1138-05-61   **Heather Smith*** (`heather.smith@math.gatech.edu`), **Laszlo Szekely**, **Hua Wang** and **Shuai Yuan**. *Extremal Properties of Vertex Attributes in Trees.*

For tree T and vertex v, define the eccentricity $ecc(v) := \max_{u \in V(T)} d(u, v)$, the distance $d(v) := \sum_{u \in V(T)} d(u, v)$ and the number of subtrees $F(v)$ containing vertex v. Each defines a "middle" of the tree consisting of the vertices with the maximum (or minimum) value.

First, we explore the interactions of $ecc(v)$ and the total eccentricity $Ecc(T) := \sum_{v \in V(T)} ecc(v)$ by examining extremal values and structures for the ratios $\frac{ecc(v)}{ecc(u)}$ and $\frac{Ecc(T)}{ecc(v)}$. Analogous studies have been done for distance [Barefoot, Entringer, Székely, Discrete Appl. Math. **80** (1997), 37-56] and number of subtrees [Székely, Wang, Electron. J. Combin. **20** (2013) 1-20]. We also compare the three different middles, determining how far apart they can appear in a single tree and characterizing many of the extremal structures. (Received January 26, 2018)