Geometric analysis of the III-class Assur group with R pairs

S. Durango[a], M. Aristizábal[b], J. Correa[b], O. Ruiz[b,§], C. Cadavid[b], J.D. Velez[c]

[a] *Grupo de investigación en diseño mecánico, Universidad Autónoma de Manizales, Colombia*
[b] *CAD CAM CAE laboratory, EAFIT University, Colombia*
[c] *Department of Mathematics, Universidad Nacional de Colombia – Sede Medelln, Colombia*
sebastiandi@autonoma.edu.co, {maristi7,jcorre20,oruiz§,ccadavid}@eafit.edu.co, jdvelez@unal.edu.co
[§]*Corresponding author. Tel. +574 430 9000 ext. 49359*

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Abstract

While performing a kinematic study of a mechanism, geometric analysis is mandatory. If a modular approach based on an Assur group disaggregation is implemented, the analysis yields to the geometric analysis of the Assur groups forming the mechanism. Previous approaches for the geometric analysis of the third-class Assur group with rotational pairs led to issues that concern more to the solution strategy than to the Assur group itself. In response to that, a geometric analysis in which the third-class group is virtually disaggregated into dyads is implemented. Two novel considerations are introduced to avoid numerical problems of the previous approaches: (a) a new parameter is defined to filter out non-valid solutions, and (b) two decomposition directions are implemented to configure the virtual dyads. (a) and (b) result in an extension of the solution range with respect to previous works. This geometric problem is recognized as non-linear with multiple solutions. A formal proof for the number of solutions is developed by algebraic geometry and two case studies are presented to highlight the main alternatives of the analysis.

Keywords: Geometric analysis, third-class Assur group, modular approach.