

Supplement to 'Watermarking of 2D Vector Graphics with Distortion Constraint'

This supplementary document contains additional plots for the paper 'Watermarking of 2D Vector Graphics with Distortion Constraint' which did not fit in the paper.

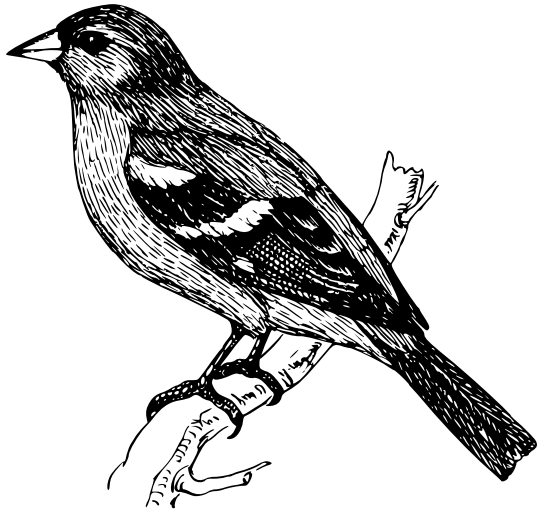
Figure 1 presents six vector graphics available from <http://openclipart.org>. In Figs. 2 and 3 we show the maximum perturbation regions (MPRs) for a detail of the *Chimpanzee* and *Hippopotamus* graphics, respectively. The MPR disks (in blue) have been superimposed on the polygonal chain data.

Figure 4 shows the estimated probability of miss (P_m) for the linear correlation detector (ρ_{LC}) for three cases: (i) without distortion constraint, (ii) with MPR distortion constraint, and (iii) with cMPR distortion constraint. Similar plots are provided for the LRT-Rayleigh detector (ρ_{LRT}) in Fig. 5. The probability of false-alarm (P_{fa}) has been fixed to 10^{-6} .

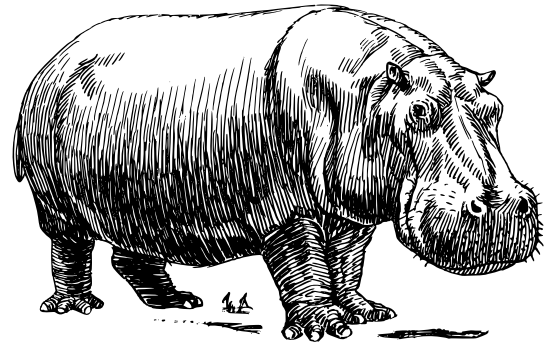
Table 1 describes the watermarking and correction process on our test data set in numeric terms: number of vertices for each data set, watermarked vertices and number of corrected vertices after MPR and cMPR correction after embedding with strength $\alpha = 0.25$ and $\alpha = 0.5$. The numbers of corrected vertices have been obtained by averaging results from 10 test runs with different random watermarks.

Data set	Vertices	Watermarked Vertices	Corrected Vertices			
			MPR $\alpha = 0.25$	cMPR $\alpha = 0.25$	MPR $\alpha = 0.5$	cMPR $\alpha = 0.5$
<i>Chaffinch</i>	23203	634	79	4	171	24
<i>Hippopotamus</i>	47378	12116	1265	48	2802	137
<i>Pigeon</i>	10523	2452	153	4	330	23
<i>Chimpanzee</i>	17296	779	80	0	186	0
<i>Owl</i>	29457	3391	470	13	987	41
<i>Catbird</i>	16353	1908	97	0	228	3

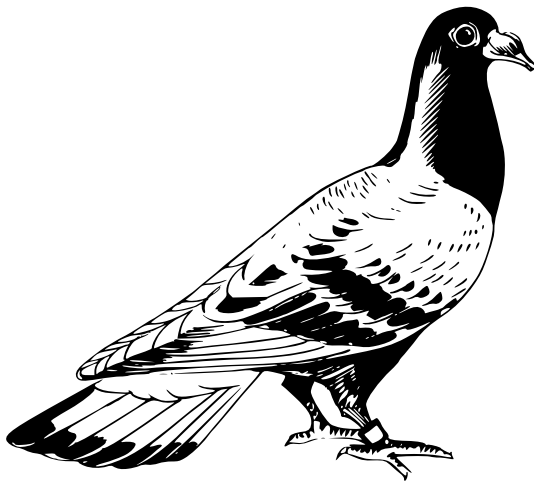
Table 1: Number of vertices, watermarked vertices and number of corrected vertices (MPR and cMPR) after embedding with strength $\alpha = 0.25$ and $\alpha = 0.5$.



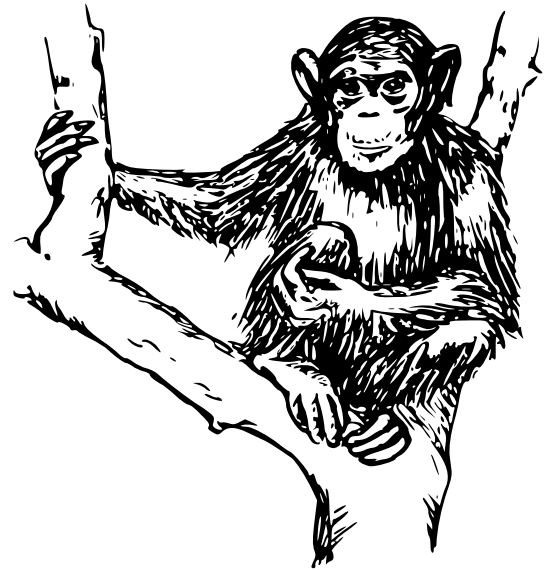
(a) Chaffinch



(b) Hippopotamus



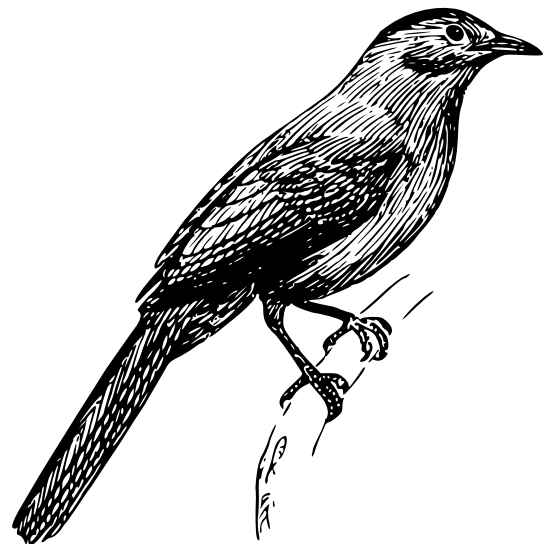
(c) Pigeon



(d) Chimpanzee



(e) Owl



(f) Catbird

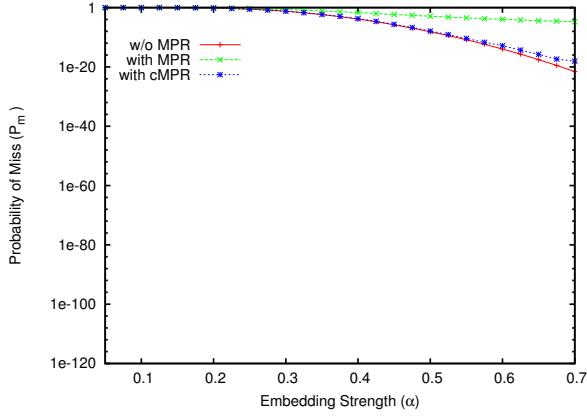
Figure 1: Cliparts taken from <http://openclipart.org>.



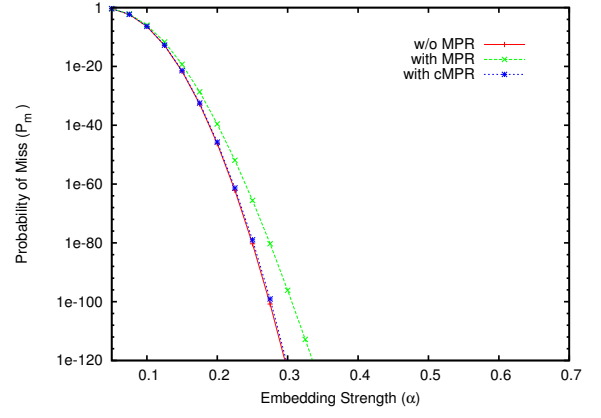
Figure 2: MPRs on a detail of the *Chimpanzee* vector graphics.



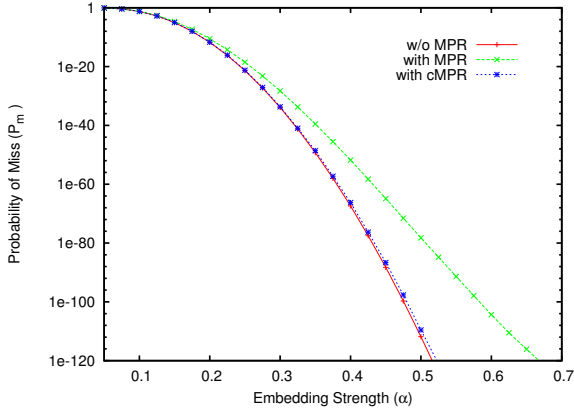
Figure 3: MPRs on a detail of the *Hippopotamus* vector graphics.



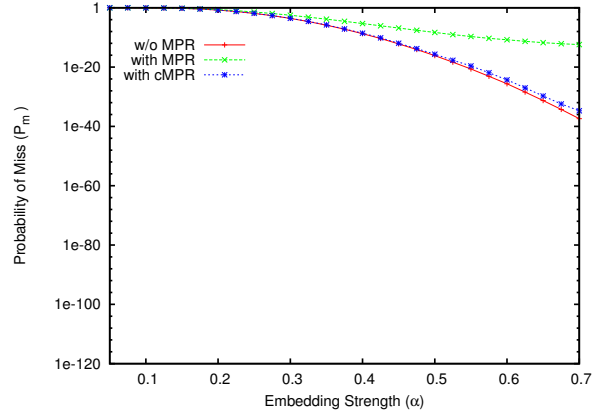
(a) *Chaffinch* (ρ_{LC})



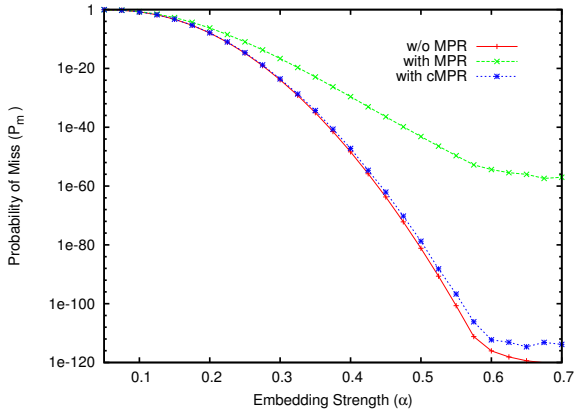
(b) *Hippopotamus* (ρ_{LC})



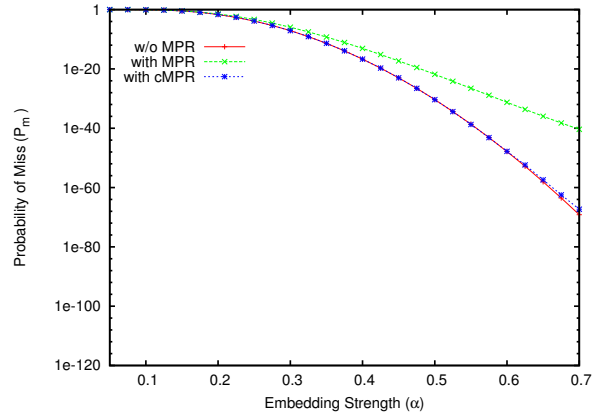
(c) *Pigeon* (ρ_{LC})



(d) *Chimpanzee* (ρ_{LC})

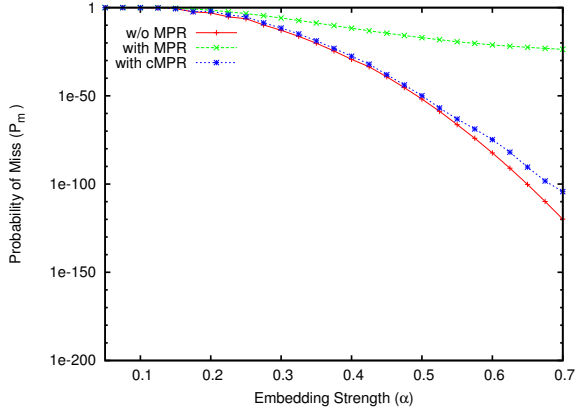


(e) *Owl* (ρ_{LC})

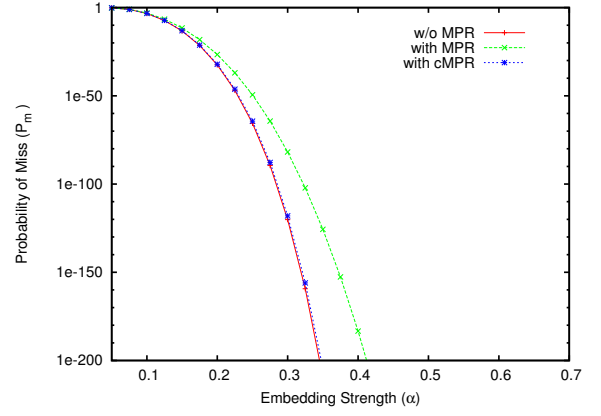


(f) *Catbird* (ρ_{LC})

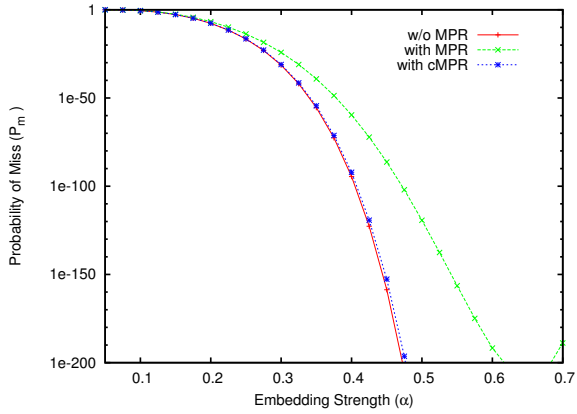
Figure 4: Probability of Miss (P_m) for the Linear Correlation (ρ_{LC}) detector without, and with constraint (MPR and cMPR), for varying embedding strength.



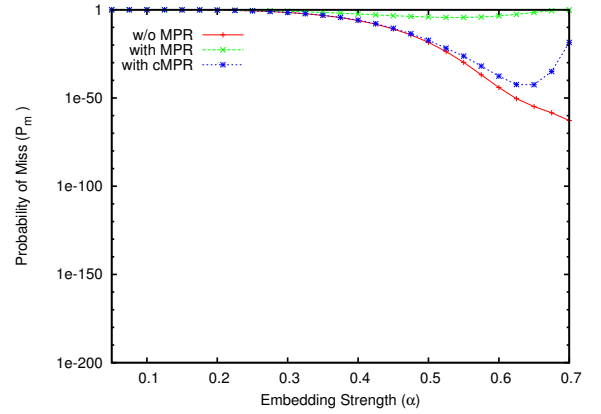
(a) *Chaffinch* (ρ_{LRT})



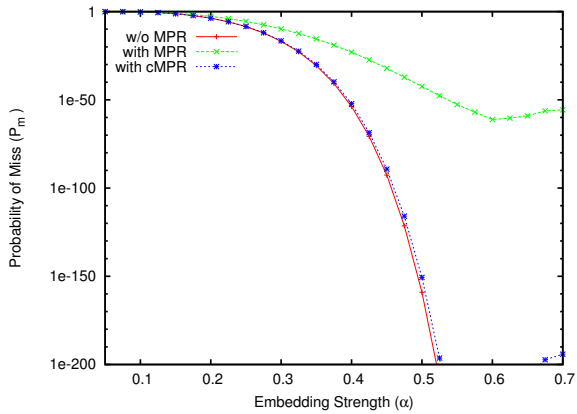
(b) *Hippopotamus* (ρ_{LRT})



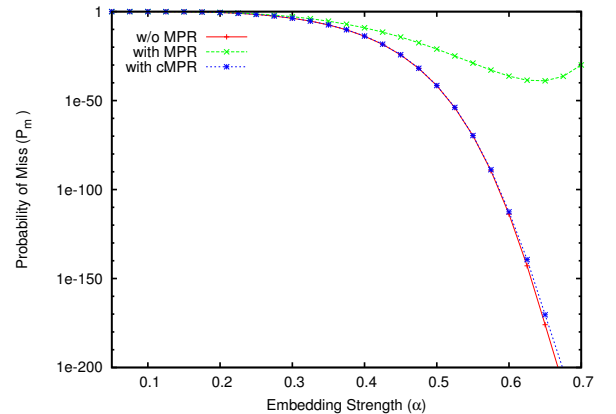
(c) *Pigeon* (ρ_{LRT})



(d) *Chimpanzee* (ρ_{LRT})



(e) *Owl* (ρ_{LRT})



(f) *Catbird* (ρ_{LRT})

Figure 5: Probability of Miss (P_m) for the LRT-Rayleigh (ρ_{LRT}) detector without, and with constraint (MPR and cMPR), for varying embedding strength.