Supplemental Material for the SIGGRAPH 2005 Poster “The Expected Running Time of Hierarchical Collision Detection”

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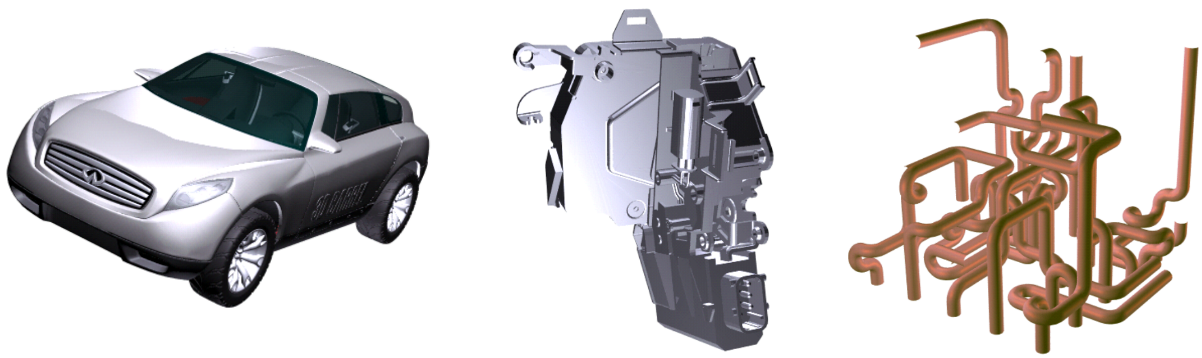

Figure 1: Models of our test suite. From left to right: Infinity Triant (www.3dbarrel.com), lock (courtesy of BMW) and a pipes model.

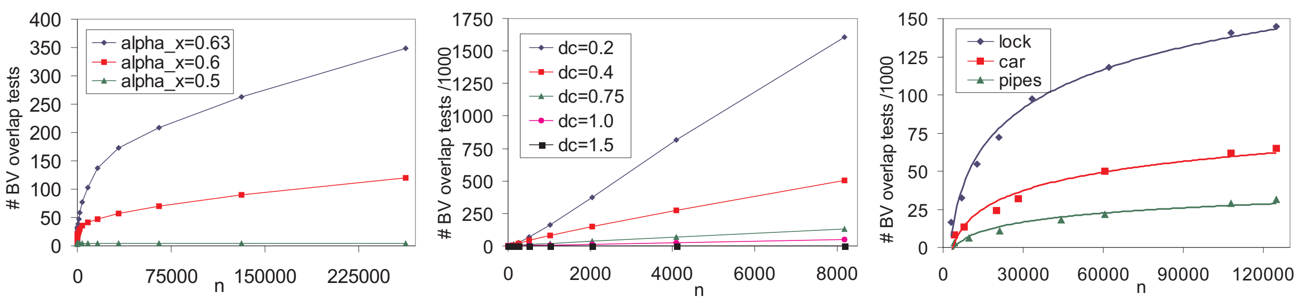

Figure 2: Number of BV overlap tests depending on the number n of leaves (left, center: artificial BVHs, right: BVHs for models shown in Fig. **??**). Left: the distance dc between centers of the root BVs is set to 1. Center: if α_y and α_z are chosen so that $p^{(l)} = 0.5$, the number of BV overlap tests is linear in n, independent of the distance dc. Right: plots for our models at distance $dc = 0.4$.

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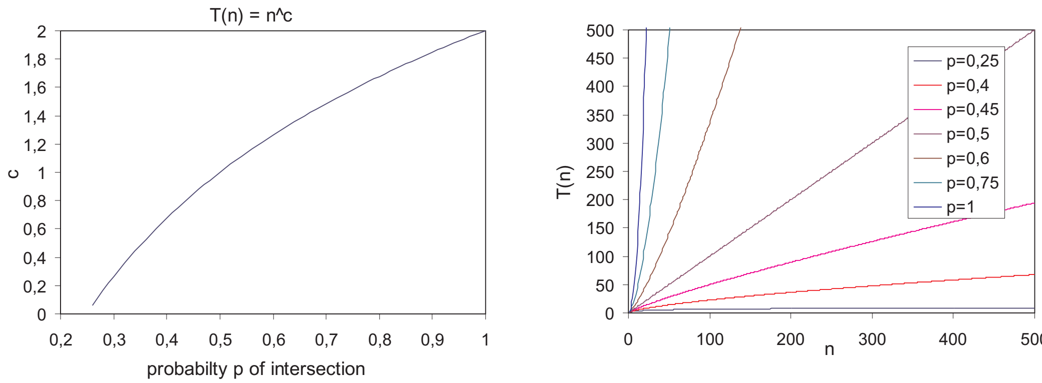

Figure 3: If $p > 0.25$, the running time can be expressed by $O(n^c)$ where $0 < c \leq 2$. Left: the exponent c for the runtime $T(n) = n^c$ is shown depending on the probability p. Right: $T(n)$ depending on n for different choices of p.

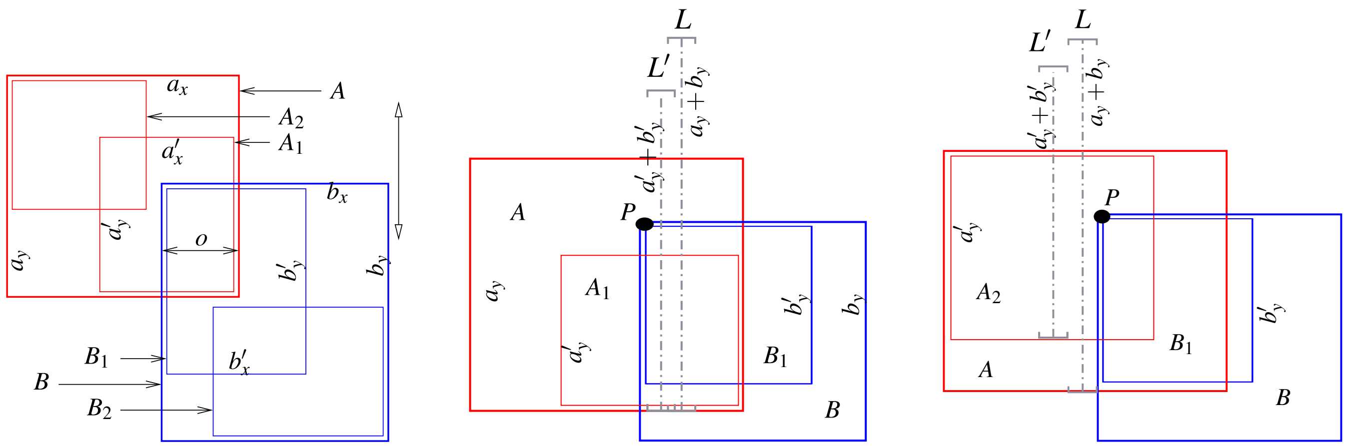

Figure 4: Left: general configuration of the boxes, assumed throughout our probability derivations. For sake of clarity, boxes are *not* placed flush with each other. Middle: The ratio of the length of segments L and L' equals the probability of A_1 overlapping B_1. Right: ditto for the probability of A_2 overlapping B_1. In 3D, L and L' are rectangles instead of segments, but the approach is exactly analogous.

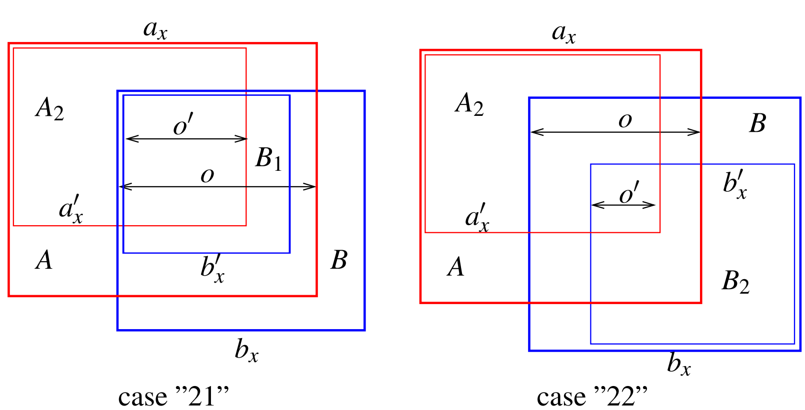

Figure 5: Denotations for computing $o^{(l)}$ for a child pair. The case "12" is symmetric to "21", and the case "11" is trivial. Given $o^{(l-1)}$, the x-overlap of $(A^{(l-1)}, B^{(l-1)})$, we can easily compute $o^{(l)}$ for each case: $o^{(l)}_{11} = o^{(l-1)}, o^{(l)}_{21} = o^{(l-1)} - \omega, o^{(l)}_{12} = o^{(l-1)} - \omega, o^{(l)}_{22} = o^{(l-1)} - 2\omega$, with $\omega = a^{(0)}_x \alpha^l_x (1 - \alpha_x)$ and $a^{(0)}_x =$ the extent of the root BV.