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**Mohammed Daher\*** (mohammed.daher79@yahoo.com), , New Zealand, and **Peter Donelan** (peter.donelan@vuw.ac.nz), , New Zealand. *Dual numbers and invariant theory of the Euclidean group.*

In this talk we discuss properties of the special Euclidean group  $SE(3)$  from two points of view, algebraic and geometric. From the algebraic point of view we introduce a dualization procedure for the special orthogonal group  $SO(3)$  vector invariants and obtain vector invariants of the adjoint action of  $SE(3)$  acting on multiple screws. In the case of three screws, there are 14 basic invariants related by two basic syzygies. Moreover, we show that any invariant of the same group under the same action can be expressed as a rational function evaluated on those 14 vector invariants.

From the geometric point of view, we study the Denavit-Hartenberg parameters which describe serial robot arms, and we calculate formulae for link-lengths and offsets in terms of vector invariants of the adjoint action of  $SE(3)$ . Moreover, we obtain a geometrical duality between the offsets and the link lengths, where the geometrical dual of an offset is a link length and vice versa. (Received September 16, 2013)