



ISSN (Print) : 2320 – 3765  
ISSN (Online): 2278 – 8875

# International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: [www.ijareeie.com](http://www.ijareeie.com)

Vol. 6, Issue 3, March 2017

## Arduino Nano Based Automatic Forklift Robot

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**ABSTRACT:** This paper proposes the design of automatic forklift with arduino nano module. Currently in warehouse the storage systems are done in traditional way with a human operator. This project is intended to construct an autonomous mini forklift robot that uses ultrasonic sensors to find the good and to store in warehouse. Here the robot identifies the item by reading the colours difference on objects. The robot will navigate to destinations where storage space is available. For navigating it uses a line follower module which follows the black path over white surface.

**KEYWORDS:** Line follower robot, Arduino nano development kit, Motor driver circuit, forklift, Bluetooth Module.

### I. INTRODUCTION

A robot is a programmable mechanical device that can perform tasks and interact with its environment, without the aid of human interaction. Robotics is the science and technology behind the design, manufacturing and application of robots. In the modern world's fast-paced, customer-driven economy, the warehousing and logistics industries are looking for robotics solutions, more than ever before, to remain globally competitive. While robotics technology already has made an economic impact on the manufacturing sector, it currently is starting to transform supply chain operations to be faster, safer and more productive. Robot will manage the goods automatically according to the database that is programmed in the robot. This will save cost and time [2].

### II. LITEARTURE SURVEY

This paper presents the design of a mini forklift robot that can store and pick up object to/ from specified storage slot from/ to a base using line follower. [1] In order to decrease costs of logistics and distribution of goods, it is quite common to find in developed countries mechatronic systems performing several tasks in harbor, warehouses, storages and products distribution center. Therefore, research in this topic is considered strategic to ensure a greater insertion of the individual countries in the international trade scenario. [5]

### III. SYSTEM DESIGN

#### A. LINE FOLLOWER ROBOT

Line follower Robot is a machine which follows a line, either a black line or white line. Basically there are two types of line follower robots: one is black line follower which follows black line and second is white line follower which follows white line. Line follower actually senses the line and run over it. Concept of working of line follower is related to light. We use here the behaviour of light at black and white surface. When light fall on a white surface it is almost full reflected and in case of black surface light is completely absorbed. This behaviour of light is used in **building a line follower robot**. These conditions can be controlled by programming.

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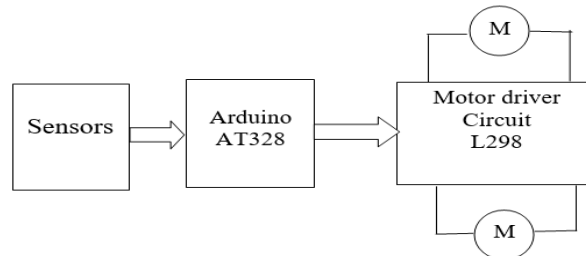


Figure 1. Line follower circuit

Practical applications of a line follower are automated cars running on roads with embedded magnets & guidance system for industrial robots moving on shop floor etc.

## B. FROKLIFT

It is a vehicle with two power-operated prongs at the front that can be slid under heavy loads and then raised for moving and stacking materials in warehouses, shipping depots, etc. Forklift AGVs are able to automatically pick up and deliver pallets, containers, rolls, carts, and many other conveyable loads. Automated guided vehicles with forks are the most common type of AGVs because they are so versatile. They can pick up and drop load from level, racks, stands and driven conveyors.

## C. MOTOR DRIVER L298

The drive circuitry for an H-Bridge is basically the electronics that sits between the PWM (and potentially other) digital control inputs and the MOSFET gates. It has two major purposes:

- Translate the input voltages to suitable levels to drive the gates.
- Provide enough current to charge and discharge the gates fast enough [4].

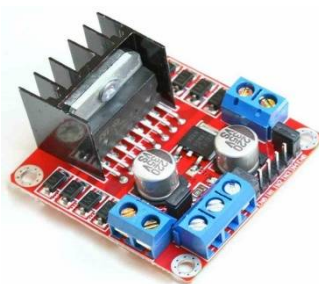


Figure 2. Motor driver L298 module

H-Bridges are typically used in controlling motors speed and direction, but can be used for other projects such as driving the brightness of certain lighting projects such as high powered LED arrays. An H-Bridge is a circuit that can drive a current in either polarity and be controlled by Pulse Width Modulation (PWM) [1]. \* Pulse Width Modulation is a means in controlling the duration of an electronic pulse.

## D. ARDUINO NANO DEVELOPMENT KIT

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.x). The Arduino Nano is a surface mount breadboard embedded version with integrated USB. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one.

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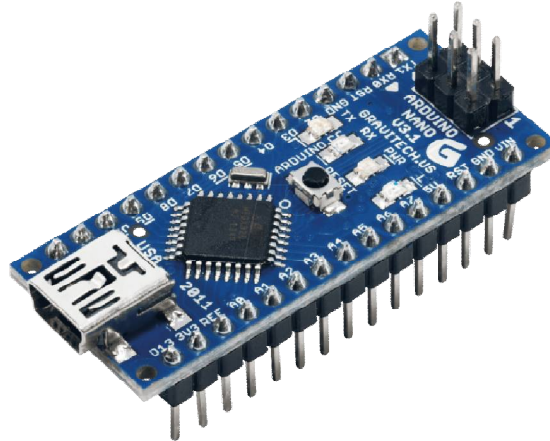


Figure 3.Arduino nano module

The Arduino Nano has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provide UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). A Software Serial library allows for serial communication on any of the Nano's digital pins. The ATmega328 also support I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus.

## **E. BLUETOOTH MODULE**

Arduino-Nano board doesn't support Bluetooth connection on its own, which makes the idea of connecting it wirelessly to an Android device impossible. So a medium between the Arduino-nano board and android device is needed and in this project it is a Bluetooth module specifically the HC-05 Bluetooth module. The HC-05 is a user friendly need only basic knowledge and it is programmable using the AT commands.



Figure 4. Bluetooth Module HC-05

## **IV.METHODOLOGY**

### **1. Hardware implementation**

To make the system hardware we gone through below block diagram. The inputs are taken from ultrasonic sensors, forklift sensors and line follower sensors used for navigation. Output of microcontroller will drive the motor through driver module L298.

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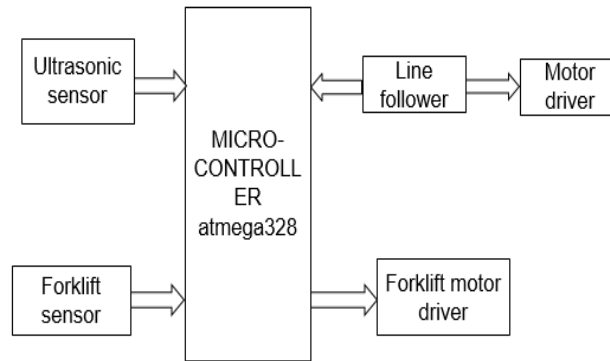


Figure 5. Block diagram of system

## 2. Software implementation

The programming operation was performed by C language using arduino IDE. Every program had its special function. The Arduino language is merely a set of C/C++ functions that can be called from your code. Your sketch undergoes minor changes (e.g. automatic generation of function prototypes) and then is passed directly to a C/C++ compiler.

## V.SIMULATION AND RESULT

Simulation of our project is done on arduino IDE. Below table shows the navigation for forklift robot.

Left sensor	Right sensor	Centre	Description
High	Low	High	Move Right
Low	High	High	Move Left
High	High	Low	Forward
Low	Low	Low	Stop

Table no.1 Navigation for line follower robot

Table shown above helps to code line follower navigation. Bluetooth module HC-05 is used to communicate. Bluetooth android application communicates easily with the robot user-friendly. There is no need of any other hardware for communication.

## VI.CONCLUSION

This research it can be concluded that:

1. The work for line follower robot is completed successfully.
2. It improves the efficiency and accuracy. With development technology, reduction of costs, decrease of the error rate. The effective use of warehouse management system becomes one of the key factors to improve the competitive power of enterprises and the efficiency of the supply chain.

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