

# Approximate Nearest Neighbor for Polygonal Curves under Frechet Distance

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**Abstract:** We propose  $\kappa$ -approximate nearest neighbor (ANN) data structures for  $n$  polygonal curves with at most  $m$  vertices each under the Frechet distance in  $\mathbb{R}^d$ , where  $\kappa \in \{1 + \epsilon, 3 + \epsilon\}$  and  $d \geq 2$ . We assume that every query curve has at most  $k$  vertices,  $k \ll m$ , and  $k$  is given for preprocessing. The query times are  $\tilde{O}(k(mn)^{0.5+\epsilon}/\epsilon^{O(d)} + k(d/\epsilon)^{O(dk)})$  for  $(1 + \epsilon)$ -ANN and  $\tilde{O}(k(mn)^{0.5+\epsilon}/\epsilon^{O(d)})$  for  $(3 + \epsilon)$ -ANN. The space and expected preprocessing time are  $\tilde{O}(k(mnd^d/\epsilon^d)^{O(k+1/\epsilon^2)})$  in both cases. In two and three dimensions, we improve the query times to  $\tilde{O}(k/\epsilon^{O(k)})$  for  $(1 + \epsilon)$ -ANN and  $\tilde{O}(k)$  for  $(3 + \epsilon)$ -ANN. The space and expected preprocessing time improve to  $\tilde{O}(k(mn/\epsilon)^{O(k)})$  in both cases. For ease of presentation, we suppress factors in our bounds that depend purely on  $d$ . The hidden polylog factors in the big- $\tilde{O}$  notation have powers dependent on  $d$ .

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**Session Classification:** Track A-2