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Factorizations of canonical full cycle, k-parking functions and cacti.

It is a well-known result of Kreweras that the inversion enumerator for trees is equal to the area enumerator for parking functions. On the other hand, Biane and Stanley found that, in the symmetric group, minimal length factorizations of the canonical full cycle into transpositions are connected to parking functions via a remarkably simple bijection. We recently found that these well-known relationships between factorizations, parking functions and trees could be generalized and significantly refined. Here we present a new approach to this refinement in which the major index on trees plays a central and natural role. We find new connections between minimal length factorizations of the canonical full cycle into k-cycles and inversions and non-inversions in cacti. These results generalize earlier work of Shin, as well as work of Yan connecting the area enumerator of k-parking functions to k-inversions on forests. This is joint work with J. Irving.