Smart Hybrid Bike

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Abstract
The advent of smart technologies has paved the way for innovative solutions in the realm of transportation. This project introduces a groundbreaking concept—the development of a Smart Hybrid Bike that seamlessly blends traditional cycling with cutting-edge technology. The bike integrates a sophisticated smart monitoring and control system, incorporating sensors to monitor vital parameters such as speed, distance, temperature, and battery level. A user-friendly interface, accessible through a handlebar-mounted dis- play or a mobile app, empowers riders to customize their biking experience and receive real-time feedback on various metrics. The usage of a GPS module integrates into the motorcycle fuel canteen, therefore sends directions of turns aside from tracking the distance that a rider goes. With its anti-theft mechanism that includes GPS tracking, one of the safest security items is not only the bike itself but also its rider
For many decades, the traditional bike and petrol-powered option have ruled the streets of cities. It is a basic vehicle design and popular among urban dwellers. Traditional bikes with the combustion engine run on fossil fuels that power the vehicle. It is simple and reliable while resistant to alternative sources of power. However, bike is detrimental as it pollutes the environment and overuses the limited extraction of fuel. Consequently, millions of bike models have been used worldwide; the environmental damaging effort has sparked the search for an alternative

Keywords:- *Transportation, Smart, Hybrid, Bike, Environment*

1. Introduction

For many decades, the traditional bike and petrol-powered option have ruled the streets of cities. It is a basic vehicle design and popular among urban dwellers. Traditional bikes with the combustion engine run on fossil fuels that power the vehicle. It is simple and reliable while resistant to alternative sources of power. However, the bike is detrimental as it pollutes the environment and overuses the limited extraction of fuel. Consequently, millions of bike models have been used worldwide; the still environmental damaging effort has sparked the search for an alternative. As a result, the electric bike is the result of the evolution of two worlds that cannot overlap: a bicycle and a motorbike. Despite the fact that the electric bicycle does not harm the environment during driving and is much quieter than known areas of human transport, the electric bike is becoming one of the most demanded transport vehicles, in addition to being environmentally pleasant due to the impossibility to pollute the air due to the ease with which the urban dweller easily transports around the city, and when moving to the workplace. Nevertheless, my proposed design is difficult in terms of battery usage, range, and battery charging.[4]
In conclusion, the smart hybrid bike ranks top among all modes of transportation. Due to the ability to combine the best of two sources of power, fuel, and electricity, the bike has a god performance and is highly efficient while achieving long-range. Moreover, the bike has a lower environmental impact. The best place that this alternative will work best is in the urban areas that are focused on achieving sustainability. The smart hybrid bike strikes a balance between traditional and modern world to foster responsible mobility.

1. Literature Review

a. Working of Conventional Fuel Bike:

Conventional fuel-powered bikes have long been the primary mode of transportation for many individuals.The motive forces for these two wheels are the internal combustion engines that, during their operation, generate the power and drive the vehicle. Here are the some of the

b. characteristics and drawbacks of conventional fuel-powered bikes:

Internal Combustion Engines: Operating on traditional fuel, conventional motorcycles with internal combustion engines (ICE) are designed to provide the rider with main propulsion. These engines generally utilize fuels such as petrol. Engine chamber is a space inside the engine where fuel and air are mixed and ignited. In the process of which controlled explosions ignite pistons up and down. This torque has a potential to transfer a mechanical motion to a bike's wheels, thus an engine acts as a motor.

Simplicity and Familiarity: One of the pros of old-fashioned fuel engine bikes is their simplicity and the fact that they are so familiar. The technology of the internal combustion engines has been improved over many years, therefore, this bikes are now reliable and easy to maintain. Many riders have gotten used to the sound and sensation of the regular engines that might influence their choice to continue using them.

Environmental Pollution: There is the concern of using old traditional fuel bicycles that emit greenhouse gases, environmental pollution from these bikes is also concerning. The burning of fossil fuels, for example, petrol, is the source of the harmful pollutants are the carbon monoxide (CO), nitrogen oxides (NOx) and particulate matter. They make a part to air pollutants increasing smog formation and climate change which may be contra action for human health and the environment.[7]

Dependence on Fossil Fuels: Another disadvantage of traditional fuel-powered bikes is their dependency on the limited fossil fuel sources. petrol, fuel and coal are finite reserves of energy, producing carbon dioxide when they are being consumed. As worries about energy security and climate change grow, low-carbon energy sources are considered as the must solutions to promote renewable energy systems.
Fluctuating Fuel Prices: Conventional fuel-powered bikes are also among the ones that are affected by fuel price fluctuations. The fluctuation of petrol and another fossil fuels costs is often influenced by many factors, such are the global oil supply and demand, nation and international politics, and also the market speculation. This volatility is Under the current system, fuel prices are highly correlated with global economic conditions and political developments. When economic conditions are uncertain, investors tend to move away from high-risk investments like oil and gas, driving down demand and hence prices. Similarly political developments such as trade wars or geopolitical instability can also lead to uncertainty, which can affect the demand and prices of oil.
Maintenance Costs: Also, the repair costs for normal bike engines can be quite high. Internal combustion engines need frequently serviced to ensure that the engine is working optimally and lasts long in time. Such servicing involves oil changes, replacing filters and tune-ups. Incidental damages that occur over the run of the diesel engines requires expensive repairs, that compound into the total expenses.

In short, while the fuel-powered bikes are simpler and more familiar, they also have some major disadvantages such as environmental pollution, the dependence on finite fossil fuels, the fluctuations in fuel prices, and the maintenance costs. Together with the increasing worries about sustainability and efficiency there emerges the wide range of interest for the alternative transport solutions that apply to smart hybrid bikes that are more eco-friendly, cheap and efficient

3.Methodology

The inverter functions in two conduction modes: the 180-degree mode and the 120- degree mode. When converting DC voltage to AC voltage in a three-phase inverter, it adheres to a specific switching sequence to generate a three-phase AC voltage wave- form. The underlying principle involves strategically manipulating the DC voltage to create the desired three-phase AC voltage waveform with a specific frequency and phase displacement. Power switches like thyristors, transistors, or gate turn- off thyristors (GTOs) are utilized and controlled by a circuit to establish the switching pattern. This control circuit generates signals to activate and deactivate the power switches at precise intervals, shaping the intended AC voltage waveform. Usually, the AC voltage waveform produced by the inverter deviates from a pure sine wave and may encompass harmonic components that could present challenges in the load or the power system. To tackle these issues, filters are commonly employed to refine the waveform and reduce harmonic content. The efficiency of a three-phase inverter hinges on diverse factors, including the type and efficiency of the power switches, the control circuit, and the filters in use. Attaining high efficiency and reliable operation across varied operating conditions necessitates meticulous design and optimization of these components.

3.4.5 120° Conduction

In this mode of conduction, every electronic device operates for a duration of 120 degrees,

resulting in a six-step waveform spanning across the phases. This configuration is particularly well-suited for a delta connection in a load. As a consequence, only two devices are conducting at any given moment due to each device's 120-degree operation. In this arrangement, the positive terminal of the source is connected to terminal A on the load, while the negative terminal is linked to terminal

4 Simulations and Results

4.1.1 BLDC circuit

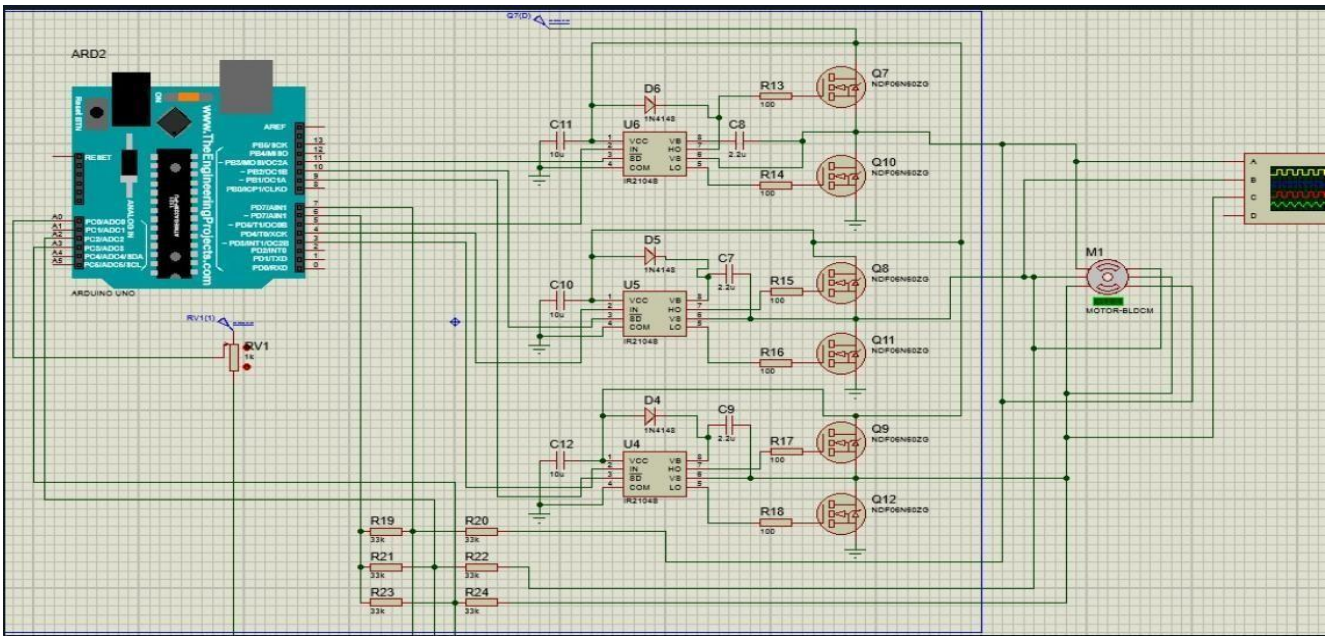

Figure 4.1: BLDC circuit

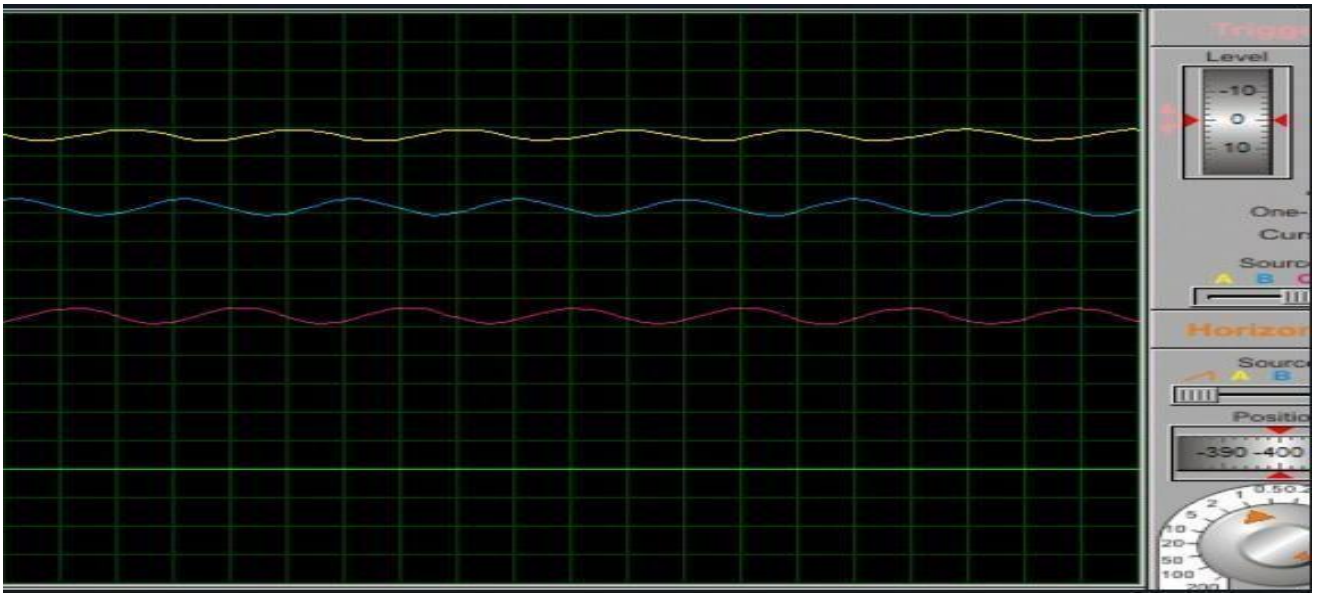

Figure 4.2: input voltage from BLDC circuit

4.1.2 Accident Alert System

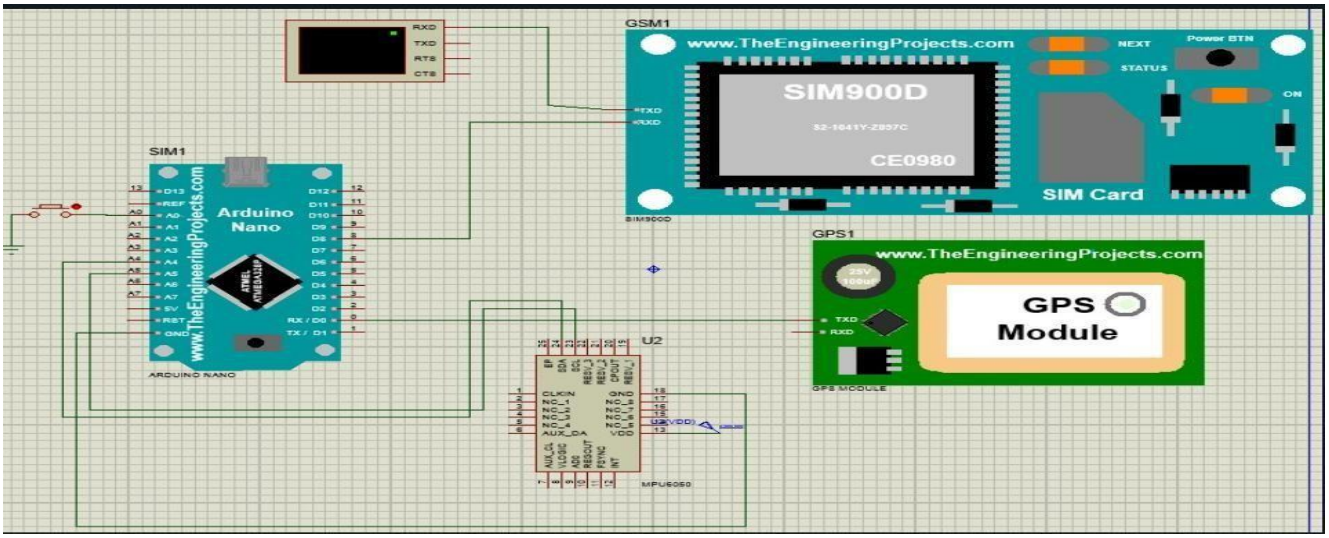

Figure 4.3: Accidental Alert

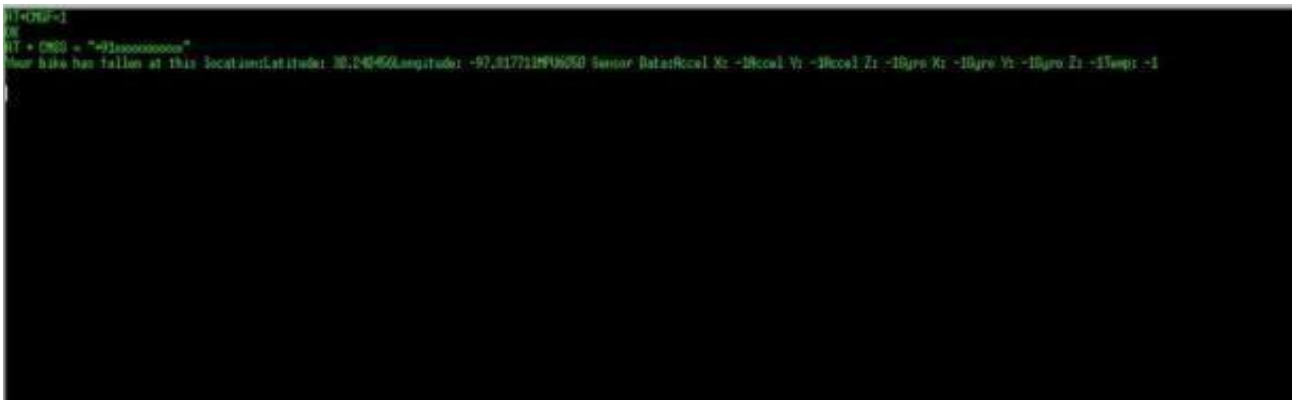

Figure 4.4: Accidental Alert results

4.2 Working

The utilization of Arduino involves the retrieval of data from the MPU-6050 gyroscope and accelerometer module, employing MEM technology. This module integrates both accelerometer and gyroscope functions into a singular chip, communicating through the I2C bus interface with the host. With 8 pins on the chip, a code is generated to validate the I2C connection between Arduino and MPU- 6050. The code encompasses the inclusion of the Wire library's header, variable definition, and a conversion function. The Setup function verifies the serial connection and assesses the GPS module to confirm its capability to determine location. The GPS module operates by determining its distance from multiple satellites, which transmit position and time information via radio signals. The Arduino code ensures the GPS module offers a position fix by monitoring its blinking patterns. Lack of blinking indicates a search for satellites, while blinking every second indicates a successful position fix. Establishing a connection between Arduino and GSM involves two methods. The first entails connecting the TX pin of the GSM module to the RX pin of Arduino and vice versa. The second method utilizes two PWM-enabled pins of Arduino (Pin 9, 10) with the software serial library. After establishing the connection, data can be directly transmitted to the GSM module. A system for accident detection and alerting has been created, utilizing Arduino to transfer information to diverse devices. The accelerometer monitors the accident direction, while the gyroscope identifies vehicle rollover. During an accident, the system reads the precise latitude and longitude of the vehicle, transmitting this data to the nearest emergency service provider through the GSM module. Employing GPS, the system tracks and sends the geographical coordinates of the location to cover the area.

5. Impact and Sustainability on Environment

The advent of smart hybrid bikes has resulted in both positive and negative environmental consequences. On a positive note, these bikes play a role in diminishing carbon emissions by utilizing dual power sources—melding an electric motor with a traditional internal combustion engine. This hybrid technology proves advantageous for fuel efficiency, especially in urban scenarios characterized by frequent stops and starts. The electric aspect of smart hybrid bikes enables riders to transition to an emission-free, electric-only mode during short distances, thereby lessening the overall carbon foot- print. Additionally, the incorporation of regenerative braking systems in these bikes captures and stores energy during braking, optimizing energy efficiency further. The incorporation of smart features, such as GPS navigation and connectivity, not only enhances route planning and efficiency but also has the potential to reduce travel times and fuel consumption. Smart hybrid bikes can have a number of positive impacts on the environment, including the following: • Reduced emissions and pollutants: This type of smart hybrid bikes will be helpful in the emission reduction and the pollution control by the use of the dual power system which unites the internal combustion engine with the electric motor. The electric mode, which is intended for short distances, works without emissions, thus drastically reducing the overall carbon footprint, energy efficiency and emissions. • Reduced noise pollution:The system of smart hybrid bikes has reduced the noise pollution by using electric motors that work noiselessly at low speed and in idle conditions. The electric mode which is only designed for very short distances is the most appealing feature of this technology because it operates quietly and so contrasting to the noise produced by all the conventional internal combustion engines. The electric only transition in the idle and slow areas is another method of mitigating noise emissions resulting from this

6. Conclusion

Having the final year project heavily geared towards the design and implementing a hybrid electric vehicle has shown our firm determination to contribute to the development of user-friendly public transport. The successfully completion of the eclectic powertrain, a battery management system and an intelligent charging entity undoubtedly represent as remarkable breakthroughs. The thorough performance tests have given the prospects of hybrid technologies in the reduction of fuel consumption, the decrease of emissions and the increase of vehicle efficiency. The experience from the project is projected to be searched for by the society as it will lead to further development of hybrid and electric vehicles. This will in turn propel the progress towards a sustainable future in transportation. The main point of the project is not only designing and presenting in the best way a vehicle with both the available, plug-in and solar sources of power, but also choosing the best motor type. Here the BLDC (Brushed Less Driven Current) motor capable of utilizing both power sources mentioned. The resulting car is a minimum two-seater vehicle and offers a choice of charging method through either solar power or a plug- in connection. A notable characteristic of this vehicle will be driving speed control through a throttle, changing the direction due to directional button, braking methods and steering system for operating. It can be completed by adding options such as speed, battery voltages, and individual cell voltages in a display that increases the usefulness. The project pays special attention to the charging sources, the installation of the solar or the battery charge controllers as the protection against overcharging, and the excess energy is stored in the battery for prolonged use. Global targets for the sustainability are considered by this project, and it is expected to make a positive contribution to the achievement of the Goals of Sustainable Development (SDGs). One of the most effective means is the energy transformation by using renewable energy resources like solar power and introducing latest hybrid technology.

7. References

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