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Fabrication of Parallel Car Parking System Using 5th Wheel (Motorised)

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ABSTRACT

In earlier methods of parking, the time taken is 2 minutes (approx)to park the vehicle. The driver needs to be more alert while parking to avoid hitting the car during the reverse motion. The unskilled drivers are not able to park the vehicle perfectly.

To avoid these inconveniences, a concept of parallel parking is made, where the total time will be 50 to 60 seconds. This parking can be done using an additional wheel (Fifth Wheel). A pneumatic cylinder and solenoid valve setup is used to control the fifth wheel to land and lift. A DC motor enables the forward and reverses the motion of the fifth wheel. A digital display is used to indicate the status of the wheel for the driver's reference. It also helps to know malfunctions during the landing or lifting of the wheel. This concept is mainly used for four-wheeler vehicles and also trucks. This setup makes the vehicle turn parallel at a significant angle regarding the front axle within a short period. The model enables the driver to park the vehicle between two vehicles, where the space is limited. The fifth wheel can rotate 360 degrees which make the vehicle turn parallel at a significant angle.

Keywords: *Parking System, Screw, Control Unit, additional wheel, DC motors.*

1. Introduction

Parallel parking is a method of parking a vehicle in-line with other parked vehicles. Parallel parking requires initially driving slightly past the parking space, parallel to the parked vehicle in front of that space, (hence the term Parallel Parking'), keeping a safe distance, and then followed by reversing into that space. Subsequent position adjustment may require the use of forwarding and reverse gears. Parallel parking is considered to be one of the hardest skills for new drivers to learn. Parallel parking enables the driver to park a vehicle in a smaller space than would be true of forwarding parking. Driving forward into a parking problem space on the side of a road is typically not possible unless two successive parking spaces are empty. Parallel parking requires initially driving slightly past the parking space, parallel to the parked vehicle in front of that space, keeping a safe distance, and then followed by reversing into that space. Reversing into the spot via the parallel parking technique allows one to take advantage of a single space not much longer than the car (to complete the parking within three wheel turns the parking space would generally need to be about one and a half car lengths long).

1.1 Reasons behind parking accidents

Driver characteristics age, gender, race, and alcohol or drug use, are the main reasons for the accident. Age matters while driving the vehicle while getting proper guessing for parking. The age group of people between 18 to 50 can drive the vehicle properly but the age group of 50 to70unable to drive the vehicle safely because of a lack of decision taking ability. The outcomes demonstrated that drivers significantly affected the likelihood of parking area crashes. Female drivers were around 23 percent bound to be associated with these accidents than male drivers. Utilization of liquor and drug drivers' basic leadership capacity and loss of vision.

Likewise, it decreases readiness and concentration which may result in accidents. Strangely, this factor was observed to be increased up to 95 %.

1.2 Shafts

A shaft is a common and important machine element. It is a rotating member, in general, has a circular cross-section, and is used to transmit power. The shaft may be hollow or solid. The shaft is supported on bearings and it rotates a set of gears or pulleys for power transmission.

1.3 Wheel

A wheel is a circular component that is intended to rotate on an axle bearing. The wheel is one of the main components of the wheel and axle which is one of the six simple machines. Wheels, in conjunction with axles, allow heavy objects to be moved easily facilitating movement or transportation while supporting a load, or performing labor in machines Wheels are also used for other purposes, such as a ship's wheel, and steering wheel.

1.4 DC Gear Motor

An electric motor is an electrical machine that converts electrical energy into mechanical energy. A motor controller a device that serves to govern in some predetermined manner the performance. The motor rotates in a clockwise as well as in an anti-clockwise direction. Motor needs electricity for its function.

The direction of this force is given by Fleming's left-hand rule.

1.4.2 Working of a DC motor

Consider a part of a multi-polar dc motor as shown in fig. when the terminals of the motor are connected to an external source of dc supply.

The field magnets are excited to develop alternate N and S poles.

The armature conductors carry currents. All conductors under N-pole carry currents in one direction while all the conductors under S-pole carry currents in the opposite direction.

Suppose the conductors under N-pole carry currents into the plane of the paper and those under the S-pole carry currents out of the plane of the paper as shown in fig. Since each armature conductor is carrying current and is placed in the magnetic field, a mechanical force acts on it. Applying Fleming's left-hand rule, it is clear that force on each conductor is tending to rotate the armature in an anticlockwise direction. All these forces add together to produce a driving torque that sets the armature rotating. When the conductor moves from one side of the brush to the other, current in the conductor is received and at the same time, it comes under the influence of the next pole which is of opposite polarity. Consequently, the direction of the force on the conductor remains the same.

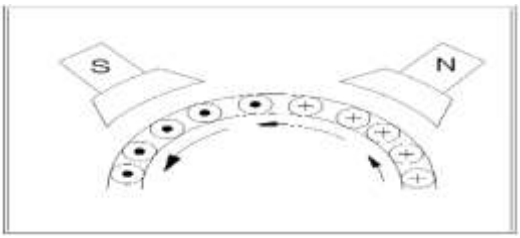

Fig.no:1.1 Multi polar DC motor

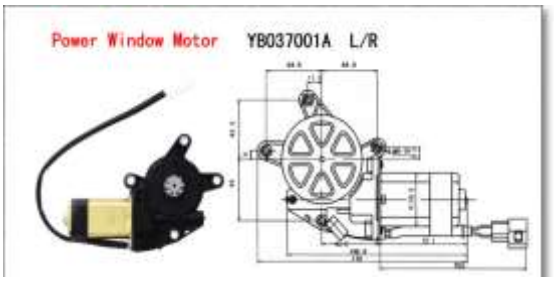

Fig.no:1.2 Power Window Motor

1.4.3 Principles of operation

In any electric motor, the operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and the strength of the external magnetic field. As you are well aware from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.

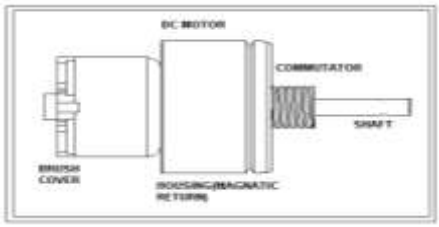

Fig.no:1.3 Electric motor

An electric motor is an electrical machine that converts electrical energy into mechanical energy. A motor controller a device that serves to govern in some predetermined manner the performance. The motor rotates in a clockwise as well as in an anti-clockwise direction. Motor needs electricity for its function.

Table 1.1: Motor Specification

Voltage Rating (V)	No Load		Load Rating			Locked Torque (Kgf.cm)	Locked Current (A)
	Speed (r.p.m)	Current (A)	Torque (Kgf.cm)	Speed (r.p.m)	Current (A)		
12	85±25	≤3	30	70±20	≤7	85±25	≤20

1.5 By using rack and pinion

A rack and pinion is a type of linear actuator that comprises a circular gear engaging a linear gear (the *rack*), which operates to translate rotational motion into linear motion Driving the pinion into rotation causes the rack to be driven linearly. Driving the rack linearly will cause the pinion to be driven into a rotation. A rack and pinion drive can use both straight and helical gears. parking can be done using an additional wheel (an Auxiliary Drive Wheel) most probably this will be a Stepney wheel. Initially, when the. driver finds a slot for parking, he pushes the button and the DC motor actuates the movement of the rack and pinion.

The rack and pinion will apply force on one side of the triangular hub and due to the pivot point, the triangular hub move in an angular moment, and another side of the triangle will lift the auxiliary wheel. This will land the auxiliary wheel on the road and slightly lifts the rear side of the vehicle.

A rack and pinion and triangular hub setup are used to control an Auxiliary drive wheel to land and lift. The model enables the driver to park the vehicle between two vehicles, where the space is limited.

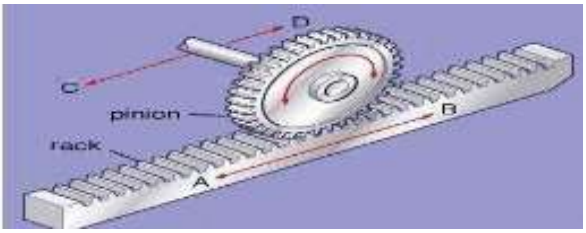

Fig. no: 1.4 Rack and pinion

1.6 Steering

The steering system is to achieve angular motion of the front wheels to negotiate a turn. This is done through linkage and steering gear which convert the rotary motion of the steering wheel into the angular motion of the front road wheels.

The secondary functions of the steering system are,

a. To provide directional stability for the vehicle when going straight ahead.

b. To provide perfect steering condition, and perfect rolling motion of the road wheels at all times.

c. To facilitate straight-ahead recovery after completing a turn. To minimize tyre wear.

1.7 Bearing

A bearing is any of the various machine elements that constrain the relative motion between two or more parts to only the desired type of motion. This is typically to allow and promote free rotation around a fixed axis or free linear

movement; it may also be to prevent any motion, such as by controlling the vectors of normal forces. Bearings may be classified broadly according to the motions they allow and according to their principle of operation, as well as by the directions of applied loads they can handle.

The term "bearing" comes ultimately from the verb "to bear", and a bearing is thus a machine element that allows one part to bear another. The simplest bearings are nothing more than bearing surfaces, which are surfaces cut or formed into a part, with some degree of control over the quality of the surface's form, size, surface roughness, and location (from a little control to a lot, depending on the application). Many other bearings are separate devices that are installed into the part or machine. The most sophisticated bearings, for the most demanding applications, are very expensive, highly precise devices, whose manufacture involves some of the highest technology known to humankind.

Fig. no:1.5 Bearing

Product details

- Product name: deep groove ball bearing; Type: 6202Rs
- Lateral: steel, rubber; structure(row Number): single row
- Outer diameter: 35 mm/1.38;inner diameter: 15mm/0.59
- Thickness: 11mm/0.43 inch
- Weight: 95G;package content: 2 x deep groove ball bearings

1.7.1 Ball Bearing

Calculation

Radial load of ball bearing(Fr) = 700 N

Thrust load of ball bearing(Fa) = 300 N

Service factor(s) = 1.2

Hours in use per week = 35

Number of years = 3

Speed N = 500 Rpm

Diameter of Shaft = 15 mm

Life of Bearing Calculation

Total life of bearing = 35 x 3 x 52

= 5460 hrs

Equivalent Load = P = (X Fr + y F a) S

Load factor = x = 0.56

Trust factor = 1.4

(FROM PSGDB 4.4 AND 4.6)

P = (0.56 X 700 + 1.4 x 300) 1.2

= 812 N

Loading ratio = C/P(FROM PSGDB 4.14)

= 6.2

C = 6.2 X P

= 6.2 X 812

= 5034 N

C = 880 Kg f = 8800 N

Since C = 8800 > 5034 , the Selected bearing is suitable.

Selected bearing = SKF6302.

1.8 Lead Screw

A lead screw also known as a power screw or translation screw is a screw designed to translate radial motion into linear motion. Common applications are machine slides (such as in machine tools), vises, presses, and jacks.

A lead screw nut and screw mate with rubbing surfaces, and consequently they have relatively high friction and striation compared to mechanical parts which mate with rolling surfaces and bearings. Their efficiency is typically between 25 and 70%, with higher-pitch screws tending to be more efficient. A higher-performing, and more expensive, the alternative is the ball screw.

The high internal friction means that lead screw systems are not usually capable of continuous operation at high speed, as they will overheat. Due to inherently high striction, the typical screw is self-locking (i.e. when stopped, a linear force on the nut will not apply a torque to the screw) and is often used in applications where back driving is unacceptable, like holding vertical loads or in hand-cranked machine tools.

Lead screws are typically used well-greased, but, with an appropriate nut, it may be run dry with somewhat higher friction. There is often a choice of nuts, and manufacturers will specify screw and nut combinations as a set.

The mechanical advantage of a lead screw is determined by the screw pitch and lead. For multi-start screws, the mechanical advantage is lower, but the traveling speed is better.

Backlash can be reduced with the use of a second nut to create a static loading force known as preload; alternately, the nut can be cut along a radius and preloaded by clamping that cut back together.

A lead screw will back drive. A lead screw's tendency to back drive depends on its thread helix angle, the coefficient of friction of the interface of the components (screw/nut), and the included angle of the thread form. In general, a steel acme thread and bronze nut will back drive when the helix angle of the thread is greater than 20°.

Fig.no: 1.6 Lead Screw

1.8.1 Advantages & Disadvantages Of Lead Screw

The advantages of a lead screw are:

- Large load-carrying capability
- Compact
- Simple to design
- Easy to manufacture; no specialized machinery is required
- Large mechanical advantage
- Precise and accurate linear motion
- Smooth, quiet, and low maintenance
- Minimal number of parts
- Most are self-locking

The disadvantages are that most are not very efficient.

- Due to their low efficiency, they cannot be used in continuous power transmission applications.
- They also have a high degree of friction on the threads, which can wear the threads out quickly.
- For square threads, the nut must be replaced; for trapezoidal threads, a split nut may be used to compensate for the wear.

1.9 Battery

Battery Voltage 12V & Battery Capacity 7Ah (It means **it can generate 7 amperes of current at 12 voltages constantly for 1 hour**) A Simple Example. Let's say My laptop consumes 63 watts in 1 hour or it is rated 63 watts. If the depth of discharge for the battery is considered to be 75%.

Battery Calculation:

B_{AH}/C_I = 8 ah/420ma = 19 hrs

To find the Current

Watt = 18 w

Volt = 12v

Current =?

P= V x I

18 =12 x I

I = 18/12

= 1.5 AMPS

BATTERY USAGE WITH 1.5 AMPS

B_{AH}/I

8/1.5 = 5.3 hrs

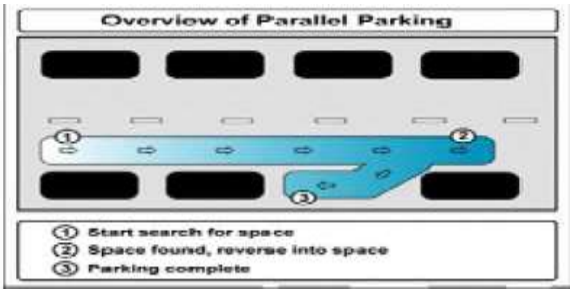

Fig. No: 1.7 Process of parking the vehicle.

1.10 Merits And Demerits Of Parallel Car Parking

Merits

- Reduce manpower
- Reliable & flexible
- Versatility
- Good Performance
- Less expensive
- Simple size and less weight
- Easy to operate
- Easy to maintain
- Low turning radius
- Can be implemented in all four wheelers
- Easy to park the vehicle

Demerits

- Additional power is required for the control unit.
- Often recharging of battery due to high power consumption

2. Literature Review

[1]AbdulganiAlbagul et al say that the project deals with the multi-level car parking system with three floors and is considered to show the use of control systems in parking systems. The parking lots have an elevator to carry cars to different floors according to the vacancies. The elevator is controlled by a programmable logic controller (PLC) along with the help of some sensors.[2] Mr. Adimurthy explained the parallel parking of autos by 90 degrees of rotating wheels. This was implemented by the switch activation, which is ready to be simpler for the driver to rotate all four wheels of the vehicle to till 90 degrees to park the vehicle.[3] N. Ahamed et al designed the automation process of an automatic car parking system using a fully functional ladder logic-based LOGO!12/24 RC. Infrared sensor (IR) electronic sensors were installed at the entrance and departure gates to sense the car that is waiting for either entry or exit. After that it gives the input signals to PLC to count the number of vehicles entering and leaving the park respectively. . If no space is available, the PLC will then send a signal to the entry gate to keep the gate closed and turn on the indication "Car Park Full". If there is space in the park, the entry gate will open to allow the car to enter the park.[4]A.Albagul et al say that the project deals with the multi-level car parking system with three floors is considered to show the use of control systems in parking systems.The parking lots have an elevator to carry cars to different floors according to the vacancies. The elevator is controlled by a programmable logic controller (PLC) along with the help of some sensors.[5] Amin Kianpishehconducteda experiment with the increase in vehicle production and world population, more and more parking spaces and facilities are required. In this paper, a new parking system called Smart Parking System (SPS) is proposed to assist drivers to find vacant spaces in a car park in a shorter time. The new system uses ultrasonic (ultrasound) sensors to detect either car park occupancy or improper parking actions. The system architecture defines the essential design features such as the location of sensors, the required number of sensors and LEDs for each level, and indoor and outdoor display boards.[6] Ashwini H Y et al performed experimental and computational analysis by Ultrasonic Sensor is used which can sense the objects between to avoid an accident. If simply too near the vehicle, then the alarm will get activated. This technique result helps in making the motive force task easy and easier, with less time requirement and more accuracy.[7] Chetan S. Jiotodeexplained the concept of a Multilevel Car Parking System using the Geneva wheel mechanism. By study, we have to show how the actual mechanism work and the actual structure and components used in that system.[8] Choudhary.S says the project deals with the multilevel car parking system using the Geneva mechanism which is driven by a DC motor.The chain and sprocket mechanisms are used to drive the system.[9] J. Cynthia et al explained an IoT-based Smart parking system that integrates with a mobile Application. IR sensors are used to identify if a parking spot is free. Availability of a free slot with its location information is transmitted using WIFI module technology, microcontroller, and wireless communication technology to the server and is retrieved through a mobile application.[10] Eslaam Tavakolietal explained a new method for automatic parallel parking problems is proposed. The suggested method uses fuzzy inference to control, steer, and park the car in a tight space. Two parallel embedded fuzzy controllers have been designed to navigate the vehicle on the desired path. There is no need to use the sensors to track the desired path in this method, but the car's kinematic model's output is the controller's input. Based on the obtained results, the generated path by controllers is close to the desired track.[11] Gonganyan et al proposed that secure and intelligent parking system based on the concept and framework of NOTICE [WO07], secure and privacy-aware architecture for the notification of traffic incidents. The proposed infrastructure prevents most security/privacy attacks. We address hardware/software architecture and implementations. The evaluation of this proposed system proves its efficiency.[12]Hongwei Wang and Wenbo He designed and implement a prototype of a Reservation-based Smart Parking System (RSPS) that allows drivers to effectively find and reserve vacant parking spaces.A smart parking system can be regarded as a full-fledged cyber-physical system (CPS). Through extensive experiments based on real traffic traces and a real-world parking map, the results show that the proposed reservation-based parking policy has the potential to simplify the operations of parking systems, as well as alleviate traffic congestion caused by searching for parking.[13] Idris.M.Y.Iet al explained due to the proliferation in the number of vehicles on the road, traffic problems are bound to exist. With the implementation of the smart parking system, patrons can easily locate and secure a vacant parking space at any car park deemed convenient to them. With vehicle detection sensors aplenty on the market. in addition to the recent research and commercial system on the market are examined as vehicle detection plays a crucial role in the smart parking system.[14]ImenMasmoudi et al proposed a combination of the Adaptive Background Subtraction algorithm to overcome the problems of changing lighting and shadow effects with the Speeded Up Robust Features algorithm to benefit from its robustness to the scale changes and the rotation. [15] Ismail.M et al conducted a project based on a prototype of the parking assistance system based on the proposed architecture is also constructed to understand the proposed design clearly. The proposed design is also simulated and analyzed using commercially available software AUTODESK INVENTOR and COMSOL. Finally, an image processing facility is also introduced to monitor and identify the vehicles.[16] Kannan, S et al explained a user interface for an automatic parallel parking system has been developed Results from three user evaluations with different prototypes indicate that audiovisual presentation is best suited for the task, and that feedback messages could be kept short. However, further research is needed since a real-life traffic situation differs from that in a sealed-off environment like the one used in this project.[17]KiranRavariya et al implemented the concept of a Microcontroller Based car parking system. There is also an RFID module that will provide security as users who have authority can swap the RFID cards and get entry otherwise not. It will also be used to settle the parking fee that has to be paid by the user.[18] M.B.Mansour et al explained autonomous parallel parking system decreases traffic casualties and optimizes the fuel consumption of cars. The scope of this paper is to present our work in a project which implements autonomous parallel car parking, where a car finds an empty suitable parking slot and then parallel-park itself into it. Finally, we evaluate the performance of our system, where results show that the car is capable of parking itself after performing all the steps specified by the algorithm.[19] Massaki Wada et aldescribed the iCAN (intelligent car navigation systems) project framework. The parking possibility region-based path-planning method proposed for implementing the proposed architecture is described, as is the design of the system's HMI. A prototype of the parking assistance system based on the proposed architecture was constructed. The adopted hardware, software, and implementation solutions in this prototype

construction are described.[20] Matthew Borg Carr discusses the different, pre-existent technologies that have been implemented. A system was implemented using Raspberry Pi 3 Model B and Arduino Uno microcontroller. The core programming language used was Java. A wireless device (a prototype) equipped with various sensors and operated using Raspberry Pi, was designed and built making use of a wireless protocol called ZigBee. This project scratches the surface of artificial intelligence and uses the string metric Levenshtein distance, where through training and scoring, it was possible to improve the recognition rates in terms of accuracy. [21] MeghrajGadhavel et al conducted an experiment and analysis A screw is used to control the fifth wheel to land and lift. DC motor enables the forward and reverses the motion of the screw. It also helps to know malfunctions during the landing or lifting of the wheel.[22]Mohammed Y Aalsalem et al proposed an automated car parking management monitoring system (CPMMS) that employs Automatic Number Plate Recognition (ANPR) cameras to efficiently manage, monitor, and protect the parking facilities of the University. We have also surveyed to analyze the parking problems around the University campus faced by the students, faculty, and staff members.[23] Paresh et al Carried out experimental analysis on the parking can be done using an additional wheel most probably this will be a Stepney wheel.Initially, when the driver finds a slot for parking, he pushes the button and the DC motor actuates the movement of the rack and pinion. Rack and pinion will apply force on one side of the triangular hub and due to the pivot point, the triangular hub move in an angular moment another side of the triangle will fit the auxiliary wheel. The model enables the driver to park the vehicle between two vehicles, where the space is limited.[24]Prabhu. K.R et al Carried out experimental analysis on parallel parking a pneumatic cylinder and solenoid valve setup is used to control the fifth wheel to land and lift. A DC motor enables the forward and reverses the motion of the fifth wheel. A digital display is used to indicate the status of the wheel for the driver's reference. It also helps to know malfunctions during the landing or lifting of the wheel This concept is mainly used for four-wheeler vehicles.[25] JPohlM et al explained that that leaves the longitudinal control of the vehicle to the driver but automates the steering process, and even stops the vehicle when the final parking position is reached.[26] Qi Wu et al proposed a novel method for parking space detection. Given input video captured by a camera, we can distinguish the empty spaces from the occupied spaces by using an 8-class support vector machine (SVM) classifier with probabilistic outputs. Considering the inter-space correlation, the outputs of the SVM classifier are fused using a Markov random field (MRF) framework. [27] M.O.Reza et al explained that smart Parking Systems obtain information about available parking spaces, process it, and then place the car in a certain position. A prototype of the parking assistance system based on the proposed architecture was constructed here. The adopted hardware, software, and implementation solutions in this prototype construction are described in this paper. The effective circular design is introduced here having a rack-pinion special mechanism that is used to lift and place the car in a certain position. The design of the rack pinion mechanism is also simulated using AUTODESK INVENTOR and COMSOL software. [28] Salve Gatha et al proposed a prototype that will help people find empty parking spaces, and under the command of the owner, the car will automatically drive to the parking system and park itself at the nearest parking space. All detailed information and notifications will be sent via the owner's mobile phone. The system will reduce time and help people find parking spaces easily. Advanced technologies like IoT, Google Assistant, etc are used in this prototype.[29] Samit Kumar Ghosh et al say that sensors such as IR (Infra Red) are used to identify the entrance or exit of the car at the parking slot This system displays the total parking slots available and indicates the occupied slots and unoccupied slots in the display board so that user can check the slots before entering the parking area and can park his car in that slot within no time without wasting his/her time. The parking slots are continuously monitored and the data is continuously updated on the display board.[30] Sathish Kumar K and Mohammed Shabirullah say that an indigenously developed system consists of an Ackerman steering and chain drive mechanism with an arrangement of various kinematics links. In this system at first, the vehicle is stopped and the wheels are then turned in the required direction with the help of the steering system. It has a turning radius nearly equal to negligible of the length of the car itself. It has a turning radius nearly equal to negligible of the length of the car itself.

3. PROBLEM IDENTIFICATION

The Statement of the problem for the project is arrived at based on the literature review done in chapter 2. The researchers have mostly investigated the following distinct areas.

- In automobiles, the parking system is complicated and time taking to park the vehicle.
- Drivers need to be more alert while parking to avoid hitting the car during the reverse motion.
- There are major problems like parking vehicles by unskilled drivers, less space, fuel consumption, and time consumption.

3.1 Objectives

- To reduce the complexity of parking vehicles.
- To Park the vehicle parallel to the other vehicles.
- To make the driving task safer and more comfortable.
- Helps to minimize the damage to other vehicles.

4. Material Selection

The various factors which determine the choice of material are discussed below.

Properties:

The material selected must possess the necessary properties for the proposed application. The various requirements to be satisfied

Can be weight, surface finish, rigidity, ability to withstand environmental attack from chemicals, service life, reliability, etc.

The following four types of principle properties of materials decisively affect their selection

- Physical
- Mechanical
- From a manufacturing point of view
- Chemical

The various physical properties concerned are melting point, thermal

Conductivity, specific heat, coefficient of thermal expansion, specific gravity, electrical conductivity, magnetic purposes, etc.

The various Mechanical properties Concerned are strength in tensile,

Compressive shear, bending, tensional and buckling load, fatigue resistance, impact resistance, elastic limit, endurance limit, modulus of elasticity, hardness, wear resistance, and sliding properties.

4.1 Metal Cutting

Metal cutting or machining is the process of removing unwanted material from a block of metal in the form of chips.

Fig.no:4.1 Metal cutting

Cutting processes work by causing fractures in the material that is processed. Usually, the portion that is fractured away is in small-sized pieces, called chips. Common cutting processes include sawing, shaping (or planning), broaching, drilling, grinding, turning, and milling. Although the actual machines, tools, and processes for cutting look very different from each other, the basic mechanism for causing the fracture can be understood by just a simple model called orthogonal cutting.

4.2 Lathe Machine

In all machining processes, the workpiece is a shape that can entirely cover the final part shape. The objective is to cut away the excess material and obtain the final part. This cutting usually requires to be completed in several steps – in each step, the part is held in a fixture, and the exposed portion can be accessed by the tool to the machine in that portion. Common fixtures include vise, clamps, 3-jaw or 4-jaw chucks, etc. Each position holding the part is called a setup. One or more cutting operations may be performed, using one or more cutting tools, in each setup. To switch from one setup to the next, we must release the part from the previous fixture, change the fixture on the machine, clamp the part in the new position on the new fixture, set the coordinates of the machine tool concerning the new location of the part, and finally start the machining operations for this setup.

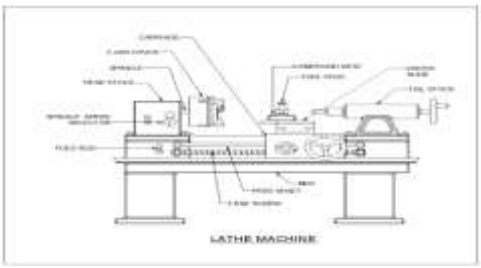

Fig. no:4.2 lathe machine

Therefore, setup changes are time-consuming and expensive, and so we should try to do the entire cutting process in a minimum number of setups; the task of determining the sequence of the individual operations, grouping them into (a minimum number of) setups, and determination of the fixture used for each setup, is called process planning.

These notes will be organized into three sections:

a) Introduction to the processes,

b) The orthogonal cutting model and tool life optimization

c) Process planning and machining planning for milling.

4.3 Sawing

Cold saws are saws that make use of a circular saw blade to cut through various types of metal, including sheet metal. The name of the saw has to do with the action that takes place during the cutting process, which manages to keep both the metal and the blade from becoming too hot. A cold saw is powered by electricity and is usually a stationary type of saw machine rather than a portable type of saw.

The circular saw blades used with a cold saw are often constructed of high-speed steel. Steel blades of this type are resistant to wear even under daily usage. The result is that it is possible to complete several cutting projects before there is a need to replace the blade. High-speed steel blades are especially useful when the saws are used for cutting through thicker sections of metal.

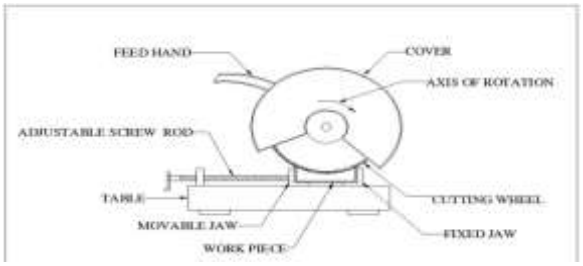

Fig.no:4.3 Sawing Cutting Machine

Along with the high-speed steel blades, a cold saw may also be equipped with a blade that is tipped with tungsten carbide. This type of blade construction also helps to resist wear and tear. One major difference is that tungsten-tipped blades can be re-sharpened from time to time, extending the life of the blade. This type of blade is a good fit for use with sheet metal and other metallic components that are relatively thin in design.

4.4 Welding

Welding is a process for joining similar metals. Welding joins metals by melting and fusing **1,** the base metals being joined and **2,** the filler metal applied. Welding employs pinpointed localized heat input. Most welding involves ferrous-based metals such as steel and stainless steel. Weld joints are usually stronger than or as strong as the base metals being joined.

Welding is used for making permanent joints. It is used in the manufacture of automobile bodies, aircraft frames, railway wagons, machine frames, structural works, tanks, furniture, boilers, general repair work, and shipbuilding.

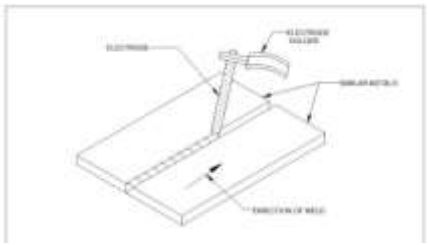

Fig.no:4.4 Welding

In the shielded metal arc welding process (SMAW) the 'stick' electrode is covered with an extruded coating of flux. The heat of the arc melts the flux which generates a gaseous shield to keep air away from the molten pool also flux ingredients react with unwanted impurities such as surface oxides, creating a slag that floats to the surface of the weld pool. This forms a crust that protects the weld while it is cooling. When the weld is cold the slag is chipped off.

The SMAW process cannot be used on steel thinner than about 3mm and is a discontinuous process it is only suitable for manual operation. It is very widely used in jobbing shops and for onsite steel construction work. A wide range of electrode materials and coatings are available enabling the process to be applied to most steels, heat-resisting alloys, and many types of cast iron.

4.5 Drilling

Drilling is a cutting process that uses a drill bit to cut or enlarge a hole of a circular cross-section in solid materials. The drill bit is a rotary cutting tool, often multipoint. The bit is pressed against the workpiece and rotated at rates from hundreds to thousands of revolutions per minute. This forces the cutting edge against the workpiece, cutting off chips (swarf) from the hole as it is drilled.

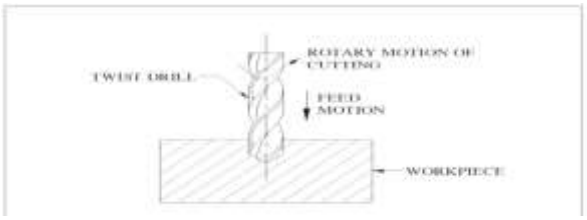

Fig. no: 4.5 Drilling

Common drill bit materials include hardened steel (High-Speed Steel, Titanium Nitride coated steel); for cutting harder materials, drills with hard inserts, e.g. carbide or CBN inserts, are used.

In general, drills for cutting softer materials have smaller point angles, while those for cutting hard and brittle materials have larger point angles.

If the Length/Diameter ratio of the hole to be machined is large, then we need special guiding support for the drill, which itself has to be very long; such operations are called gun-drilling. This process is used for holes with a diameter of a few mm or more, and an L/D ratio of up to 300. These are used for making barrels of guns.

4.6 Grinding

Grinding, an abrasive machining process that uses a grinding wheel as the cutting tool is capable of making precision cuts and producing very fine finishes. The grinding head can be controlled to travel across a fixed workspace or the workpiece can be moved while the grinding head remains in a fixed position.

A precision grinding machine consists of a power-driven grinding wheel spinning at the required speed (which is determined by the wheel's diameter and manufacturer's rating) and a bed with a fixture to guide and hold the workpiece.

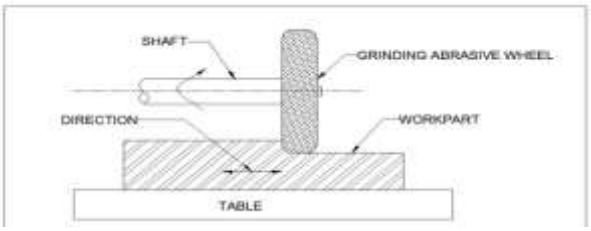

Fig.no4.6 Grinding

The way the abrasive grains, bonding material, and air gaps are structured, determines the parameters of the grinding wheel, which are

- Abrasive material.
- Grain size.
- Bonding material.
- Wheel grade and
- Wheel structure.

5. Design Setup

Design is one of the most important roles in making any product. It is the first and foremost step toward developing a project.

In our project, every part is designed and assembled like a prototype model. We designed by using Solid Works software.

Solid Works is the perfect 3D modeling software for engineers and 3D designers. Solid Works is a powerful and complete tool that will help designers and engineers to build innovative mechanical models. This 3D software has a user-friendly interface and can be used for design, or to create machinery parts, Every component can be designed by software using Solid Works. This is the 3D design of our project

Fig. No. 6.2: 3D Design Of The Project

This is the top view of our project model

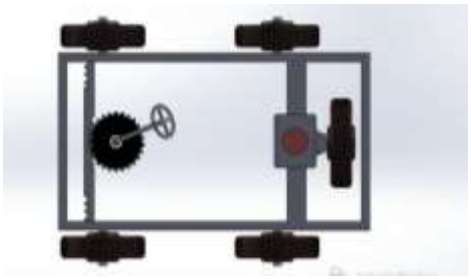

Fig. No. 6.3: Top View Of Project Mode

This is the top view of our project model

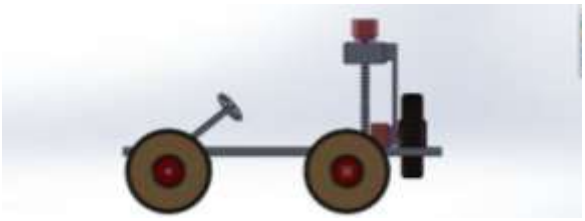

Fig. No. 6.4: Side View Of Project Model

5.1 Components

The car parking assistance with the 90-degree wheel turning consists of the following components, to full fill the requirements of the complete operation of the machine.

1. D.C Motor
2. Battery
3. Lead screw
4. Battery 12v.7.2ah
5. D.C Motor 12V
6. Screw Rod
7. Spur Gear
8. Wheel
9. Steering
10. Rod and Pinion

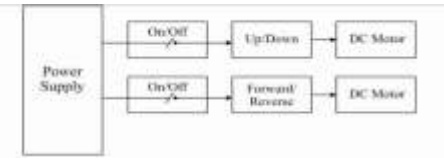

Fig. No. 6.5: Block diagram of DC motor

6. Testing

Testing is a standard and essential part of any design and manufacturing process. Whether it is characterizing the properties of materials or providing validation for final products, ensuring safety is vital. Testing also plays a crucial role in ensuring a cost-effective design as well as technological evolution and superiority.

6.1 Testing of fifth-wheel drive

The fifth wheel is moved forward /reverse using a DC motor. After parking the vehicle in the correct alignment, the fifth wheel is lifted. Simultaneously, the driver gets the status of the process in the display kept on the dashboard of the car. This will help to diagnose the problem during malfunction consisting of three wheels. DC motor used for driving Vehicle model. Chain and sprocket or DC motor arrangement can transfer the ability from the motor to the vehicle axle. At the rear side, we are going to provide an auxiliary drive wheel on the perpendicular plane of four wheels. Triangular pivot principal used for the folding of an auxiliary drive wheel. As shown in the rack and pinion will apply force on one side of the triangular hub. Due to the pivot point on the top of the triangle, another side of the triangle will lift the fifth wheel. For the actuation of the rack, a DC motor will be provided at the pinion. Hence whenever needed operated must unfold the fifth wheel axel by liner actuator (Rack and Pinion). In normal drive, the vehicle will travel with the normal four wheels whereas during parallel parking the fifth wheel comes into action and the remaining two rear wheels will be not in contact with the ground.

Fig. No. 7.1:**Final Product of our Project**

Conclusion

In this project, we studied the various system like the fifth wheel mechanism, and modified the new method of parking in the vehicle by using 5th wheel will result in solving the parking problem in compact spaces which require more space and more time, this both the things will be reduced to 1.33 times. By using a DC motor the 5th wheel can be moved in upward and downward directions. This method is very compact and easy to use in car models.

The project makes driver tasks easy and more comfortable and also while parking it reduces damage to other parked vehicles. It also saves us time while parking.

Finally, we tested our project. Our project is working perfectly. The fifth wheel driver is working and then the forward and reverse motion is working properly

In the digital world, where parking space has become a very big problem and in the era of miniaturization, everybody wants to have a car and the space required to park is getting shorter.

Reference

[1]. AbdulganiAlbagul, K Alsharef, Mustafa Saad “Design and Fabrication of an Automated Multi-level Car Parking System” (IEEE), 2013.

[2]. Adimurthy, "Parallel Parking" (International Journal of Engineering Research& Technology), 2017.

[3]. N.Ahamed, M.Y.Zulkifli, L and A. Hassnawi “Automatic Car Parking and Controlling System Using Programmable Logic Controller (PLC)” (International journal of applied engineering research), 2015.

[4]. A.Ali, M.Saad, Y.Abujeela "Design and Fabrication of an Automated Multi-level Car Parking System" (IEEE), 2013.

[5]. AminKianpisheh, ”Smart Parking System (SPS) Architecture Using Ultrasonic Detector” (Semantic Scholar), 2012.

[6]. Ashwini H Y, Yamuna N, Mala T, Mrs. Vanitha K S, "A smart parallel parking by rotating wheels of vehicles” (International Journal of Engineering Research & Technology (IJERT)),2020.

[7]. Chetan S. Jiotode, "Multilevel Car Parking System using Geneva Mechanism" (International Journal for Research in Applied Science and Engineering Technology), 2018.

[8]. Choudhary. S, "Design and Fabrication of Multilevel Car Parking System- using Geneva Mechanism” (International Journal for Research in Applied Science and Engineering Technology), 2018.

[9]. J.Cynthia, C.Bharathi Priya, and P.A.Gopinath "IoT-based smart parking management system" (Blue Eyes Intelligence Engineering and Sciences Publication), 2019.

[10]. EslaamTavakoli, Faezeh Ibrahimi, and M. Delrobaei, "A Novel Intelligent Parallel Parking System Based on Fuzzy Logic Without Using Sensor” (6th Iranian Conference on Signal Processing and Intelligent Systems (ICSPIS)), 2020.

[11]. Gongjun Yan, Stephan Olariu and Michele Weigle “A Secure and Intelligent Parking System Using NOTICE” (Intelligent Transportation Systems), 2008.

[12]. Hongwei Wang and WenboHe “A Reservation-based Smart Parking System” (Computer Communications Workshops), 2011.

[13]. Idris. M.Y.I, Leng. Y.Y, Tamil. E.M, Noor. N.M and Razak. Z, "Smart Parking System" (Information Technology journal), 2009.

[14]. ImenMasmoudi, Ali Wali, Anis Jamoussi, Adel M. Alimi "Vision-based System for Vacant Parking Lot Detection" (VISAPP), 2014.

[15]. Ismail.M, Reza.M, Sarkar.M “Design and development of an advanced vehicle parking system” (International Conference on Informatics, Electronics &Vision(ICIEV)), 2012.

[16]. Kannan, S, Vignesh, V, Vignesh, K., Manikandan. M and Harish. L.K."Design and fabrication of parallel parking system in four wheelers" (International Journal of Current Research), 2021.

[17]. KiranRavariya, SohilShahAzharuddinSolkar. "Automatic Car Parking System Using RFID" (International Journal of Advance Research and Innovative Ideas in Education), 2017.

[18]. M.B.Mansour and Abdelrahman said seif Sallam "Autonomous parallel car parking" (2020 Fourth world conference on smart trend in systems), 2020.

[19]. Massaki Wada, Kang Sup Yoon and Hideki Hashimoto “Development of advanced parking assistance system” (IEEE Transactions on Industrial Electronics), 2003.

[20]. Matthew Borg Carr “Intelligent Parking Management System using License Plate Recognition Techniques and ZigBee Wireless Technology” (IEEE), 2012.

[21]. MeghrajGadhavel, TejasChaudhari, Ankita Kumari, Prof. Dr.M.H.Attal "Fifth Wheel Car parking, (Open access international journal of science and engineering), 2015.

[22]. Mohammed Y Aalsalem, Wazir Zada Khan, Khalid Mohammed Dhabbah “An automated vehicle parking monitoring and management system using ANPR cameras” (17th International Conference on Advanced Communication Technology), 2015.

[23]. Paresh G. Chaudhary, Mr. Sanket R. Avhad, Mr. Omkar P. Dharpale, Mr. Ganesh R. Dhumal, Mr. Akshay R. Dhende "Auxiliary drive wheel vehicle parking mechanism(fifth wheel car parking mechanism)",(International Journal of Pure and Applied Mathematics), 2018.

[24]. Prabhu. K.R, Gokulraj.S, Jeeva. L, Leon Richardson, and Manikandan. R "Fabrication of parallel car parking using 5th wheel" (Engineering publication house),2018.

[25]. J Pohlm, Sethsson. P, Degerman, J Larsson "A semi-automated parallel parking system for passenger cars" (Proceedings of the Institution of Mechanical Engineers Part D Journal of Automobile Engineering), 2006.

[26]. Qi Wu, Changchun Huang, Shih-yu Wang, Wei-Chen Chiu "Robust Parking Space Detection Considering Inter-Space Correlation" (IEEE), 2007.

[27]. M.O. Reza, M Farhad Ismail, Arif Abdullah Rokoni, M. A. R. Sarkar “Smart Parking System with Image Processing Facility” (International Journal of Intelligent Systems Technologies and Applications), 2012.

[28]. Salve Gatha, DaulePratiksha, KarandePranita, Ingale Sneha and Shilpa Rudrawar "Automatic Car parking system using Google Assistant" (International Conference on Communication Information and Computing Technology (ICCICT)), 2021.

[29]. Samit Kumar Ghosh, SankataPrusty, P B Nataraja "Design and Implementation of Smart Car Parking System Using Lab VIEW" (International Journal of Pure and Applied Mathematics), 2018.

[30]. Sathish Kumar K and Mohammed Shabirullah, "Design and fabrication of "360-degree car parking,"(International Journal of Pure and Applied

Mathematics)2017.

[31]. Shrikant Jogi, Prashant Patil, Akash Jagdale, prof.S.S.Shirsath"Fifth wheel car parking mechanism"(International Research journal of Engineering and Technology (IRJET)),2019.

[32]. Soh Chun Khang, Teoh Jie Hong, ShengqiongWang "Wireless Mobile Based Shopping Mall Car Parking System (WMCPS)" **(**IEEE Asia-Pacific Services Computing Conference),2010.

[33]. Sonar R.M. Nahata P.R, Ajmera T.P, Saitwal N.A, Jain S.C "Automatic underground car parking system" (International trends of the modern trend in engineering and research),2017.

[34]. Ms.S.Srikurinji, Ms.U.Prema, M.Manivannan "Smart parking system architecture using an infrared detector (International Conference on Vision Towards Emerging Trends in Communication and Networking (ViTECoN)), 2016.

[35]. Mr. Suraj Bawankude "Fabrication of parallel parking system in the vehicle" (International Journal of Advance Research and Innovative Ideas in Education), 2018.

[36]. Suraj Bawankude, S. Sonule and Vivek Patil "Design and fabrication of parallel parking system in four-wheel drive" (Open access international journal of science and engineering),2018.

[37]. Thakare. M.B, Dukare. S.K, Gaikwad. S.G, Jadhav. V.A, Pardeshi. R.H "FifthWheel Drive For Parallel Parking" (Resin cap Journal of Science and Engineering) 2019.

[38]. Vaibhav Channewadkar, NinadVaidya, Dhaval Shah, "Fifth Wheel Drive System" (International Journal of Engineering Research &Technology(IJERT), 2021.

[39]. Wada.M, Yoon. K, Hashimoto. H "Development of advanced parking assistance system" **(**IEEE Trans. Ind. Electron),2012.

[40]. Zusheng Zhang, Xiaoyun Li, Huaqiang Yuan, and Fengqi Yu "A Street Parking System Using Wireless Sensor Networks" (International Journal of Distributed Sensor Networks), 2013.