

Ackermann Steering System – A Review

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ABSTRACT

This paper is written with the sole purpose of providing relevant and efficient information and data to any student who seeks interest in Ackermann Steering System and its mechanism. This paper covers all the components used in the Ackermann Steering mechanisms and detailed discussion and calculations about the same can also be found. Topics include designing of Rack and Pinion, Steering ratio determination, Steering Effort calculation, Kinematic Simulations, Turning radius calculations, Calculating steering angles, Steering column and Arm and Steering System for BAJA vehicle.

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LITERATURE REVIEW

1. **Jing Shan, Ziangliu, Zhi Jing Fang, Jian s Dia** has written This paper focus on making a steering system that meets all the requirements of Ackermann geometry. Discussed topics are Four bar linkage mechanism, gears formulation and design and Kinematic simulations.

They have concluded that Single plane four bar mechanism could just trace 9 points at most. Ackermann criteria synthesized by using incomplete non circular gears. Designed pitch curves, addendum curves. As a result, Ackermann system improves maneuverability but is similar to 4 bar mechanism.

2. **M. Kumara, G. Bureika** has written The steering system in tractor is driven directly by a drawbar. In Ackermann steering geometry, both wheels rotates in circles of different turning radii but originating a common turning centre.

They have concluded that Steering system which satisfies the Ackermann steering geometry is presented with inner wheel allowable turning angle as 90. Optimized 5 bar linkage mechanism is also effective except small turning radius achieved.

3. **Niraj Kulkarni1 Tushar Nagargoje2 Pratik Maid3** has written In this paper, both rear and front wheels can be turned according to the space available and speed of the vehicle. Ackermann geometry applied to front wheel and Parallel mechanism to the rear wheels also the aim is to reduce the steering effort.

They have concluded that This system has got low turning radius, cornering capability, straight line

stability, lane changing and low speed maneuverability. The lesser turning radius helps in easier parking of the vehicle.

4. **Hardik kumar Gadher1, Tejash kumar Patel2, Chirag Modi3, Zeel Bhojani4** has written Objective is to achieve greater Ackermann angles in Steering systems. For formula cars utmost effort and cornering ability is required. Optimization of steering system is discussed.

They have concluded that Ackermann geometry can achieve greater inside angle than the anti Ackermann geometry. Bevel gears are more preferable than U Joints for transmission because of its single transmission ratio at both ends.

5. **Ranbir Singh, Sandeep Phogat, Kanwarpal** has written This paper present the analytic study to study the errors in steering system in the Ackermann geometry. Significant errors have been found in various mechanisms which produce instability in vehicles maneuverability.

They have concluded that The difference between required and actual steering angles is 2.2deg. This results in skidding during high speeds. Study helps in development of stable steering systems for the vehicles.

6. **Abhishek Das1 ,Shakti Prasanna Khadhanga2, Debidutta Mahapatra3 ,Shekhar Suman4, Ritesh kumar5, Nakul Sardar6 and Jogimuni T. Garnaik7** has written Design of steering system for an All terrain

vehicle is discussed. Ackermann Mechanism is opted for ATV with the maximum speed is 60 KMPH because of the terrain. The geometry ensures that the wheels roll without slipping sideways when they are steered to track a common turn centre.

They have concluded that The objective of this design of the effective steering system with safety and low production costs seems to be accomplished. Engineering Principles are used for designing and production.

7. By **Dallin Colgrove** has written Study of 2 different mechanisms namely Ackermann geometry and Parallel geometry for BAJA vehicle is done. Ackermann geometry is recommended but analysis of parallel geometry is also advised.

They have concluded that Both the geometries were discussed and analysed for the BAJA vehicle and it was found out by the tests that Ackermann system is more stable for high speed turning due to less slippage but more analysis of the parallel geometry is also suggested.

8. **Dipal kumar Koladia** has written Steering mechanisms require the application of rack and pinion design for transmitting motion. A mathematical model is discussed which contains 3 equations which can be solved to get different steering parameters. Can be used for Ackermann and reverse Ackermann both.

They have concluded that By applying the 3 equations steering system can be optimized for which percentage Ackermann and steering effort is optimum. This design is applicable to both 2 wheel and 4 wheel steering mechanisms.

9. **Abhinav kumar pathak, Devendra kumar verma, Satya prakash gupta** has written The steering system of a TATA Nano is modified to meet the design requirements for SAE BAJA INDIA . Rack and Pinion is also modified and designed both theoretically and practically in the workshop.

They have concluded that The performed kinetic synthesis ensures that the steering system works perfectly fine and is symmetric without crossing the practical limitations.

10. **Das1, Shakti Prasanna Khadhanga 2, Debidutta Mahapatra3, Shekhar Suman4, Ritesh kumar 5, Nakul Sardar6 and Jogimuni T. Garnaik7** has written ATV is that vehical that run on off road conditions this paper deals for thpsevhickes that runs on speed near 60kmps amd efforts have been putu how to mininmzerurning radius ackermansterring geometry is considered for the the design of steeing system.

They have concluded that the objective get completed of designing low production coast and hiogly safety vehicle The design is first conceptualized based on personal experiences and intuition then engineering principles wee used for validating the data.

11. **Akshay Pawar, Suraj Zambare** has written this paer focuses on design of atv for saebaja competition vehicle

is design for the worst conditions with maximum stability and minimum turning radius.steering system using rack and pinion steeribgmachanism with ackerman principle.

They have concluded that sterring system is desuignwth best stability and tested in adamssofteware and also on various rough terrains The stipulated objectives namely providing better directional stability, minimum turning radius, less steering effort and minimal bump steer.

12. **Dr. S. Neelakrishnan, Kowshik T, Krishnakumar G, Bharathi Mohan M P** has written the main objective of this paper is to improve maneuverability of atvbajabuggythatoversteered much which result to vehicle out of track,steering ratio is reduced to 3:1.ackerman principle is used in this steering system

They have concluded that The motive behind writing this paper was to analyse the faults experienced in BAJA buggy and enhance its characteristics. Steering gear box and upright designing is covered. Efficiency of BAJA buggy is increased.

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