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EXTREMA CONCERNING POLYGONS IN SPACE-TIME

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1. Consider an astronomer and his observation field, i.e., the set of observable (light or radio) signal emitting loci of the universe. Let the observation field be ordered by attaching a date to each observable locus indicating the time in the history of the universe that the signal was emitted from its source. Whereas both the astronomer and his observation field age with time, the observations of the astronomer may trace a sequence of loci whose time labels proceed *forward or backward in time.*

Consider now, a finite set S of events in L^n, n-dimensional space-time[1] ($n \geqq 2$). A rectilinear world line segment with endpoints in S will be called a *rectilinear connection* in S and a set of rectilinear connections which form a polygon with vertex set S a *polygonal connection* of S. The *clock time* of a polygonal connection is defined to be the sum of all the time separations[2] of its rectilinear connections. A polygonal connection having either the least or the greatest clock time of all possible "circuit states," i.e., all possible polygonal connections of

[1] Riemannian n-space having fundamental form $\Phi = (dx^1)^2 + \cdots + (dx^{n-1})^2 - (dt)^2$.

[2] The *time separation* of a rectilinear connection with endpoints E_u: $(x_u^1, \cdots, x_u^{n-1}, t_u)$ and E_v: $(x_v^1, \cdots, x_v^{n-1}, t_v)$ is equal to $[(t_v - t_u)^2 - \sum_{i=1}^{n-1} (x_v^i - x_u^i)^2]^{1/2}$ and will be denoted by $s(E_u E_v)$.