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Development and Cost Analysis of anE-Smart Vehicle Empowered with Smart Parking System

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Abstract:-The quick development in innovation and economy leads to the utilization of four wheelers, especially private cars has been expanded on streets everywhere throughout the world. In exceptionally populated nations, for example, India, this prompts different issues like blockage, travel delays, mishaps and so on. On account of this there emerges a requirement for Intelligent Transportation System. Parking of vehicles is another difficult issue that the nation is confronting today. Different researchers are working on this region to build up a solution for this difficulty. Present investigation focuses on improvement of a framework to lessen the turning radius of a car which already exists in earth movers like excavator. In this framework from the outset vehicle is halted and wheels are then turned in the necessary direction with the assistance of steering. It has turning radius almost equivalent to immaterial of the length of vehicle itself.So that vehicle can be turned in the place which is justequal to the dimension of the vehicle. This structure can be helpful in improved parking, high traffic, back turning on narrow streets, and so forth.

Keywords: *Vehicles, Improved Parking, Turning radius*

Introduction:

The progressed new innovation has prompted different adjustments in the car or vehicle segment. Zero degree turning range of a car or vehicle infers the vehicle pivoting about a hub which is going through the focal point of the gravity of vehicle for example the vehicle turning at a same spot, where it is parked. No additional place is essential to turn the vehicle. Therefore thevehicle can be turned in the place which is just equal to the dimension of the vehicle. This innovation exists in substantial earth movers like excavator. Ordinary guiding component includes either the utilization of Ackerman or Davis controlling frameworks. The problemassociated with these structures is the base turning series that is conceivable with these structures is the base turning sweep that is feasible for the guiding activity. This problem is associated with the regular methods for directing is eliminated by utilizing a four wheel controlling framework. This course of accomplishment of the wheels permits the vehicle to turn 360 degrees when steering wheel is rotated, without moving from the spot, for example the vehicle has zero turning radius which aides in moving the vehicle in restricted spaces, for example, parking areas and in small streets.The key objectives of this system are

1. To reduce the turning radius of the vehicle i.e. the turning radius is negligible which is equal to the length of the vehicle.

2. To make each wheel of the vehicle to rotate 360° when steering wheel is rotated
3. To move the vehicle in required direction using electric motor.
4. To give power to the motor using battery

Literature Review

The following literatures show the previous works that other researches had done in the same area for enhancing the parking difficulties and developing smart vehicles. Halleman et al.[1] examined that joining the ideas of its precursors, e-stopping is a spearheading business stage that pays a path for the drivers to discover an opening for stopping , hold a space, and to pay the stopping charges. Drivers can get to by means of phone with Internet. Bluetooth innovation can likewise perceive every vehicle at section and leave focuses and creates installment. Merriman in [2] and Ferguson in [3] found that an appraisal of the writing suggests that stopping deficiencies at rural rail stations may intriguingly compel travel ridership. Furthermore, drivers may react to pre-excursion and on the way data on stopping accessibility at travel stations by expanding their travel use. Thompson et al [4] proposed a framework in the wake of leading examinations and recommend that, mindfulness and comprehension of PGI signs can be moderately high, yet so as to be powerful, messages must show precise data that addresses explorers' issues. PGI structures were reduced leaving office line lengths; be that as it may, structure wide falls in movement time and automobile travel and financialbenefits might be moderately small. Considering destinations of the old PGI frameworks, travel based structures will build travel use and incomes and furthermore lessen vehicle travel, fuel use, and air contamination. Robert T. Clemen et al [5] utilized Spearman Correlation to gauge the relationship quality and bearing among the elements of: city, client age, sexual orientation, vehicle type, work, instructive level, month to month compensation, Mastercard type, just as the utilization of savvy leaving by means of canny frameworks J Liu et al. [6] presented an I-Parking which is an indoor situating arrangement, which wires WLAN signals and cell phone sensor estimations, application sufficient to empower an insightful stopping administration as far as situating precision, unwavering quality and accessibility. A Bagula et al.[7] presented a Smart stopping framework which speaks to an IoT sending in a which is fit for giving a wide scope of administrations intended to encourage the entrance to a parking space and to kill the gridlock with alternatives for pre-paying, upgraded security and recovery. V Paidi [8] inferred that the presence of savvy stopping administrations committed to open/private outside stopping would be required, however sadly sensors systems and frameworks devoted to outside stopping are not right now being used. Grodi et al. [9] proposed a keen stopping arrangement dependent on Wireless Sensors Network sent utilizing XBeeS2 modules. In this framework each parking space area is planned to a status and the drivers are advised by means of versatile or web application about free parking spaces. C Lee et al.[10] proposed a framework that considers both indoor and open air stopping frameworks. As an indoor stopping structure, ultrasonic sensors hubs attached on the roof of each parking space speak with the client through Bluetooth Low Energy correspondence innovation with a portable application is introduced on the cell phone. In another work by P H V Sesha Talpa Sai et al., vehicle protection system using finger print authentication was tested. They used GSM and GPS to verify and process the anti theft system and found this technology was affordable and precise [11].Even though various researchers have worked on this area, very few researchers have considered the economical aspect. This proposed system mainly focuses on the economical feature.

Components Used

The main components utilized in this proposed vehicle are Chassis, Sprockets, Bearings, Chain drive, Forks, Rims, Tires, Steering rod, D.C Motor and Battery. The overview of the components and its dimensions used for this investigation is given below.

Length of Frame	62 inches
Width of frame	56 inches
Wheel base	20 inches
Taper	2.5 inches
Fork Dimensions	22 inches
Wheel dimensions	20 inches
Height of frame from base	28 inches
Diagonal length of frame	76 inches
Sprockets	18 teeth sprocket
	Pitch=0.5inch, width=0.124inch
Bearings	NTN 6206LU Ball Bearings, 4 Nos.
Forks	20 inches, 4 Nos.
Rim & Tube Tires	20 inches, 4 Nos

Working Process

The main objective of this investigation is to turn each wheel of the vehicle up to 360 depending on the parking condition. The back wheels of the vehicle are really locked through a lever which makes this vehicle go about as would be expected vehicle. The controlling is given through steering wheel. The steering wheel is utilized to turn just front wheels yet back wheels are not pivoted with this wheel. The back wheels are turned utilizing the little wheel which is placed before driver's seat.The guiding of wheels is done through chain drive system. A locking framework is given at the front of the seat to bolt the back wheels when the vehicle is moving.

On the off chance that, we need turn the back wheels, first we need to stop the vehicle by utilizing slowing mechanism given at the force wheel. The slowing down is finished by pushing the lever given at front. At that point the wheels are turned at required angle and locking of back wheels is to be done to evacuate the uneven development of wheels. The movement of the vehicle is given by utilizing center point engine which is encased in a force wheels. The ability to the engine is given by a pack of batteries which are charged by utilizing charge regulator. At the point when the accelerator at the front area is pressed, the battery gives capacity to the force wheels. At that point, the vehicle moves in the required direction. Advanced features also

can be incorporated using IOT based iParking system. Establishment of charging stations on the highways is another important aspect as the E-smart vehicles can be charged when required. Typical architecture of iParking using IOT and charging station of E-smart vehicle are shown in Figure 1 and Figure 2.

Fig.1 The architecture of the iParking service using IOT

Fig.2 Charging station for E-smart vehicle

Cost Analysis

An ordinary least price conventional car (NANO CAR) available in the market will cost around rupees of 2, 00,000. This investigation proposes an E-Smart vehicle which can be made available at an amount of less than rupees 50, 000 if it is produced with the ordinary 500w motor. The detailed part to part cost is listed in table 1.

Table 1: Cost of Components for E-Smart Vehicle

S. No	Component Name	Expected Cost (INR)
1	Battery pack	8,200
2	Hub motor	3,300
3	wheels	1,600
4	Electric charger	1,200
5	Brake system	500
6	Chassis (work, Material)	4,200

7	Steering system	1,200
8	Wiring with cables	1,200
9	Accelerator	500
10	Accessories	1,800
11	Producer profit with tax	8,000
	Total cost:-	31,700

Analysis of Charging Time, Power Consumption Calculations:

1. The time taking for full charging of 4 batteries is, T= 6 hours
2. The current consumed for full charging of a battery is, X=1.2 units.

3. The total power consumed for full charging of 4 batteries is

   N=4*X=4*1.2 =4.8 units

   1 unit cost = 4 rupees. 4.8units cost = 4.8*4 = 20 Rupees. (Approximately)

Conclusion:

The replacement of E-smart vehicle for regular vehicles brings about a critical decrease in ozone harming substance discharges. E-smart vehicles are having a contamination free and greener condition. A vehicle highlighting minimal effort and easy to understand directing system has been presented.They have likewise monetary advantages, for example, less expense to run. Parking of vehicles is as yet a major issue to be tackled. A model for the proposed approach was created by presenting separate system for ordinary guiding reason and 360 directing reason. This model was seen as ready to be moved effectively in restricted spaces, likewise making 360° directing possible. All things considered, one can guaranteed that E-smart vehicles are the vehicles of things to come and will govern the car business until the up and coming age of eco-accommodating and eco-friendly vehicles have their spot with multi directional turn of wheels. This sort of vehicles have an incredible breadth in future and can grew further for utilizing in more traffic areas and improved parking.

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