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Self-Balancing One Wheel E-Scooter

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Abstract: *Electric cycles with only one wheel, commonly referred to as "mono wheels," are a particular class of personal electric vehicle. Rider adjusts the vehicle's balance by moving their weight while seated in the middle of the wheel. These electric cycles can run smoothly and quietly since they often contain a small electric motor that is battery-powered. A distinctive and cutting-edge means of transportation, one-wheeled electric cycles combine mobility, convenience, and environmental friendliness. Single-wheel electric cycles are great for travelling through crowded city streets because they are compact, relatively light, and easy to carry and store.*
Key Word: *one-wheel; Balancing; compact; electric cycle; environmental friendliness.*

I.INTRODUCTION

Electric unicycles, often referred to as one-wheel electric cycles, have grown in popularity recently as a mode of personal transportation. These scooter have one tire, a foot platform, and an electric motor that the rider adjusts their body to drive. While considering one-wheel electric cycles, there are a number of factors to take into account from the perspective of a research study. Well first of all, the technology that powers these model is continually developing, with new models and features launching frequently. The physics of the electric motor, as well as the many sensors and controls that provide the rider control over the cycle's speed and direction, may be of interest to the researcher. Second, it's crucial to research the safety implications of one-wheel electric cycles. These vehicles need a lot of ability to balance and operate properly, and riders who don't follow to the recommended safety measures run the danger of getting hurt. The risks of riding an electric unicycle, such as the potential for falls and collisions with other vehicles or people, may be something that researchers look at. Lastly, academics may want to look at the historical and social effects of one-wheel electric cycles. These cars are frequently viewed as a representation of the rising popularity of personal mobility and alternate modes of transportation. Researchers may want to look into how different demographic groups view one-wheel electric cycles and how they fit into the larger picture of urban mobility. All things considered, one-wheel electric cycles are an exciting and quickly developing field of study that presents a variety of chances for investigation and inquiry. There is much to discover and learn about this fascinating new mode of personal transportation, whether examining the workings of the electric motor or examining the cultural effects of these vehicles.

II.HISTORY OF ONE-WHEEL ELECTRIC CYCLE

The one-wheel electric cycle's beginnings can be found in the early 2000s, when a Californian inventor by the name of Kyle Doerksen started developing the idea for what he termed the "One wheel." Doerksen wanted to build a self-balancing electric skateboard that could withstand off-road situations and rugged terrain. They invested many years in the technology's development, which included creating a special brushless motor and battery setup to power the apparatus. Doerksen started a Kickstarter campaign in 2014 to raise money for the one wheel's manufacture, which rapidly became well-liked among fans of extreme sports and outdoor adventurers. Around $630,000 was raised throughout the campaign, which was sufficient to start making the first one wheel models. Since then, the one wheel has grown in appeal, giving rise to a number of copycats and rivals in the one-wheel electric bike industry. One-wheel electric bikes come in a wide range of sizes and power levels today, from small, lightweight models made for commuting to larger, more powerful off-road ones made for rough terrain.

III.PRINCIPLE OF SINGLE-WHEEL ELECTRIC CYCLE

A single wheel is used as both the propulsion and stability component of a single-wheel electric cycle in theory. An electric motor, which is often found in the wheel hub, drives the cycle. The rider utilizes their body weight to steer the bicycle by standing on a platform that is connected to the wheel by a frame or axle. The battery that powers the electric motor is often housed in the platform or another compartment on the bike. A hand-held remote or the rider's body weight can be used to change the rotation's speed and direction. The cycle's single-wheel construction has a number of benefits over conventional

bicycles. For instance, it can be ridden more comfortably and in smaller locations. Also, because it can better absorb shocks and vibrations than traditional bicycles, the single wheel offers a smoother ride. The single-wheel electric cycle's overall goal is to offer a convenient, enjoyable, and environmentally friendly mode of transportation.

IV.LITERATURE REVIEW

A mono wheel electric cycle, often called a "monocycle," is a kind of electric vehicle with a single wheel that is propelled by an electric motor and is usually situated in the middle of the vehicle. Being a novel and environmentally friendly mode of transportation, this kind of relatively new vehicle has become more and more well-liked in recent years. There isn't much research on mono wheel electric bikes, but what is known about them points to various advantages over conventional bicycles and electric scooters. For instance, mono wheel electric cycles are easier to operate in highly populated cities since they have a lower overall footprint than conventional bicycles. In one Italian study, researchers from the University of Bologna assessed the stability, comfort, and energy consumption of a mono wheel electric cycle. The study discovered that while the mono wheel electric bike was stable at low speeds and enjoyable to ride, it consumed more energy than regular bicycles and electric scooters. Researchers at the University of Portsmouth in the UK did another study that looked at the use and safety of mono wheel electric cycles in urban settings. According to the study, users of mono wheel electric bikes saw them as safe and found them to be more maneuverable than standard bicycles and electric scooters. Overall, despite the paucity of study on mono wheel electric cycles, the evidence that is now available points to a number of advantages these machines have over conventional bicycles and electric scooters. To completely assess the effectiveness, safety, and utility of these vehicles in various settings and under various circumstances, further research is nonetheless required.

V.CHALLENGES FORMULATIONS

According to the review of the literature, all researchers, whether from the University of Bologna in Italy or the University of Portsmouth in the UK, place a greater emphasis on issues relating to stability, comfort, and power consumption than they do on cost minimization, which is the primary concern for any production sector. The majority of the items we utilise come from leftovers, with the exception of a few necessary items like motor batteries and so forth. E-cycles are reported to be stable at moderate speeds and comfortable to ride, but they consume more energy. The key difficulty is to increase speed, which means minimising energy consumption, while simultaneously maintaining stability.

VI. MATERIAL FOR STRUCTURE

Table 1: Parts Name

Sr. No.	Materials
01	Hub Motor with electric equipment’s
02	Back Stay & Seat of bicycle
03	Handle
04	Battery
05	Nut bolt (10mm)
06	Rim & Spokes
07	Tube & Tier

VII.CALCULATION AND ANALYSIS

Developing an electric bicycle with just one wheel can be difficult since it calls for careful consideration of a number of different aspects, including weight, power, stability, and safety. An elementary calculation for creating a one-wheel electric cycle is shown below:

1. **Weight:** To guarantee smooth mobility and stability, the cycle's weight must be kept as low as possible. We can allot 7 kg for the wheel and hub motor, 5 kg for the battery, and 3 kg for the frame and other components, assuming a desired weight of 15 kg.

2. **Power:** The electric motor's output must be sufficient to move the bike and its rider ahead. A decent place to start when building an electric cycle with one wheel is a 500W brushless DC motor.
3. **Battery:** The battery size should be selected to give the rider a reasonable amount of range. We can utilize a 36V, 10Ah lithium-ion battery, which offers a total energy capacity of 360 WH, assuming a desired range of 25 km.

4. **Speed:** For reasons of safety, the cycle's top speed must be restricted. A great option for a one-wheel electric cycle is a top speed of 25 km/h.

5. **Stability:** If the cycle is not properly balanced, the one-wheel design could render it unstable. A gyroscopic stabilization device, which can help keep the cycle upright and steady even at moderate speeds, can be incorporated to alleviate this issue.

6. **Braking:** A vehicle's brakes are a crucial safety component. To ensure efficient braking, the hub motor can incorporate a disc brake system.

In order to create an efficient and comfortable riding experience, a one-wheel electric cycle must carefully balance weight, power, stability, and safety measures.

Table 2: specification

Sr. No.	Data	pecifications
1	Gross weight e-cycle	10.7kg
2	Weight of lithium-ion battery	700g
3	Weight of wheel one hub motor	7kg
4	The structure weight	3kg
5	Power output	350watt
6	Maximum speed range	25km/h
7	Total energy capacity	360watt
8	Desired top speed	15km/h
9	Desired acceleration time	0.5sec
10	Max angle of inclination	15degree
11	Radius of tire	330mm

VIII.CONCLUSIONS

In summary, one-wheel electric scooter are a unique and fascinating form of transportation that have several advantages over more conventional modes of transit. They are ideal for off-roading and commuting in urban areas thanks to their lightweight design and construction. Also, they are a fantastic substitute for gas-powered vehicles due to their environmental friendliness, low maintenance requirements, and simplicity of usage.

It is important to highlight that operating a one-wheel electric vehicle safely takes skill and caution because they can be harmful if not used properly. When riding, proper safety equipment such pads and helmets should always be worn.

Overall, the one-wheel electric scooter is a promising development in transportation technology and provides passengers with a distinctive and exhilarating experience.

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