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Optimal Kinematic Synthesis of Crank and Slotted Lever Quick Return Mechanism for Specific Stroke and Time Ratio

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Abstract: A quick return mechanism is one which that converts rotary motion into reciprocating motion at different rate for its two strokes i.e. working and return stroke. The working stroke is required to be greater than return stroke. Rational kinematic synthesis of quick return mechanism is the motivation. The optimal synthesis of mechanisms is an approach for mechanism design to satisfy all the desired characteristics of the designed mechanism. The Quick Return Mechanism is synthesized using the conventional analytical method and Powell's optimized method. The main advantage of Powell's Optimization Method is there is no implementation of derivatives. The optimization process is done in MATLAB software. The Analytical results are compared with the results determined by Powell's Technique. The Velocity analysis is done for both the results using Relative Velocity Method. The Prototype of Mechanism is prepared using CREO Software and performance analysis is done in the same showing the difference in performance for both the models. The Experimental Validation is done by preparing the model of best optimized results of quick return mechanism and verifying the slider displacement for simulation as well as the experimental model.

Keywords: Quick return Mechanism, Synthesis, Optimization, Powell's Technique

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