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SMART OPERATOR FOLLOWING TROLLEY FOR MATERIAL HANDLING INDUSTRIES

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ABSTRACT

Material handling plays a major role in industries in every step of production. The material needs to be carried efficiently across the industry floor and in time for full production efficiency. This project involves fabrication and implementation of automated human following trolley for material handling. This trolley can automatically detect the person using the sensors added on the trolley. As the person moves ahead the trolley automatically moves behind the person following the person. This is done using intelligent control algorithm of the trolley.

Keywords:Human following, Sensors etc.

I.INTRODUCTION

Material handling plays a very important role in the industrial economy. Mass production depends mainly on conveying system and expansions is mass production invariably follow developments in method of handling the materials involved. The material handling is a system or combination of methods, facilities, labor and equipment for moving, packaging and storing of materials to meet specific objectives. The present day material handling systems can be classified into following as given below.

1. Conveyor systems: These follow horizontal, vertical or compound motions through the air, over fixed routes by gravity or by power. Conveying equipment is a group of machines which move loads in a continuous flow and which may have no lifting gear.

2. Transportation and Transferring Equipment:

(a)Transportation Equipment: These follow horizontal motion over fixed or variable, level or nearly level routes by pulling or pushing on surface riding vehicles.

(b) Transferring Equipment: These follow horizontal, inclined or declined motions through the air over fixed routes or limited areas, with intermittent motions.

3. Hoisting equipment (Lifting, lowering or elevating equipment):

(a) Lifting and lowering equipment: These are used in the operation of lifting a load, handling them in suspension, lowering and placing them at required locations.

(b) Elevating Equipment: Vertical motion over fixed vertical or steep inclined routes with continuous or intermittent motion is followed by this equipment’s. Hoisting equipment is a group of machines with lifting gear intended for moving loads mainly in batches.

1.1 OBJECTIVE

The main objectives of this project are:

1) To fabricate an automated trolley which can move behind or follow the person who requires the trolley thus achieving automation in material handling
2) To make the trolley economical and user friendly, which facilitates even a very unskilled worked to easily operate this trolley.

1.2 PROPOSED CONCEPT AND WORKING METHODOLOGY

In this project the trolley is first fabricated which is later used for material handling. The Drive train of the trolley is electric and works on Geared electric motors. The sensors are mounted on the front of the trolley which can sense the human as well as the movement of the human in front of sensors.

When the person is in front of the trolley at specific distance, the trolley stays at halt. When the person starts moving, the trolley also moves behind the person.

1.3 STANDARD COMPONENTS USED IN THIS PROJECT

The components used in the project are as given below:

1. Microcontroller:

A microcontroller is a self-contained system with peripherals, memory and a processor that can be used as an embedded system for processing signals. Most programmable microcontrollers that are used today are embedded in other consumer products or machinery including phones, peripherals, automobiles and household appliances for computer systems. Due to that, another name for a microcontroller is "embedded controller."

2. DC Geared motors for drive train:

The drive train of the human following trolley includes the DC Motor with the reduction gear boxes. The drive train of a motor vehicle is the group of components that deliver power to the driving wheels which will facilitate for the navigation of the vehicle on industry floor. This excludes the engine or motor that generates the power.

3. The motor driver:

The motor driver used is 18V 5 Amp DC motor H- bridge. The H- bridge IC is used to provide the directional control to the DC motors as well as to control the speed of the DC motors. This helps the trolley to navigate in all direction including reverse. The specifications of the DC motor driver are:

4. The Ultrasonic sensors for smart human sensing:

The project uses ultrasonic sensor for sensing and following the human. There are three sensors used on this project which follow the human. The three sensors are arranged in such a way that they can be used to trace the human. There were different sensors available in market for this particular task.

1.4 OPERATION PRINCIPLE

When voltage is applied to piezoelectric ceramics, mechanical distortion is generated according to the voltage and frequency. On the other hand, when vibration is applied to piezoelectric ceramics, an electric charge is produced. By applying this principle, when an electric signal is added to a vibrator, constructed of 2 sheets of piezoelectric ceramics or a sheet of piezoelectric ceramics and a metal sheet, an electric signal is radiated by flexure vibration. As a reverse effect, when an ultrasonic vibration is added to the vibrator, an electric signal is produced. Because of these effects, piezoelectric ceramics are utilized as ultrasonic sensors.

II. IDENTATIONS AND EQUATIONS

The following calculations show the power supplied by the battery and other calculations:

Battery voltage: 12 V,

Battery current: 7.5 AH

Therefore power output of the battery is given by

$P = V \times I = 12 \times 7.5 = 90$ Watt

We use 12 V 2 Amp adapters for charging the system. Power of adapter = 24 Watt

Therefore time required for charging the battery is given by: $t = 90/24$, $t = 3.75$ Hours

The total power consumed by the system is given by:

Power consumed by the motors + power consumed by microcontroller

$= 17 \times 4 + 1 = 68 + 1 = 69$ Watt

Therefore the time for which system can run continuously on full charge is given by

$= 90/69 = 1.3$ Hour

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III. FIGURES AND TABLES

3.1 FIGURES

1. Automated human following trolley

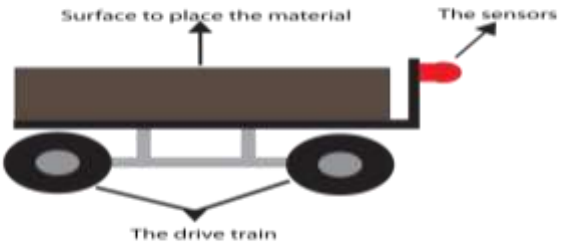


Fig. a

2. Microcontroller

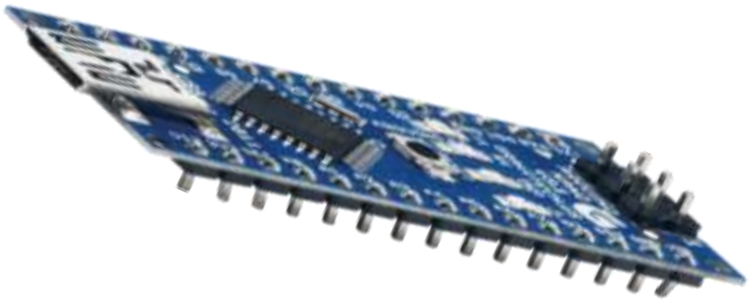
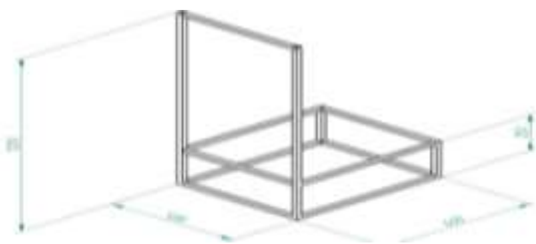


Fig. b

3. DC Geared motor

Fig. c

4. 3D Modeling:



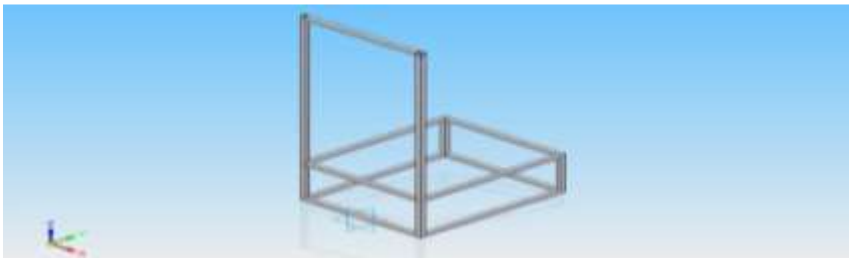


Fig. d

5.

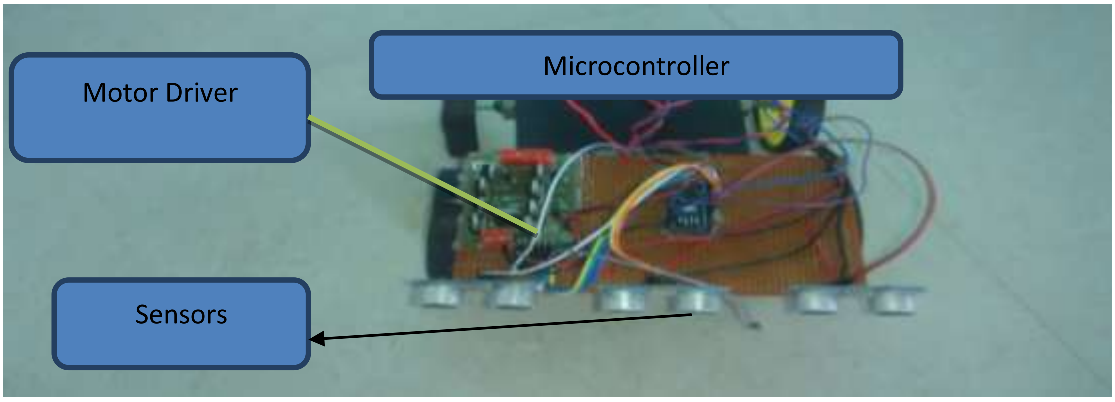


Fig. e

3.2 Table

The technical specifications of the motors are as shown below.

Sr. No	Parameter	Value
1	Voltage	12
2	Current	1.4 A
3	Shaft size	8 mm
4	Gear Type	Heavy duty metal
5	Weight	500 gms
6	Speed	30 Rpm

IV.CONCLUSION

From this project concept we can conclude that the human following trolley forms a better approach to the problems faced by manual labor in material handling industries today. The trolley can also serve as automation in small scale industries. Since the cost of fabrication of trolley and implementing this technology is almost similar to the manually operated trolleys available in the market, this trolley can easily be implemented by almost every industry without spending much cost. Thus this trolley forms a better and economical solution as compared to manually operated trolleys.

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