Correction: The Polar Dual of a Convex Polyhedral Set in Hyperbolic Space

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The "polar dual" $P(X)$ of a convex polyhedral set X in hyperbolic space is defined twice in [1]. In fact, as B. Okun has pointed out, the two definitions don't always coincide in the case where X has infinite volume.

The first definition is given in the first paragraph of the Introduction: $P(X)$ is the set of outward-pointing unit normal vectors to the supporting hyperplanes of X, that is,

$$P(X) = \{ u \in \mathbb{S}_1^n \mid \langle u, x \rangle \leq 0 \text{ for all } x \in X \text{ and } \langle u, x \rangle = 0 \text{ for some } x \in X \}.$$

(This definition is repeated on p. 493 at the beginning of Sec. 3.1.) This is the correct definition and is the one used in proving the main theorem in Sections 3 and 4. The second definition [1, p. 489] is given as: $P(X) = C^*_{>0} \cap \mathbb{S}_1^n$, where $C^*_{>0}$ is defined as the union of the spacelike faces of the dual cone C^*.

The problem is that a timelike face of C may fail to intersect $\mathbb{H}^n$ (it may intersect the other sheet of the hyperboloid instead), in which case not every spacelike face of C^* is dual to a face of X. To make the two definitions agree, we must take $C^*_{>0}$ to consist only of those faces of C^* that are dual to faces of X. The remainder of Section 2 then holds, providing we replace the phrase "timelike face of C" by "timelike face of C that intersects $\mathbb{H}^n$".

Reference

[1] R. Charney and M. Davis, *The polar dual of a convex polyhedral set in hyperbolic space,* Michigan Math. J. 42 (1995), 479–510.

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