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Design and Fabrication of Multilevel Car Parking System- using Geneva Mechanism

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Abstract: ***Many advanced worldwide cities uses car parking systems. This project deals with the multilevel car parking system using Geneva mechanism which is driven by DC motor. The objective of this project is to improve the existing car parking system. Parking of vehicle has become a problem of crowded areas and to cope up with this big problem, various types of car parking systems are actualized. The chain and sprocket mechanism are used to drive the system. The multilevel car parking system minimizes the excess use of parking areas and required floor space.***
Keywords: Geneva Mechanism, Chain and Sprocket Mechanism, DC motor, Mechanism prototype, ANSYS, CAD.

I. INTRODUCTION

The rotary vertical vehicle parking system has been actualized in large scale. This project deals with the design and fabrication of vertical car parking in multilevel and is possible by using a Geneva mechanism or Geneva drive powered by DC motor. In existence the automated car parking system using PLC **[1].** In this project, we have successfully eliminated the PLC in automatic car parking system which requires more maintenance. As population is increasing number of vehicle are also increasing. But the area to park vehicle is not increasing. Due to insufficient parking space, cars are parked on the roads which lead to traffic jam and sometimes further leads to accidents. The advantage of multilevel parking system is to Reduce the excess time and skilled work force and least chances of vehicle damage. This System helps in parking maximum cars in minimum space. The multilevel vehicle car parking system accommodates more than 8 cars.

II. WORKING

Rotary type vertical multilevel car parking system is easily operated with the help of chain and sprocket mechanism. Geneva mechanism is used to drive the system and is powered by DC motor. The driver come along with his car and the driver leaves the car incorporated safety zone. Once the car goes on pallet, Pallet lifts the car up on a particular stage. And the next available empty space will come at the ground level and for the next car to be parked on. In this way, car is to be parked and the process continues till the parking space is vacated. The parked car is simply entered and retrieves the system. The required car is to be rotate down and next car to be enter the available space**.**

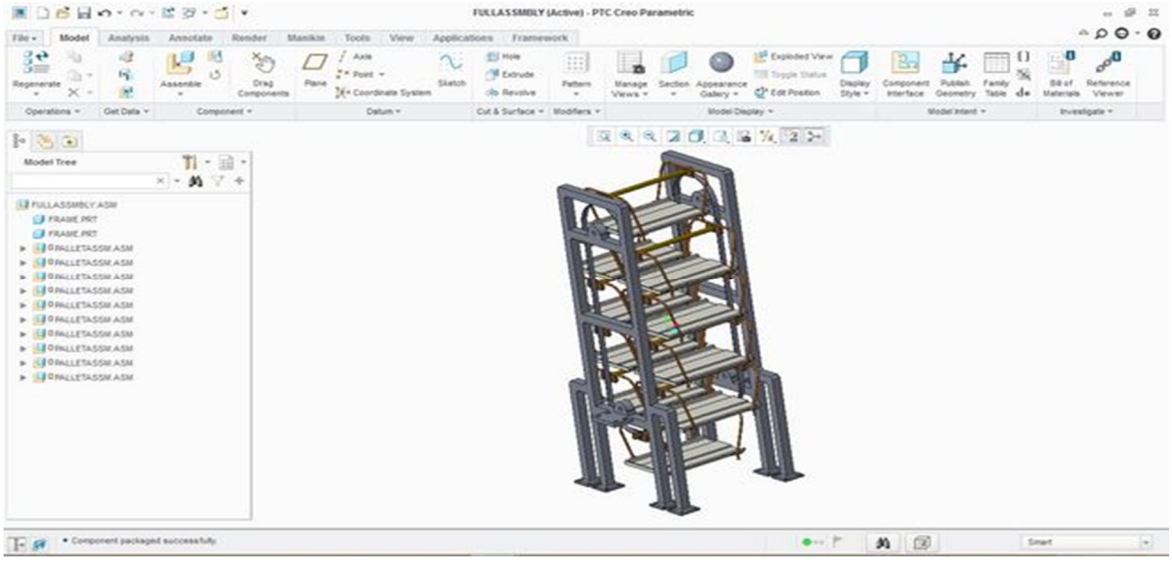

Figure 1: Car parking system

III. COMPONENTS OF THE SYSTEM

A. Sprocket

Sprocket is a toothed wheel that fits into a shaft. Chain and sprocket are used for power transmission from one shaft to another it can be runs at high speed.

Figure 2: Chain sprocket

B. Roller Chain

Roller Chain as so constructed as to be noiseless even at high speed. It is driven by toothed wheel called sprocket. Chain drive is a way of transmitting power from one place to another. A chain is used to connect two sprocket one sprocket is the driver sprocket and another sprocket is the driven sprocket motion and force can be transmitted via the chain from one sprocket to another.

Figure 3: Roller Chain

C. *Shaft*

It is a Mechanical component for transmitting torque and rotation. A shaft also called a propeller shaft. It transmits power to the mechanical components. Which is a system used to generate and deliver power

Figure 4: Chain Shaft

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D. Ball Bearing

A bearing is a machine element that constrains relative motion to only the desired motion and reduces friction between moving parts.

Figure 5: Ball bearing

E. DC motor

A DC motor is any of a class of rotary electrical machine that convert direct current electrical energy into mechanical energy. Rotary DC motors are available which are capable of producing continuous rotary movement.

Figure 6: DC Motor

F. Genev Mechanism

Geneva drive or Geneva wheel is a gear mechanism that translates a continuous rotation movement into intermittent rotary motion it is also used for indexing that Is rotating of shaft through a prescribed angle.

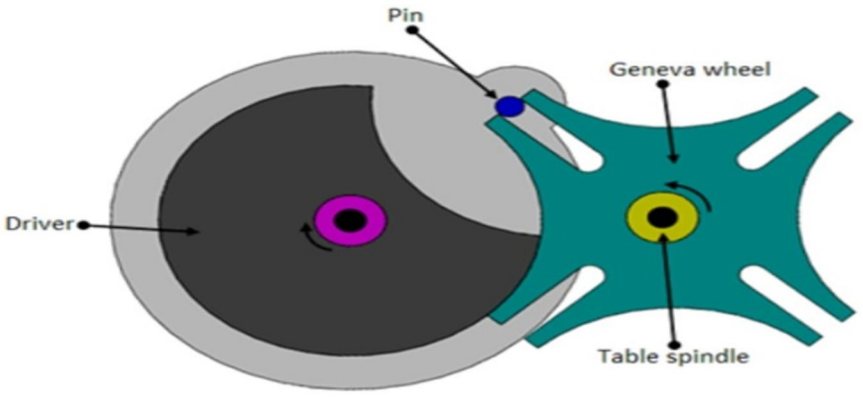

Figure 7: Geneva Wheel

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IV. CHARACTERISTIS

A. Small footprint, install anywhere
B. Manufacturing and maintenance cost is less.
C. Space for handling 2 cars and adopts 8 cars.
D. Easy to reallocate.

V. DESIGN AND CALCULATION

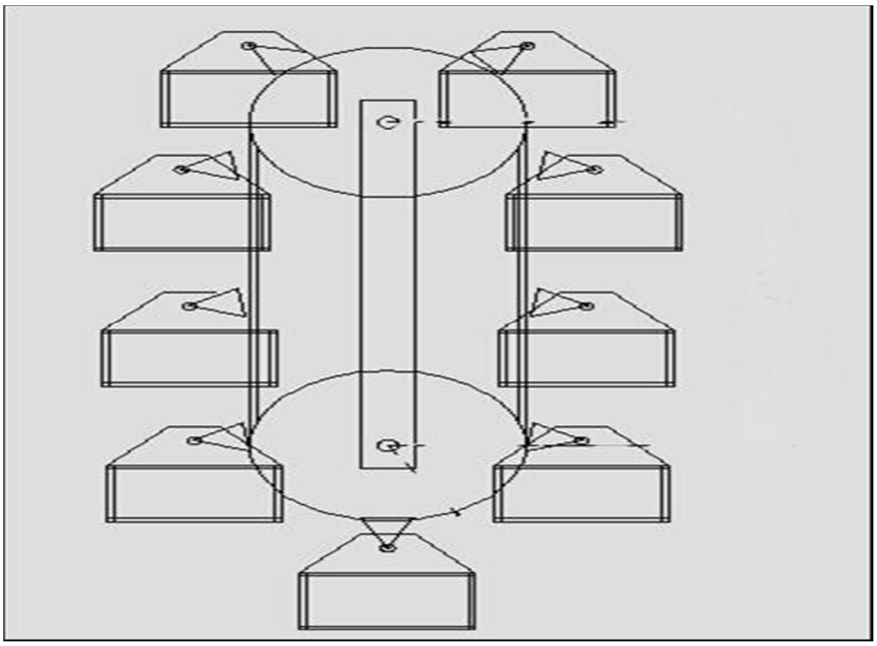

Fig2. AutoCAD model

A. Dc Motor

Maximum weight of single car = 2000kg,
Total weight of car 2000*8 = 16000kg,
= 156960N
Motor power = 16 KW, =22 HP. **[2].**

B. Roller Chain

Design Power Pd. = PR* KL =24 KW, = 32 HP. By using tooth load equation
F = Pd. /V = 565 m/min, = 9.18 m/sec.
Chain No. = 120, N1 = 900 rpm, N2 = 250 rpm.
By using velocity equation V = πD1N/60,
D1 = 200 mm, D2 = 600 mm. Center distance between two sprocket C = 800 mm.
T1 = 25, T2 = 75, Chain No. =80, Pitch = 30 mm.
By using Length of Chain equation,
$L = T1+T2/2+2C/P+P(T1+T2)^2$, =800 mm**. [3].**

C. Shaft

Shaft material SAE 1030 by using equation of shaft diameter, Td=π/16*ds^3*τmax, Ds =24 mm

VI. CONCLUSION

Automatic car parking is one of the important factor in traffic areas, apartments, restaurants etc. we have be used the components of Geneva Mechanism, DC motor, Chain and sprocket Mechanism for driving the system. This system has been successfully designed. All the parts are to be manufactures and assembled successfully.

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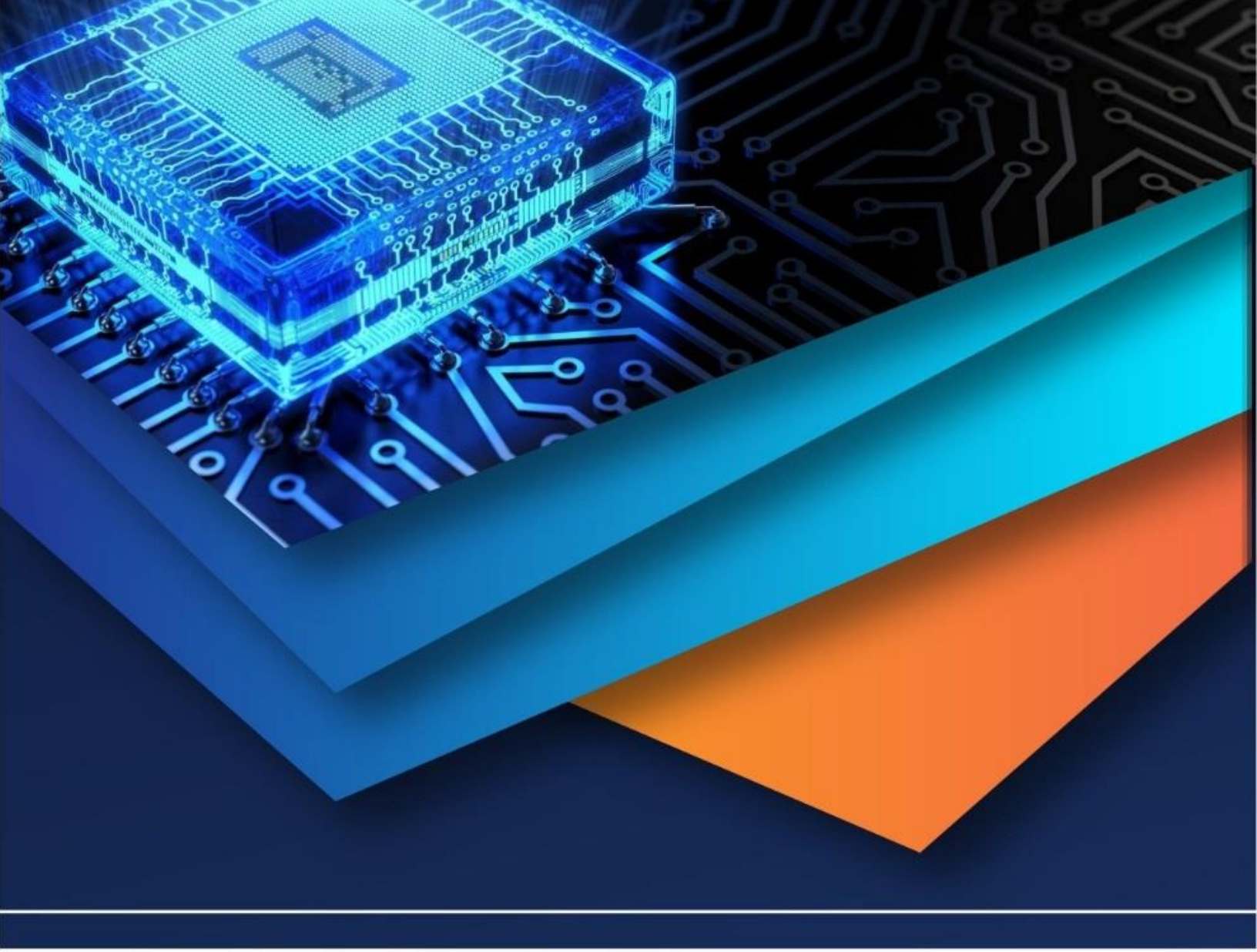

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