Corrigenda and addenda for "Convex hulls for random lines" by Luc Devroye and Godfried Toussaint, Journal of Algorithms, vol. 14, pp. 381-394, 1993

Why? What prompted this correction is the apparent contradiction of Theorem 1 with a result by Daniel Berend and Vladimir Braverman entitled "Convex hull for intersections of random lines", 2005 International Conference on Analysis of Algorithms, DMTCS Proceedings, pp. 39-48, 2005. They showed that for every n there is a distribution of R with $\mathbb{E}R = 1$ such that $\mathbb{E}N_{ol} \geq n/2e$. So, our $O(1)$ bound, originally claimed to hold uniformly over all n and all distributions, was wrong. In fact, our distribution-free bound only holds asymptotically, with asymptotics kicking in at different rates for different distributions. As a side note, Berend and Braverman could exhibit a distribution with $\mathbb{E}R = \infty$ for which $\mathbb{E}N_{ol} \geq n/2e$ for all $n \geq 2$. So, maybe the bounds of our paper hold for some distributions with $\mathbb{E}R = \infty$ but certainly not all.

Abstract. Replace "give bounds" by "give asymptotic bounds"

Page 383. Theorem 1 now reads: Let R have a distribution with $0 < \mathbb{E}R < \infty$. Then there exists a finite universal constant γ such that

$$\limsup_{n\to\infty} \mathbb{E}N_{ol} \leq \gamma.$$

Page 388. Replace the last sentence of Lemma 6 by: For every $\epsilon > 0$, there exists a $\delta(\epsilon) > 0$ depending upon the distribution of R such that

$$\mathbb{P}\{||V|| \geq r, V \in C_1\} \geq \frac{(6-\epsilon)n\mathbb{E}R}{\pi r}$$

for all n, r such that $n/r \leq \delta(\epsilon)$.

Page 390. Replace the last two lines in the long chain of inequalities by

$$\geq \frac{(6-\epsilon)n\mathbb{E}R}{\pi r},$$

for all n, r such that $n/r \leq \delta(\epsilon)$. This statement follows from the bounded convergence theorem.

Page 390. In Lemma 7, replace the first sentence by "Let $\delta(\epsilon)$ be the function of Lemma 6." After "Then", add "if $n/r \leq \delta(\epsilon)$". And replace 3 in the exponent by $3 - \epsilon$.

Page 391 Replace 6 in the definition of p by $6 - \epsilon$.

Page 392. Replace the top three lines by: We choose $M = \lceil \log_2(K \log n) \rceil$, where K is a large fixed constant. We assume that $2^M(n+2)/r \leq \delta(\epsilon)$ (this holds if $2K \log n/(n+2)\mathbb{E}R \leq \delta(\epsilon)$).

Page 392. Replace $3n^2$ in four exponents by $(3 - \epsilon/2)n^2$.

Page 393. The sentence starting with "Also" now reads: I tends to 0 since $2^M \geq K \log n$ and K is a large constant.

Page 393. In the exponent, replace 3 by $3 - \epsilon/2$.