Invisible sets and where to see them.

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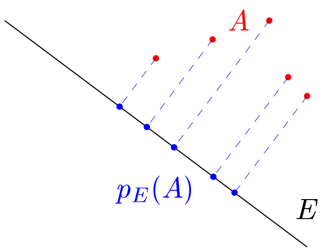
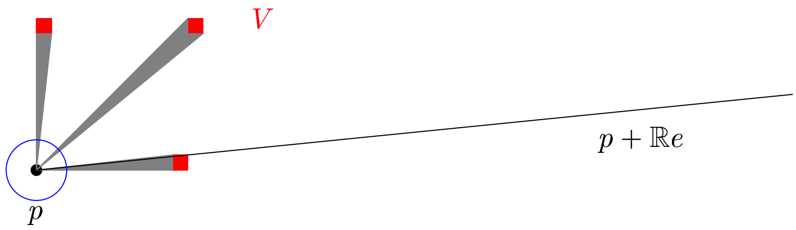
A subset A of the plane is called *invisible* if its orthogonal projection is of measure zero in almost every direction, that is, if

$$\mathcal{L}(p_E(A)) = 0$$

for *almost every* one-dimensional subspace $E \subseteq \mathbb{R}^2$, where $\mathcal{L}$ denotes the one-dimensional Lebesgue measure on the line E and $p_E \colon \mathbb{R}^2 \to E$ denotes the orthogonal projection on to E.



A set $V \subseteq \mathbb{R}^2$ is said to be *visible from a point p* if the set of directions $e \in S^1$ for which the line $p + \mathbb{R}e$ intersects V is of positive measure (in the circle S^1).



In this bachelor thesis, we will study the following question of Mattila: Is the set of points from which an invisible set is visible invisible? This question was answered negatively by Csörnyei [1]. Thus, seeing a given invisible set need not be an impossible task: one only has to find a suitable place to stand, of which there can be surprisingly many.

References

[1] M. Csörnyei. On the visibility of invisible sets. *Annales Academiae Scientiarum Fennicae. Mathematica*, 25(2):417–421, 2000.