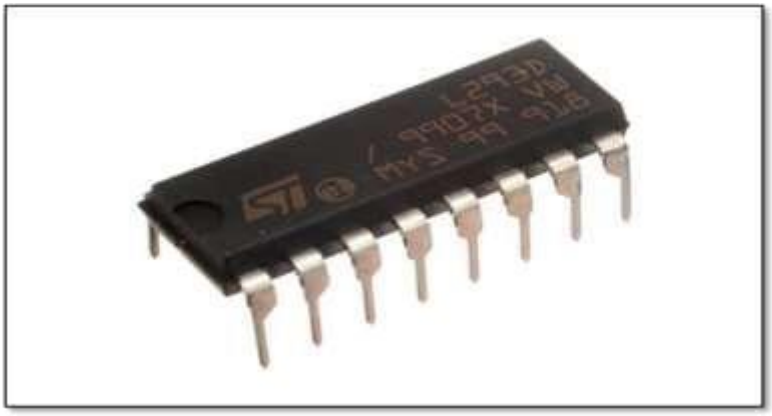


Figure No.7.2 L293D motor driver

L293D Description:

L293D is a typical Motor driver or Motor Driver IC which allows DC motor todrive on either direction. L293D is a 16-pin IC which can control a set of twoDC motors simultaneously in any direction. It means that you can control two DC motorwith a single L293D IC.

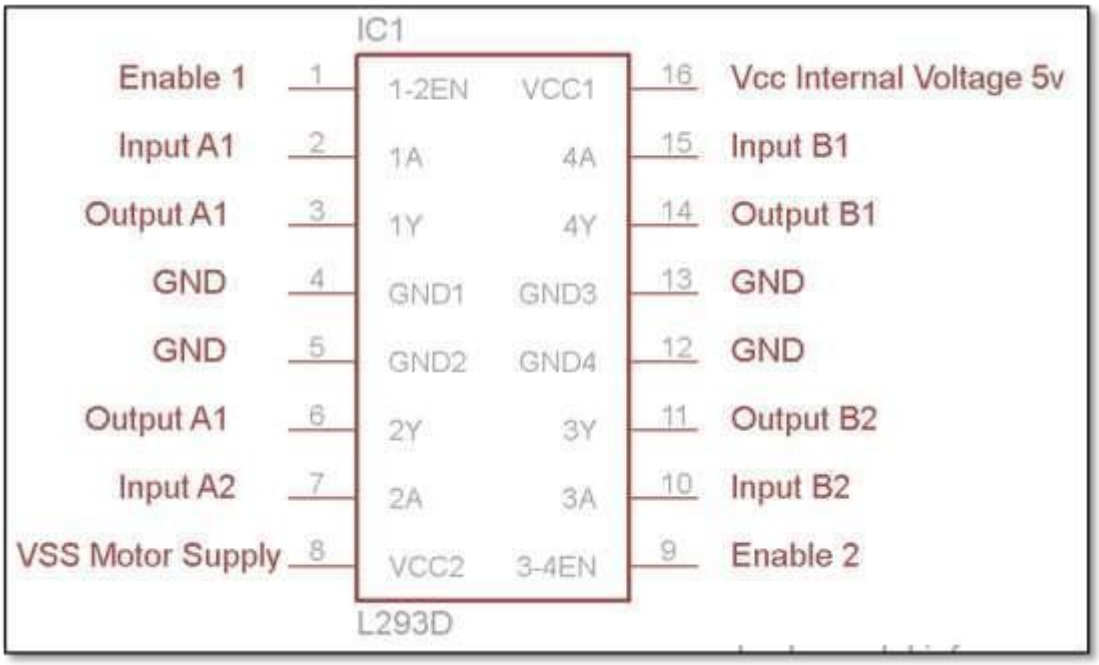


Figure No.7.2 L293D motor driver circuit

Here we have used Dual H-bridge motor driver board.

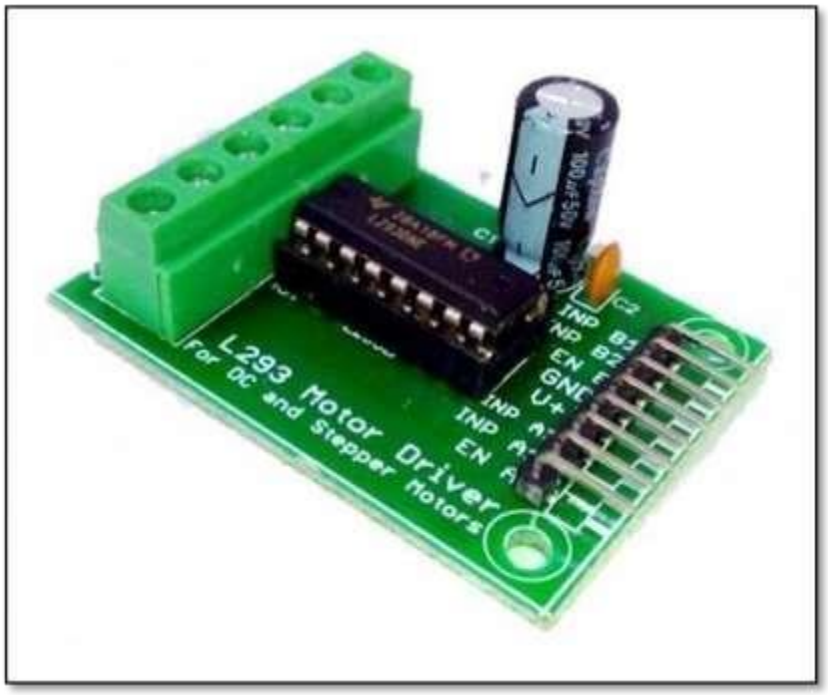


Figure No.7.3 Diagram for l293d motor driver IC controller

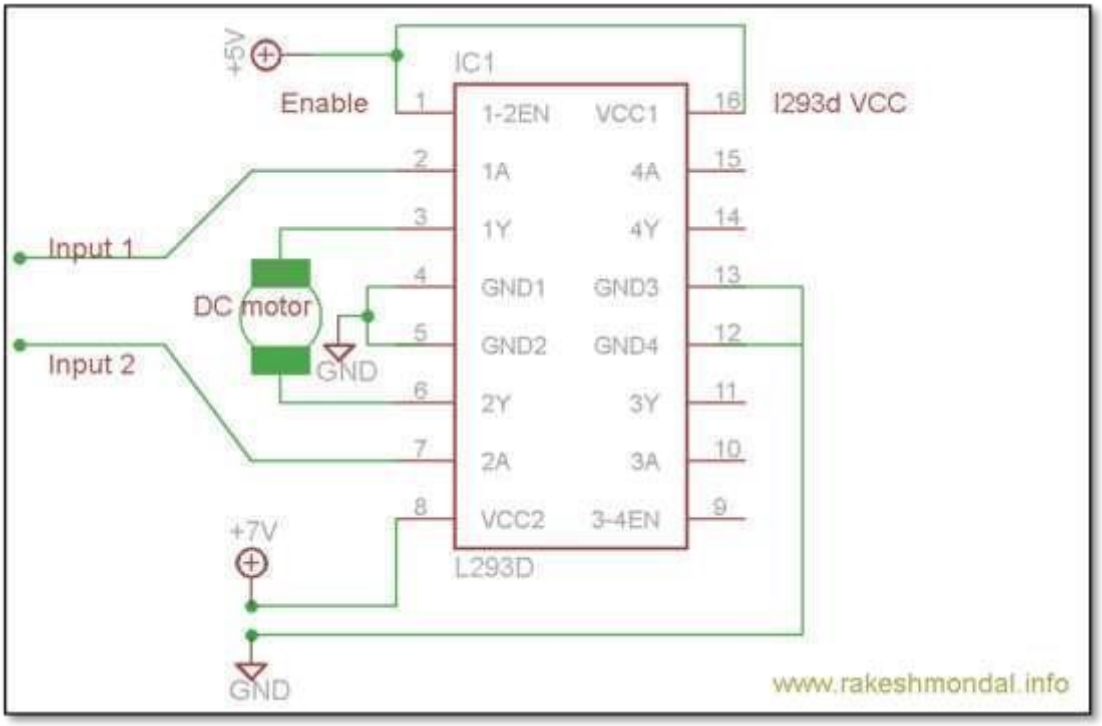


Figure No.7.4 Circuit Diagram for l293d motor driver IC controller

- **Working of L293D:**

There are 4 input pins for l293d, pin 2, 7 on the left and pin 15, 10 on the rightas shown on the pin diagram. Left input pins will regulate the rotation of motor connected across left side and right input for motor on the right-hand side. The motorsare rotated on the basis of the inputs provided across the input pins as LOGIC0 or LOGIC 1.

In simple you need to provide Logic 0 or 1 across the input pins for rotating the motor.

- **L293D Logic Table:**

Let's consider a Motor connected on left side output pins (pin 3, 6). Forrotating the motor in clockwise direction, the input pins have to be provided with Logic1 and Logic 0.

- **Pin 2** = **Logic 1** and **Pin 7** = **Logic 0** |Clockwise Direction
- **Pin 2** = **Logic 0** and **Pin 7** = **Logic 1** |Anticlockwise Direction
- **Pin 2** = **Logic 0** and **Pin 7** = **Logic 0** | Idle [No rotation] [Hi-Impedance state] • **Pin 2** = **Logic 1** and **Pin 7** = **Logic 1** | Idle [No rotation]

In a very similar way, the motor can also operate across input pin 15, 10formotor on the right-hand side.

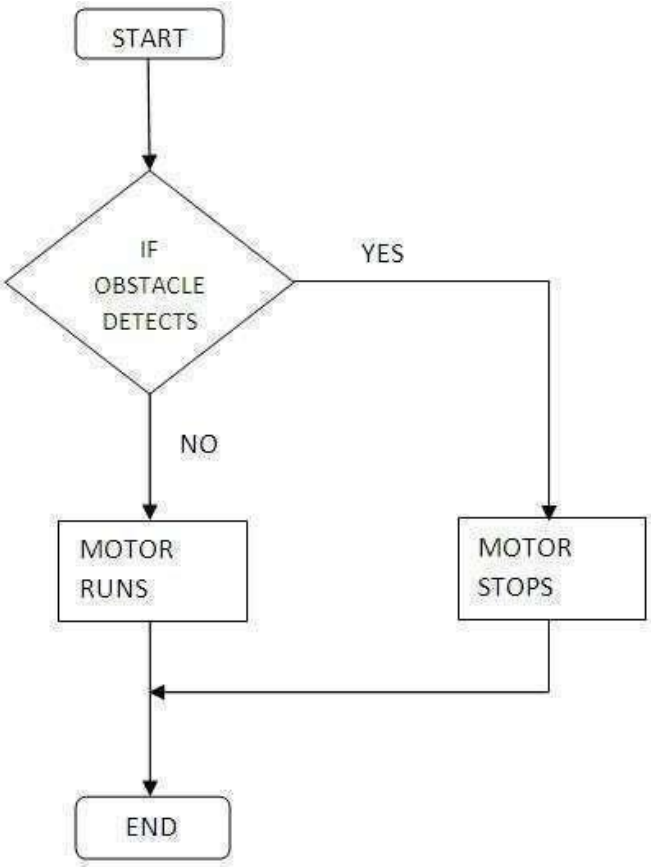
- **Voltage Specification:**

VCC is the voltage that it needs for its own internal operation 5v; L293D willnot use this voltage for driving the motor. For driving the motors, it has a separate provision to provide motor supply VSS (V supply). L293d will use this to drive the motor. It means if you want to operate a motor at 9V then you need to provide a Supply of 9V across VSS Motor supply.

The maximum voltage for VSS motor supply is 36V. It can supply a max current of 600mA per channel. Since it can drive motors Up to 36v hence you can drive pretty big motors with this l293d.

VCC pin 16 is the voltage for its own internal Operation. The maximumvoltage ranges from 5v and up to 36v.

TIP: Don't Exceed the Vmax Voltage of 36 volts or it will cause damage.



FLOW CHART

Our projects working on following two conditions or cases:

➔ **CASE 1:**

If there is no obstacle in front of vehicle then the sensor output remains unchanged that means LOW and so that motor drives the vehicle as its output isHIGH.

➔ **CASE 2:**

If there is obstacle detects by the IR sensor in front of our vehicle then sensor outputs the value HIGH and so that motor stops running as its value will be LOW and our vehicle will be stops.

CHAPTER 8

ACTUAL EXPERIMENTAL SET-UP

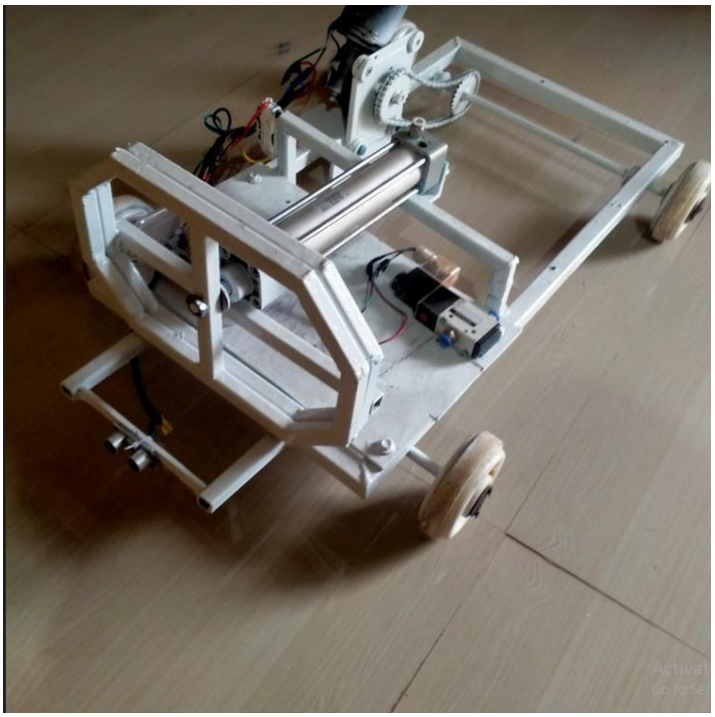


Fig. 8.1 Actual Prototype of Pneumatic Bumper System

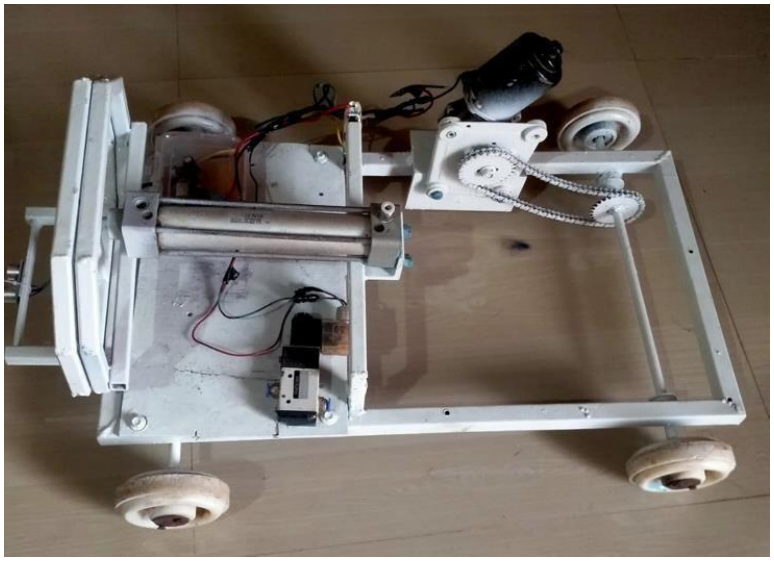


Fig. 8.2 Actual Prototype of Pneumatic Bumper System

CHAPTER 9

Testing of Intelligent Braking system

9.1 Observation table

Sr. No	Points observed	Observed Details	Remark
1.	Simplicity	Procedure is verysimple and Easily understandable.	Operates successfully
2.	Effort required	Effort required is less and working is smooth	Operates successfully
3.	Acceleration and speed	Sensing capacityis fast	Operates successfully
4.	Obstacle distancecapacity	Up to 0.5meter	Fast and easy
5.	Time required	Time required is very less	Less time required
6.	Power required	Here pneumatic power is used but this we can change as per requirement	_____

CHAPTER 10

Project cost and Bill of material

10.1 Expenditure sheet and Materials Used:

-Project cost – calculation

Sr. No	Material	Quantity	Cost per Unit Rs.	Total cost inRs.
1	Steel material (angle, C channel,plate, strips)	…	60	1200
2	4 wheels	04	500	2000
3	Bearings	04	150	600
4	Motor PMDC	01	1200	1200
5	Us sensor and its circuit	01	2500	2500
6	Fabrication (labor charges)	-	1000	1000
7	Battery and adaptor for motor	01	1090	1090
8	Single acting cylinder	01	1200	1200
9	Solenoid valve 3/2 DC valve	01	900	900
Total Rs.				**11690**

CHAPTER 11

Conclusion

As per practical testing and feedback from experts it is confirmed that this mechanismis very useful and operates successfully for car segment. If we change the sensor and source power the capacity and time we can change.

CHAPTER12

Future Scope

In addition to the braking system, an additional module is developed for controlling the direction of the vehicle. The remote controller is developed using RF transmitter and receiver which is interfaced with microcontroller. The power of the proposed system lies in its flexibility and capability of development with little hardware changes such as changing the speed limits and speed control methods using the software of the base station in negligible amount of time. A revolutionary invention is made in the field of brakes.

The Electromagnetic brakes are excellent replacement for conventional automobile brakes. The use of Electromagnetic brakes can be done for lighter vehicles also. With some modification, a regenerative braking system can be equipped with the Electromagnetic brakes. The Electromagnetic brakes are the future of automobile brakes.

REFERENCES

- https://www.researchgate.net/publication/343193557_Design_and_develop ment of_automatic_pneumatic_bumper_for_four_wheelers
- https://ijarsct.co.in/Paper1523.pdf
- https://www.irjet.net/archives/V6/i3/IRJET-V6I3983.pdf
- https://www.researchgate.net/publication/343193557_Design_and_develop ment_of_automatic_pneumatic_bumper_for_four_wheelers
- https://www.ijream.org/papers/AMET201905.pdf
- https://www.internationaljournalssrg.org/IJME/2021/Volume8-Issue5/IJME-V8I5P105.pdf
- http://www.ijirset.com/upload/2017/march/245_DESIGN.pdf
- https://www.ijsr.net/archive/v10i8/SR21819212124.pdfhttps://www.ijsr.net/archive/v10i8/ SR21819212124.pdf
- https://journals.resaim.com/ijresm/article/download/164/147/301
- V B Bhandari " Design of machine element" 2nd Edition
- R S Khurmi " Machine Design"3rd Edition
- Mr. S. N. Sidek and M. J. E. Salami, "Hardware implementation of intelligent brakingsystem".
- Milind S.Deotale, Hrishikesh Shivankar, "Review on Intelligent Braking System" G.V.Sairam, B.Suresh, have published paper "Intelligent Mechatron.