

FABRICATION OF ZERO RADIUS FIRE EXTINGUISHER SYSTEM

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Abstract

Since the Industrial Revolution, human progress has grown quickly and the structures have become skyscrapers and their inside has gotten muddled. Another blaze concealment technique is expected to stifle or forestall fire in different situations because of the difference in putting out fires condition. The Sori Sound Engineering Research Institute (SSERI) applied a special acoustic lens to the Sound Extinguisher to focus the sound energy. The wind speed of the sound beam was estimated, when the converse stage sound was provided to the sound beam, the wind speed was lost and the sound level was decreased by around 20 dB. The characteristics of a sound beam formed by a special acoustic lens and how efficiently a sound beam transmits sound energy through experiments are investigated. Sound Fire Extinguisher utilizes an acoustic focal point to limit the constriction of sound vitality and move vitality to the objective point. It can forestall ablaze by bringing down the surrounding temperature even before the fire. In this examination, we tested to check whether the Sound Fire Extinguisher could forestall fire by bringing down the surrounding temperature. Test results show that when the Sound Fire Extinguisher sound part of a similar breeze speed is provided, the warmed silverware is cooled by 10 ~ 20% quicker than the breeze speed of 2m/s. These outcomes show that the Sound Fire Extinguisher can be utilized to forestall blazes since the sound segment of the Sound Fire Extinguisher itself advances the encompassing warm dissemination to cool rapidly.

Keywords: Fire Extinguisher, Sound Fire Extinguisher, acoustic lens

1. Introduction

Nowadays, machinery and robotic design become important in helping humans. This Fire Protection Robot was designed to help people in any destructive burnt situation where this robot can extinguish burnt areas immediately using an autonomous system. In real life, a destructive burnt area often happens without our realization. Therefore, this type of robot will require a high demand in the market because of its usefulness to humans as well as the environment transmitting fire information to a cell phone using GSM modern. The objective of the project will be to design an SMS electronic Fire Protection Robot toolkit which can replace the traditional Fire Protection Robot. The toolkit sends the fire and sends SMS to the owner of the house, The system is made 2 efficient by SIMs so that the SMS can be received by a number of device boards in a locality using techniques of time division multiple access. The GSM modem receives the SMS. The AT commands are serially transferred to the modem. In return, the modem transmits the stored message through the wireless link. The microcontroller validates the SMS and then perform specific task on the device.

A robot is a machine that looks like a human being and performs various complex tasks. Now, let's have a good look at existing firefighting robots. Virtual Reality Simulation of Fire Fighting Robot (Indonesia) is a virtual adaptation of a competition robot, that took part in Panitia Kontes Robot Cerdas Indonesia competition in 2006. This system was developed in MATLAB/Simulink with the help the Virtual Reality Toolbox plug-in. It is oriented for the initial testing of controlling algorithms. It's important to notice, that even the robot itself doesn't have enough level of functionality, because of low-detailed formalization of the environment. The robot could operate only in corridor-room environment, without strange objects. Only one fire source is meant and there are auxiliary marks on floor, that means for example room entrance. Pokey the Fire-Fighting Robot

(USA) is a firefighting robot, that made its way out of competitions, and became more “serious” than other systems. In there are a detailed descriptions of used equipment and basic algorithms for operating. The robot’s operating environment is a building, so the robot is equipped with necessary sensors, for example, a line sensor, that could be unusual in conditions of dense smoke. The main advantages of robots are:

- Using of two types of fire sensors, working in different ways;
- Using of complex firefighting tool; The main disadvantages are:
- Short distance of sensor’s work. The fire could be recognized at the distance not more than 1.5m. At longer distances the sensors works bad, ad developers say

2. METHOD AND MATERIALS

2.1 Construction of Zero radius fire extinguisher

- 2D model sketch is made according to the dimensions. With the help of a 2D sketch, a 3D model is made in CATIA Accordingly the components required for the model are bought and tested The base was made from aluminum and slots were cut to accommodate the wheels according to the 2D model. Cycle wheels were attached at the front and rear ends on the slots made with the help of screw and bolt. They are arranged in such a way to enable free forward motion.
- A motor (DC motor) is attached near to the rear wheel with the aid of a driving mechanism (chain driven) in order to drive the rear wheel.
- A 12V DC battery is connected to both the motor by the aid of connecting wires and was mounted on the base frame. A voltage regulator which is connected between the battery and the motor is monitored and the rpm was calculated.

The details of the components used in the prototype are tabulated below in Table 3.1. And specifications of the Microcontroller are displayed in Table 3.1.

Table 3.1 Details of Components

SL.No	Items	Parameters	Quantity
1	Drive motor	Speed- 60 rpm	2nos
2	Battery 12V 4.5ah	5A lithium-ion	1nos
3	Servo motor	Torque 5kg/cm	4nos
4	Rubber wheels	Diameter-100mm	4nos
5	Nozzle	1mm outlet	1nos
6	Water pump	3LP 12V	1nos
7	Sensors	Fire sensors	3nos
8	Water tank	1L CPVC	1nos
9	Electrical circuit	DRIVE +SENSOR	1nos

3.Components of Zero Radius Fire Extinguisher

3.1 Rubber wheel:

The wheel greatly reduces friction by facilitating motion by rolling together with the use of axels. For wheels to rotate, a moment needs to be applied to the wheels about their axis, eitherby way of gravity or by the application of force or torque.

3.2 Drive Motor:

DC motors are of great industrial importance. The main advantage of a DC motor is thatit is amenable to different methods of speed control to provide a wide range of speeds and good speed regulation. A machine that converts dc power into mechanical power iscalled a DC Motor.

3.3 Battery:

A battery is a connection of one or more electrolytic cells which provide regulated power. Batteries are devices in which reduction-oxidation occurs at cathode and anode;they are separated by an ionic ally-conductive electrolyte.

Battery capacity is a measure of a battery’s ability to store or deliver electrical energy.

Commonly expressed in units of ampere-hour. An ampere-hour is equal to the transfer of one ampere over one hour. For example, a battery that delivers 5 amps for 20 hours is said to have delivered 100-ampere hours. The capacity of a battery depends on several constructional factors like the quantity of active material, the number and physical dimension of the plates, and the electrolyte-specific gravity. Battery capacity also depends on operational factors like the discharge rate, depth of discharge, and cycle resistor of the battery. It also depends on the number of charging cycles and discharging cycles.

3.4 Servo motors:

Presently, servo motors are widely used in many applications such as robotic applications, home appliances and industrial automation. The typical servo motor system that is frequently used in above mentioned applications consists of an electric motor and several cascaded control loops, which are a position control loop, a velocity control loop and a current control loop. The current control loop is used to control motor current and to prevent overloaded motor current. The velocity control loop controls motor velocity, and the position control loop commands the velocity control loop in order to rotate the servo motor to the desired position. This paper studies effects of the current limiter on the dynamic characteristics of servo motor and proposes high-speed and high- accuracy positioning system.

3.5 Water pump:

A water pump is an electromechanical machine used to increase the pressure of water to move it from one point to another. Modern water pumps are used throughout the world to supply water for municipal, industrial, agricultural, and residential uses.

Water pumps also are used to move wastewater in sewage treatment plants. Modern waterpumps most often are driven by electricity, but other power sources also are used—for example, diesel or gasoline engines. In some remote areas, such as desert regions, solar panels may be used to supply power to small pumps.

3.6 Fire sensor:

A fire detector works by detecting smoke and/or heat. These devices respond to the presence of smoke or extremely high temperatures that are present with a fire. After the device has been activated, it will send a signal to the alarm system to perform the programmed response for that zone.

3.7 Electronic circuit:

The electronic circuit is composed of individual electronic components, such as resistors, transistors, capacitors, inductors, and diodes by conductive wires or traces through which electric current can flow. To be referred to as electronic, rather than electrical, generally, at least one active component must be present. The combination of components and wires allows various simple and complex operations to be performed: signals can be amplified, computations can be performed, and data can be moved from one place to another.

4. WORKING PRINCIPLE

This sensor/detector can be built with an electronic circuit using a receiver like electromagnetic radiation. This sensor uses the infrared flame flash method, which allows the sensor to work through a coating of oil, dust, water vapor, otherwise ice.

The aim of our project is to incorporate all four modes of steering mechanism in single vehicle. This can be obtained by modifying the traditional steering mechanism and using a modified differential gearbox in case of zero-degree radius turning. In which the vehicle rotates on the position. The principle we used for the project is to make changes in the steering mechanism. The changes are given below.

1. There are two steering columns (Rack and Pinion), one for front-wheel steering and another for rear-wheel steering.
2. One additional steering shaft is used to connect the front steering column with the rear steering

column using knuckle joints and a pin.

3. Modifying differential gearbox so that during zero degrees turning radius, one side of the wheel is allowed to rotate clockwise and another is allowed to rotate counterclockwise.
4. The steering modes of the vehicle can be changed by shifting the position of tie rods of the steering column on guide plates.

Below Fig4.1 shows the side view of the 2d diagram of the robot

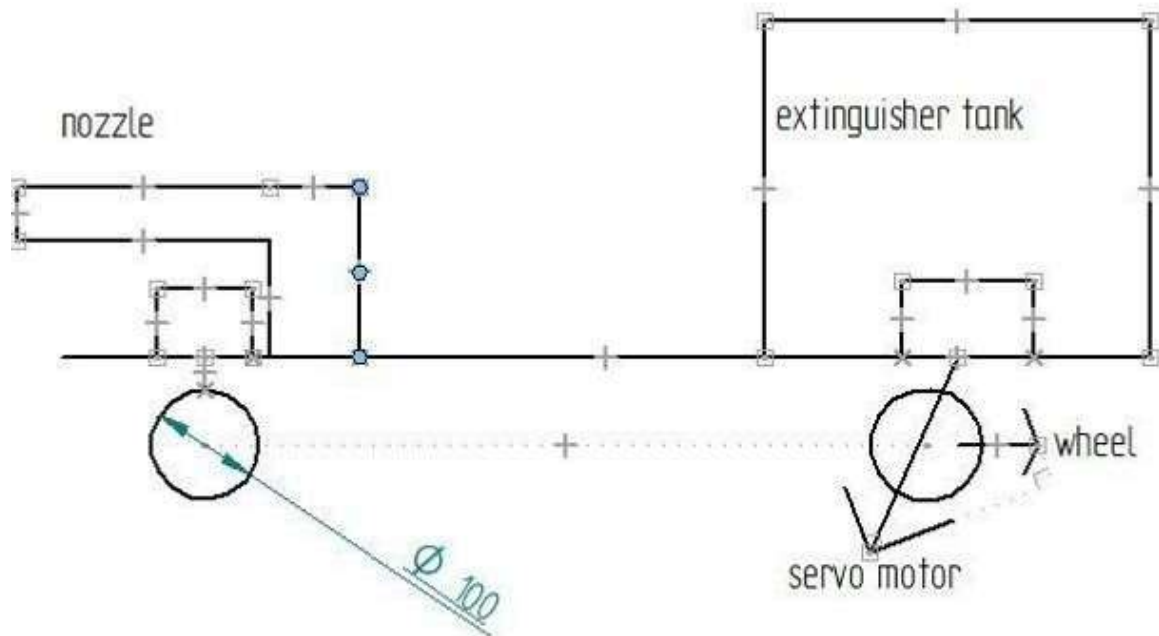


Fig4.1 side view of the 2d diagram of the robot

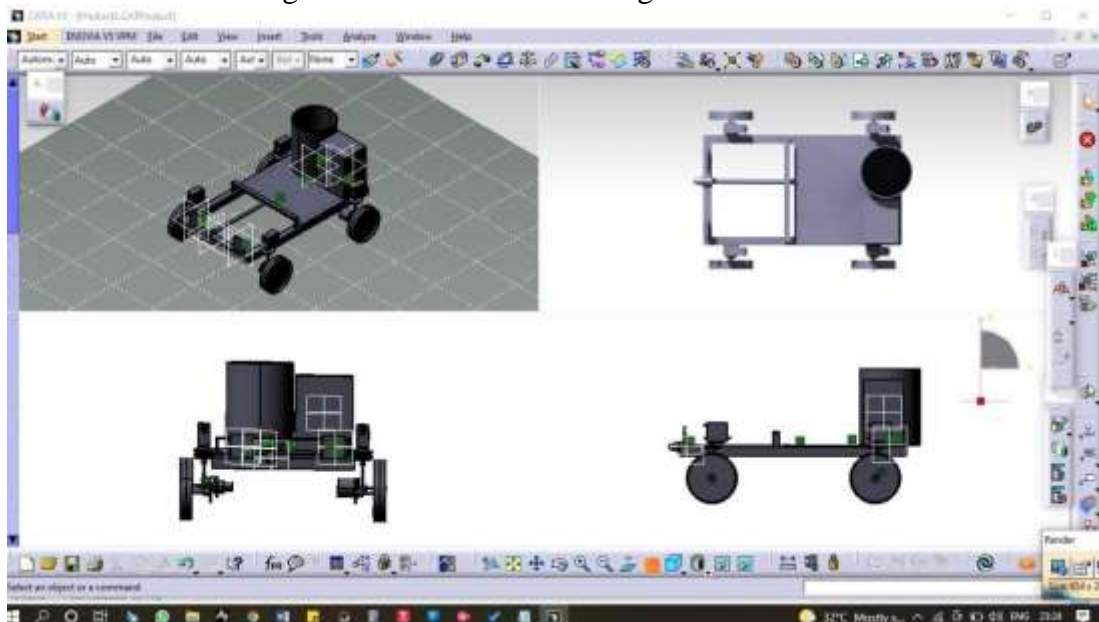


Fig4.2 3d diagram of the robot

5. CONCLUSION

Overall the design and improvisation of the extinguisher has been done successfully. All the actions which has to be performed by extinguishers are working properly. Water extinguishers with these modifications will be a new success in terms of safety as well as fire fighting and rescue operations. Based on the experiment result obtained it can be seen that the sound wave can extinguish flames.

There are four modes in 4-wheel steering each of which is individually implemented in most the 4-wheel steering cars. Each one has its own disadvantage like the use of crab mode increases the turning radius which in turn decreases the ease of maneuvering the vehicle at sharp bends, similarly, rear steer mode decreases the turning radius to a greater extent, thus increasing the risk of the toppling of the vehicle at high speed. Hence to overcome these problems, both the modes have been introduced together in a locomotive and its performance has been evaluated.

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