then the hypothesis is that the two configurations lead to the same sensation. Since elements of length appear to be equal, then if the apparent size is determined by a quadratic differential form, it follows that

$$g_{11}d\gamma^2 + g_{22}d\phi^2 + g_{33}d\theta^2 + \cdots = g_{11}d\gamma^{*2} + g_{22}d\phi^{*2} + g_{33}d\theta^{*2} + \cdots,$$

where the coefficients $g_{ik}(\gamma, \phi, \theta)$ on the left are the same functions as $g_{ik}(\gamma^*, \phi^*, \theta^*)$ on the right. This leads to a non-Euclidean metric in general. The observation that two line elements on the same line of view which give the same $d\gamma$, $d\phi$ are seen as parallel, together with considerations of symmetry, leads to the quadratic differential form

$$ds^2 = M^2(\gamma)(\sigma^2 d\gamma^2 + d\phi^2 + \cos^2 \phi d\theta^2),$$

in which σ is a parameter of the observer which measures the relative effectiveness of convergence as compared with angular displacement in the estimation of length. Further considerations suggest that $M(\gamma) = 1/\sin h\sigma(\gamma + \mu)$, in which case the metric is hyperbolic.

Some of the topics which are treated in considerable detail are the horopter problem (geodesic lines), the alley problem, and rigid transformations of the hyperbolic visual space. In the alley problem with walls sensed as parallel it is pointed out that the meaning of "parallel" is ambiguous. Two cases are treated which correspond to different instructions to the subject. These in general give different results, the difference depending on the geometry chosen. Thus, while it is possible to account for apparently conflicting experimental results, it is also possible to make use of the experimental data to obtain restrictions on the metric. Using the hyperbolic metric, the author calculates the shape of distorted rooms which are congruent to rectangular rooms, that is, rooms with distorted walls and windows which appear (under fixed conditions) to be identical to rectangular rooms with rectangular windows.

Even if further experiments show that the metric derived is not adequate to account for the data, the author's efforts will greatly facilitate the task of determining a better approximation. The point of view developed, together with the many suggestions given, should prove to be of great help in determining the direction to be taken for further theoretical studies and experimental observations.

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This volume, which is the first of two proposed volumes, is divided