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Cruising with Confidence: Electric Tricycle for Empowered Handicapped Travel

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Abstract—Electric Tricycle for Empowered Handicapped Travel" aims to address the mobility challenges faced by individuals with disabilities by developing an innovative solution in the form of electric tricycles. Conventional transportation options often fail to cater to the unique needs of handicapped individuals, limiting their independence and quality of life. This project proposes the design, development, and implementation of electric tricycles that are specifically tailored to accommodate individuals with various disabilities. Through this project, the goal is to enhance the travel autonomy of handicapped individuals, empowering them to participate more actively in their communities and daily activities. The development of electric tricycles that prioritize accessibility and inclusivity has the potential to not only improve mobility but also promote social integration and overall well-being among individuals with disabilities. The project's success will be measured by the increased accessibility and improved quality of life for its target users, contributing to a more inclusive and equitable society.

***Keywords*—Battery Protection System, Electric Tricycle, Disabilities**

I. INTRODUCTION

People with disabilities frequently encounter transportation challenges. They might find it difficult to walk or use public transportation, limiting their independence and ability to participate in activities. Electric tricycles can help to solve these problems by providing an accessible and secure means for people with disabilities to travel. This project promises to produce an electric tricycle made specifically for use by people with disabilities. The tricycle will have features like a compact step-through frame and handlebar options that make it effortless to use and comfortable to ride. A strong electric motor that can travel for an extended period will alsopower the tricycle.

II. BLOCK DIAGRAM

The hardware elements show the process for the flowof recording and marking.

1. HUB MOTOR KIT – 36V 250W
2. BATTERY PACK – 36V, 10AH
3. LI-ION BATTERY CHARGER PACK – 42V, 2A
4. ARDUINO UNO
5. LM35 SENSOR
6. COOLING FANS
7. SINE WAVE CONTROLLER

HUB MOTOR KIT

Fig.2.1Hub Motor

For electric tricycles, a 250W 36V hub motor kit is an increasingly common choice since it achieves a nice combination of power, efficiency, and price. It is also quite simple to install. The following elements are commonly included in a hub motor kit with a 250W 36V:

- a hub motor of 250W 36V.
- A controller for a 36V.
- motor throttle handle.
- a brake pedal.
- an assist pedal sensor mounting device.
- The tricycle's front wheel will be replaced with the hub motor wheel in order to install a 350W 36V hub motor kit. The motor controller and other components will be then mounted on and connected to the wiring harness [1].

BATTERY PACK -36V 10AH

Lithium-ion batteries are used in electric tricycles because they offer a number of advantages over other battery types:

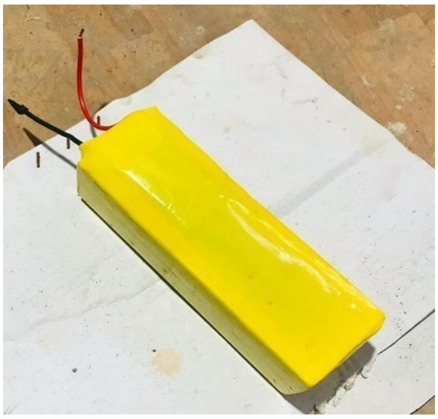

Fig.2.2. Battery Pack

- Higher energy density, meaning they can store more energy in a smaller and lighter package
- Longer cycle life, meaning they can be recharged more times before needing to be replaced
- Faster charging times
- Better safety performance

LITHIUM-ION BATTERY CHARGER PACK

A 48V lithium-ion charger is a device that is specificallydesigned to charge 48V lithium-ion batteries. It is important to use a charger that is designed for the specifictype of battery you are charging, as using the wrongcharger can damage the battery or even cause a fire [2]. 48V lithium-ion chargers typically have a variety of safety features, such as overvoltage protection,overcurrent protection, and short circuit protection. Theyalso typically have an LED indicator light that shows thecharging status of the battery [3].

ARDUINO NANO

An Arduino NANO can be used for battery protection in an electric tricycle by:

Monitoring the battery voltage and current to ensure that they remain within safe limits. Disconnecting the battery from the load if the voltage or current exceeds a predetermined threshold, sending an alert to the user if the battery is running low or if there is a problem with the battery.

Fig.2.3. Arduino Nano

LM35 SENSOR

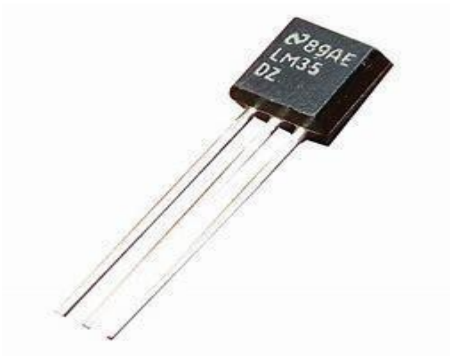

Fig.2.4. LM35 Sensor

An LM35 sensor of 60 microamps is a precise temperature sensor that can be used in the battery protection of electric tricycles. It has a wide temperature range of -55°C to 150°C and a low power consumption of 60 microamps, making it ideal for use in battery-powered devices [4]. The LM35 sensor can be used to monitor the temperature of the battery and trigger an alarm or cut off the power to the motor if the temperature exceeds a safe limit. This helps to protect the battery from damage and prevent fires.

COOLING FANS

Fig.2.5. Cooling Fans

12V cooling fans are used in battery protection of electric tricycles to help dissipate heat generated by the battery, especially during high-power discharge or charging. This can help to extend the battery's lifespan and improve its safety. Cooling fans are typically mounted on the battery case or near the battery pack. They are powered by the battery itself and operate automatically when the battery temperature reaches a certain threshold.

SINE WAVE CONTROLLER

Smooth and quiet operation: Sine wave controllers produce a smooth and quiet sinusoidal output voltage, which results in a smoother and quieter ride for the vehicle. This is in contrast to square wave controllers, which produce a choppy output voltage that can cause vibration and noise.

Fig.2.6. Sine Wave Controller

Increased efficiency: Sine wave controllers are more efficient than square wave controllers, which means that they can convert more electrical energy into mechanical energy. This can result in a longer range for the vehicle on a single charge. Reduced wear and tear: Sine wave controllers can help toreduce wear and tear on the motor, which can extend thelife of the motor. This is because the smooth sinusoidal output voltage reduces stress on the motor windings [5]. Improved torque: Sine wave controllers can provide improved torque, which means that the vehicle can accelerate more quickly and climb hills more easily.

SPECIFICATIONS OF COMPONENTS

```
#include <OneWire.h>
#include <DallasTemperature.h>
#define ONE_WIRE_BUS 2 // Pin where the DS18B20 isconnected
#define RELAY_OFF_PIN 3 // Pin to control the relay toturn off
#define RELAY_ON_PIN 4 // Pin to control the relay toturn on
OneWire oneWire(ONE_WIRE_BUS);DallasTemperature sensors(&oneWire);void setup () {
Serial.begin(9600); pinMode(RELAY_OFF_PIN,OUTPUT);pinMode(RELAY_ON_PIN, OUTPUT);
}
void loop() {
 sensors.requestTemperatures(); // Request temperaturereadings
 float                        temperatureCelsius=
sensors.getTempCByIndex(0);
 if (temperatureCelsius >= 50.0) { // If temperature isgreater than or equal to 50 degrees Celsius
digitalWrite(RELAY_OFF_PIN, HIGH); // Turn off the relay
digitalWrite(RELAY_ON_PIN, LOW); // Turn on theother relay
}
else { // If temperature is below 50 degrees Celsius digitalWrite(RELAY_OFF_PIN, LOW); // Turn off therelay
digitalWrite(RELAY_ON_PIN, HIGH); // Turn off theother relay
}
Serial.print("Temperature: "); Serial.println(temperatureCelsius); delay(1000); // Adjust the delay as needed}
```

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Components	Quantity	Range
Lithium ion battery	1	36V,10AH
Lithium ion battery charger	1	42V,2A
Hub Motor Kit	1	250W,36V
Cooling Fans	2	12V
Dual channel relay	1	25A,400V
Arduino UNO	1	---
LM35 Sensor	1	60 micro amps

Table 1. Specifications of Components

III. EXPERIMENTAL RESULTS

In this section, the experimental approaches and thecorresponding prototype are presented.

Fig.3.1 When the temperature is raised above 50 deg C cooling fans gets on

Fig.3.2 Electric Tricycle

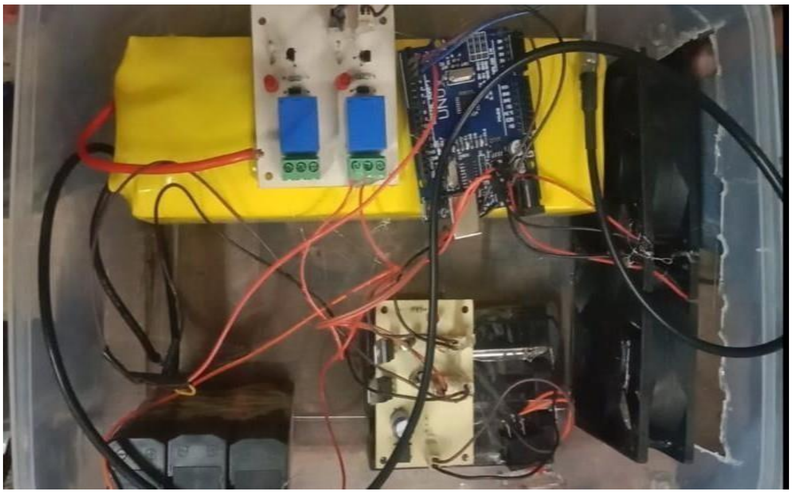

Fig.3.3. Hardware setup of battery and BMS system

VEHICLE SPECIFICATIONS AND RANGES
VALUE OF TORQUE - 35N-M CHARGING TIME - 3-4 HOURS MAXIMUM SPEED OF VEHICLE:25KPH
RANGE IN ONE SINGLE CHARGE - 35KM WEIGHT CARRYING CAPACITY - 120-140KG

KEY FINDINGS

- Electric tricycles offer several advantages over traditional wheelchairs, including increased stability, speed, and range.
- Electric tricycles are relatively easy to operate and can be customized to meet the individual needs of each user [6].
- Electric tricycles are becoming increasingly affordable and accessible to people with disabilities.

FUTURE SCOPE

We intend to provide a good interface by adding a Redesigned **dashboard** with a user-friendly interface for individuals with disabilities.
Large, easy-to-read displays with high contrast for bettervisibility.
Real-time Performance Monitoring: Display real-time information about the tricycle's performance, including battery status, range estimation, and speed

CONCLUSION

The development of an electric tricycle for handicapped travel has the potential to revolutionize the way individuals with mobility impairments live their lives. Byproviding a safe, convenient, and affordable mode oftransportation, electric tricycles can empower these individuals to regain their independence and participate more fully in society.

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