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Remote Controlled Mini Forklift Robot

Venugopal Kulkarni [1], Vishwas Gudlanur [2], Pradeep Patil [3], Adarsh Madiwalar [4], Prof. Anita Patil [5]

1 2 3 4 Dept. of Electronics and Communication Engineering, S. G. Balekundri Institute of Technology. Belagavi, Karnataka, India.
5 Assistant Professor, Dept. of Electronics and Communication Engineering, S. G. Balekundri Institute of Technology. Belagavi, Karnataka, India.

A B S T R A C T :

This project presents the development of a remote-controlled mini forklift robot utilizing Arduino Nano microcontroller, ESP32 camera module, ESP01 Wi-Fi module, mecanum wheels, limit switches, and relay module. The integration of these components enables wireless control and real time video feedback for precise navigation and manipulation tasks. The forklift's movement is enhanced by the omnidirectional capabilities of the mecanum wheels, while limit switches ensure safe operation. The relay module facilitates the control of additional equipment or accessories. This system offers a versatile solution for remote-controlled industrial applications, warehouse automation, and educational purposes.

Keywords: Arduino Nano, ESP32 camera module, mecanum wheels, Omnidirectional, Limit switch, Relay module.

1. Introduction

1.1. The proposed Mini forklift robot system aims to reduce human efforts. These robots are equipped with forklift belt to lift, transport, and stack items in warehouses, manufacturing facilities, or other settings where precise material handling is crucial.
1.2. Using remote operation capabilities, it allows users to control the forklift from a distance, enhancing safety and efficiency in various environments. It consists of components namely Arduino Nano, ESP-32 camera, mecanum wheels, Johnson geared motor, Battery management system and Li-ion battery.

2. Objectives

1. To reduce human efforts.
2. To Design and integrate a reliable remote-control system to allow manual operation by an operator.
3. To Provide safety for labors in material handling.
4. To Incorporate mecanum wheels into the design to enable omnidirectional movement.

3. Literature Survey

K. Sudheer Kumar, A. Srikant Reddy: "Fabrication of mini forklift using Wi-Fi module" The project aims to design and implement a system that can operate forklift using Google link the transmitter is able to control the forklift from a certain distance of 3feet.

Aditya chawke, Lakhan Raut: Title of paper is "Fabrication of battery-operated remote-control forklift machine" outline the project's objective of designing and assembling a forklift robot comprising an electrical core and a basic mechanical frame, controllable through a tethered remote.

Dr. K. Hema Latha, Mohd Ahmed Khan: Title of paper is "Design and Analysis of a Remotely Operated Mini Forklift Bot" The primary objective of this technology was to offer a potential storage solution for lightweight items, leveraging the technological capabilities of robots and robotic circuits to develop a Remote-Controlled Forklift Bot.

Mohamad Muaz, Mohamad Hafiz: Title of paper is "Omnidirectional Configuration and control approach on mini-Heavy loaded forklift vehicle" This paper presents the omnidirectional configuration and control approach on Mini heavy loaded Forklift Vehicle for flexibility manoeuvrability in confine and narrow area. Here left, right, forward and backward movements are involved which was controlled by 2 boards one for monitoring

and another for controlling.

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4. Methodology

Creating a Remote-Controlled Mini Forklift Robot involves several steps. First, assemble the Forklift robot components, ensuring motors, wheels, ESP-32 cam module. The control system relies on Arduino Nano for overseeing all the operations in the robot. Battery is used to transmit supply to all the components that all will work in a proper way. BMS is a battery management system used to provide required supply to the required components. Johnson geared motor and relay modules are used to lift the heavier materials. We can lift it up to a certain height and then once it reached a certain height it will blink the light of limit switch. Remote controlled mini forklift robot. These heavier materials are lifted and placed from source to destination using L298N motor driver with the help of mecanum wheels.
These wheels will help to travel in omnidirectional where precise material handling is crucial. The esp32 cam module will help to track the materials lifting and placing it from source to destination.

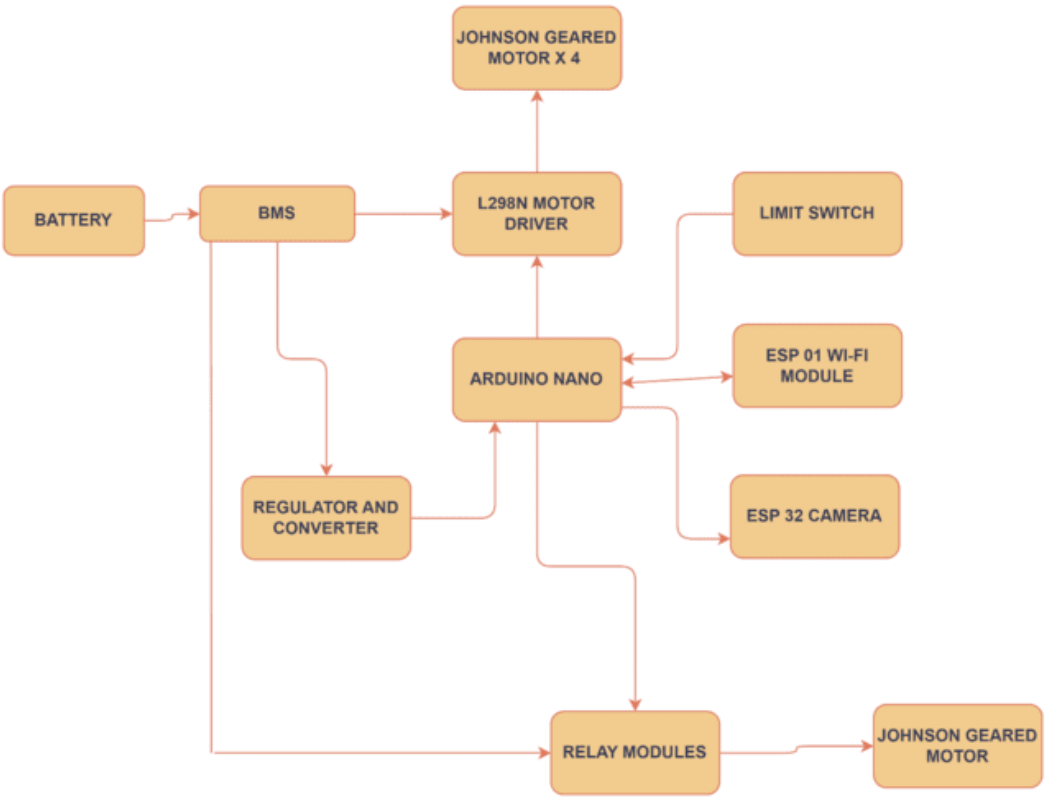

Fig 4.1 Block Diagram

Result and Discussion

The development of Remote-Controlled Mini Forklift Robot has a wide range of benefits to Industries, warehouses and also has wide range of applications. This will help in loading and unloading the materials which will help to reduce human efforts also gives protection to materials. While moving we have implemented Mecanum wheels which will help to move the vehicle in all directions along with curve movement will help to place the components in congested areas.

Omnidirectional Movement of Mecanum wheels:

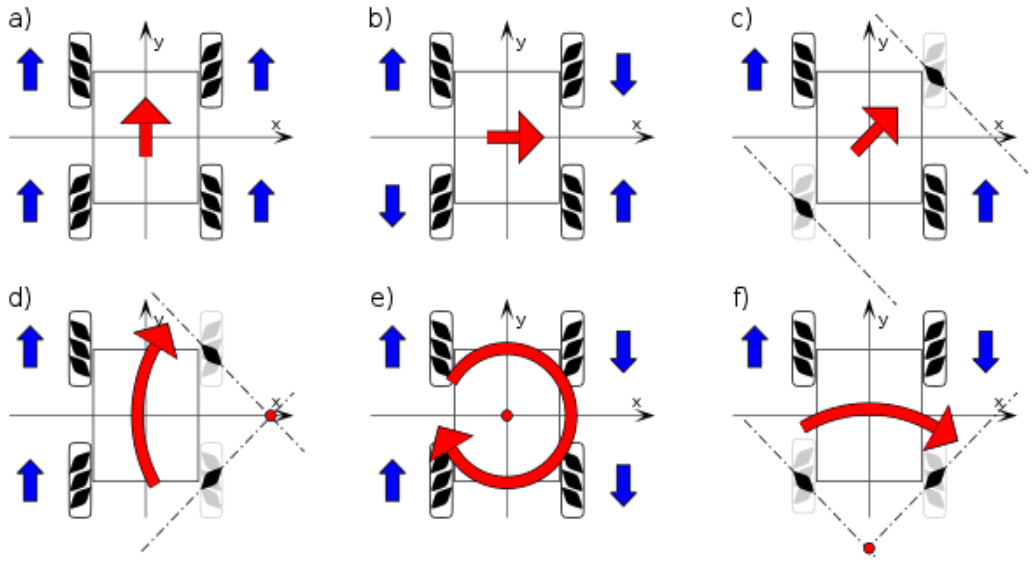

Fig. Omnidirectional Movement of Mecanum Wheels

The above figure shows the movements of Mecanum wheels in all directions along with curve movement. Here the wheels move in Forward, backward, left, right, clockwise, anticlockwise and curve. This is the view of Remote-Controlled Mini Forklift Robot It Consists of all the components like mecanum wheels, battery, Arduino Nano, ESP 01 Wi-Fi module, ESP32 camera module, relay modules, l298n motor drivers and wires.

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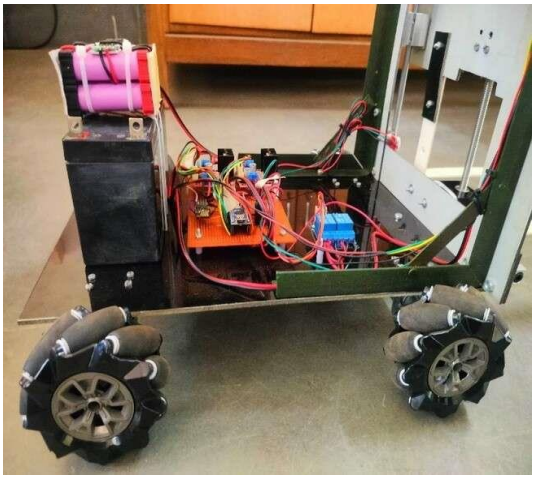

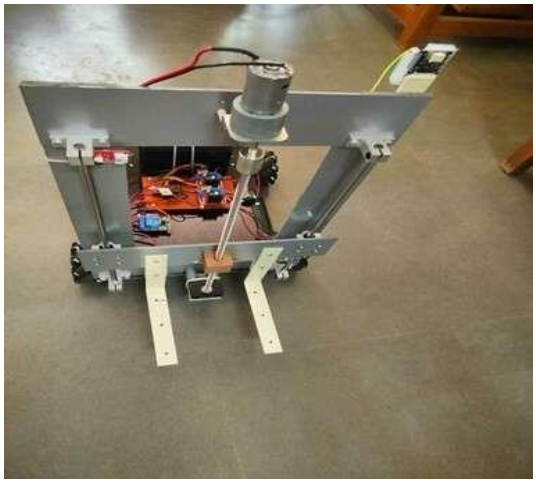

Conclusion and Future Scope

Mini forklift robots offer increased efficiency and flexibility in various industries. Their compact size and automated capabilities make them ideal for navigating tight spaces and repetitive tasks, ultimately improving productivity and reducing labor costs. As technology continues to advance, these robots are likely to play a crucial role in material handling processes.

The future scope of the Remote-Controlled Mini Forklift Robot utilizing mecanum wheels, Arduino Nano, ESP32 camera module, and ESP01 Wi-Fi module is promising. Potential directions include integrating AI for autonomous navigation and object recognition, enhancing control precision through feedback systems, IoT connectivity for remote monitoring, and cloud integration for data analysis. Further expansions may involve adding advanced sensors for object tracking and obstacle avoidance, adapting the robot for industrial applications, utilizing it as an educational tool, or exploring commercialization opportunities. This project offers a versatile platform for innovation and learning in robotics and IoT domains.

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