Supplementary Materials: A Mixed Method with Effective Color Reduction

María-Luisa Pérez-Delgado

1. Introduction

This file includes tables with extra information for the article. The tables show the execution time of several methods for each image and palette size:

- Wu's method (WU),
- Octree (OC),
- Median-cut (MC),
- Variance-based method (VB),
- Neuquant (NQ),
- K-means (KM),
- K-means applied to the palette defined by Binary splitting (BSKM),
- Wu's method combined with ATCQ (WATCQ),
- Shuffled-frog leaping algorithm (SFLA),
- Artificial bee colony algorithm combined with ATCQ (ABC+ATCQ),
- Firefly algorithm combined with ATCQ (ATCQ+FA).

Table S1. Average execution time (milliseconds) of other color quantization methods – palette size 32.

	WU	OC	MC	VB	NQ	WATCQ	BSKM	KM	SFLA	ABC+ATCQ	ATCQ+FA
Lenna	14	170	12	243	130	94	8485	7991	2389	24,930	10,468
Peppers	13	166	13	306	156	90	8289	7798	2125	25,468	10,403
Plane	12	144	13	213	130	90	8239	7790	2026	24,560	10,187
Mandrill	12	180	14	339	141	95	8395	7897	2153	26,592	9442
Blond	13	171	12	145	138	92	8288	7790	2049	25,356	10,489
Lake	12	160	13	361	157	92	8173	7736	2140	25,125	10,438
Hydrant	13	180	12	335	837	98	8244	7780	2107	24,729	10,621
EPSZ	14	183	11	311	942	98	8275	7810	2325	25,805	10,228
Machine	11	187	11	358	812	97	8270	7808	2402	26,236	10,320
Text	11	187	11	219	857	97	8405	7944	2348	24,549	10,362
Sign	14	192	14	270	762	95	8236	7776	2230	26,195	10,380
Bikes	10	184	11	265	837	99	8027	7566	2236	25,440	10,855
Sailboats	19	241	17	238	156	140	12,196	11,672	3093	38,261	15,347
Motorcycles	18	257	18	262	171	148	12,407	11,863	3068	40,127	16,263
Lady	17	238	17	358	169	140	12,238	11,713	3353	41,748	16,011
Caps	17	210	17	247	166	137	12,122	11,584	2991	39,767	14,747
Parrots	18	222	18	262	181	127	12,166	11,631	3077	39,274	14,950
Girl	17	231	17	334	160	138	12,173	11,619	3122	41,341	14,810
Landscape	14	148	12	230	129	92	8469	8011	2154	26,825	10,044
Headbands	15	144	12	298	142	92	8424	7966	1957	26,732	10,347
Dessert	11	146	12	260	127	91	8535	8075	2133	27,197	10,837
Snowman	11	152	12	288	137	93	8535	8056	2151	25,821	10,429
Cathedrals	15	158	11	257	123	90	8488	7995	2157	26,343	10,247
Beach	15	151	12	338	131	91	8416	7953	2259	24,794	10,254
AVERAGE	14	183	13	281	320	105	9312	8826	2419	29,301	11,603

Table S2. Average execution time (milliseconds) of other color quantization methods – palette size 64.

	WU	OC	MC	VB	NQ	WATCQ	BSKM	KM	SFLA	ABC+ATCQ	ATCQ+FA
Lenna	11	191	12	290	203	158	15,974	15,343	4561	43,611	17,384
Peppers	12	191	13	372	242	153	15,896	15,294	3986	42,222	18,132
Plane	14	183	12	258	184	152	15,955	15,340	3917	42,658	16,926
Mandrill	12	214	15	415	210	146	15,853	15,240	4306	42,871	15,400
Blond	13	207	13	155	202	158	15,863	15,252	3860	43,836	17,600
Lake	11	168	13	462	205	159	15,757	15,161	4099	42,086	17,420
Hydrant	13	185	12	432	925	162	15,701	15,091	4118	42,114	17,190
EPSZ	12	193	11	368	891	163	15,835	15,221	4452	42,731	15,847
Machine	10	191	11	417	884	158	15,864	15,260	4532	42,532	16,432
Text	11	197	11	259	1058	159	16,010	15,403	4538	42,773	17,200
Sign	11	194	11	335	815	158	15,711	15,106	4371	42,110	17,957
Bikes	10	189	12	311	926	161	15,882	15,277	4292	43,613	18,021
Sailboats	19	257	17	286	250	235	23,680	22,945	6071	65,195	26,550
Motorcycles	19	306	19	319	268	235	23,755	23,036	5997	64,617	28,263
Lady	17	273	17	431	259	237	23,342	22,624	6638	67,698	27,723
Caps	19	246	18	319	265	231	23,516	22,823	5933	66,125	27,890
Parrots	19	258	18	312	291	231	23,618	22,921	6101	65,580	27,175
Girl	18	258	18	418	251	234	23,579	22,844	5890	63,929	27,060
Landscape	13	155	12	272	202	175	16,040	15,411	4304	34,569	16,687
Headbands	11	149	12	369	205	158	16,501	15,876	3691	47,995	17,628
Dessert	13	152	12	303	187	157	16,088	15,466	4106	44,192	18,056
Snowman	15	149	12	370	189	158	16,261	15,628	4029	45,230	17,565
Cathedrals	15	154	12	329	177	165	15,896	15,265	4268	43,417	17,351
Beach	13	149	12	421	192	160	15,742	15,106	4314	44,756	17,885
AVERAGE	14	200	14	343	395	178	17,847	17,206	4682	48,603	19,806

Table S3. Average execution time (milliseconds) of other color quantization methods – palette size 128.

	WU	OC	MC	VB	NQ	WATCQ	BSKM	KM	SFLA	ABC+ATCQ	ATCQ+FA
Lenna	12	227	13	346	306	278	30,939	30,182	8954	77,457	29,819
Peppers	12	220	14	438	323	275	30,675	29,916	7776	74,297	29,923
Plane	14	195	14	303	272	280	31,544	30,798	7618	76,433	26,792
Mandrill	14	236	16	496	312	257	30,437	29,689	8182	76,185	26,272
Blond	14	244	15	178	304	276	30,807	30,020	7276	74,537	30,345
Lake	13	222	15	570	311	281	29,448	28,665	7615	77,757	29,604
Hydrant	13	193	13	500	1058	282	31,283	30,521	8326	75,895	28,502
EPSZ	11	189	12	481	993	283	31,187	30,430	8750	73,464	27,230
Machine	11	195	12	545	961	281	30,793	30,042	8970	76,157	27,124
Text	19	205	11	294	1058	284	30,931	30,179	9636	74,748	24,692
Sign	11	195	12	437	925	281	30,661	29,911	10,360	74,675	27,556
Bikes	11	194	12	401	1016	285	30,980	30,208	9540	74,323	28,754
Sailboats	21	304	18	355	382	414	49,023	48,112	12,438	114,634	48,770
Motorcycles	19	343	19	384	442	424	45,150	44,264	11,387	115,274	49,033
Lady	18	319	17	521	425	422	45,787	44,929	13,237	117,945	46,917
Caps	20	282	18	381	425	419	45,535	44,657	12,547	114,719	47,755
Parrots	18	290	19	375	433	401	46,548	45,666	12,214	114,395	45,709
Girl	19	294	19	494	390	417	44,410	43,506	11,542	118,924	48,119
Landscape	11	148	12	325	303	281	31,084	30,305	8836	83,615	27,470
Headbands	16	154	13	466	326	282	32,829	32,072	7553	82,450	30,199
Dessert	15	148	12	367	285	285	33,367	32,604	7993	76,468	30,070
Snowman	11	157	13	477	293	281	31,122	30,359	8114	76,909	29,464
Cathedrals	12	156	12	388	271	281	31,483	30,739	8462	77,610	28,814
Beach	11	151	12	539	294	279	31,524	30,765	8825	77,853	30,300
AVERAGE	14	219	14	419	505	314	34,898	34,106	9423	86,530	33,301

Table S4. Average execution time (milliseconds) of other color quantization methods – palette size 256.

	WU	OC	MC	VB	NQ	WATCQ	BSKM	KM	SFLA	ABC+ATCQ	ATCQ+FA
Lenna	13	257	14	399	504	543	58,657	57,714	18,035	141,260	47,429
Peppers	14	251	15	512	529	525	65,101	64,127	15,679	142,941	48,313
Plane	13	237	14	369	477	526	61,721	60,754	15,378	145,749	41,503
Mandrill	14	269	22	602	507	459	59,491	58,562	16,138	141,314	42,776
Blond	15	308	14	198	493	529	61,020	60,046	15,213	142,330	46,481
Lake	14	249	16	667	514	515	60,537	59,604	15,739	146,818	49,865
Hydrant	13	201	13	573	1363	534	59,969	59,031	17,244	145,143	45,183
EPSZ	11	201	12	504	1401	524	61,104	60,159	17,860	146,335	43,991
Machine	12	204	12	591	1260	535	60,337	59,403	19,913	142,697	43,686
Text	12	208	12	353	1234	527	58,550	57,634	22,314	138,074	36,605
Sign	12	205	12	442	1118	516	62,428	61,505	18,475	139,508	43,975
Bikes	12	205	12	431	1233	526	59,314	58,403	18,128	140,624	44,658
Sailboats	21	367	19	408	653	777	88,805	87,706	29,456	218,047	81,247
Motorcycles	19	404	20	456	725	788	88,040	86,916	23,654	215,585	80,630
Lady	18	353	18	613	705	781	88,959	87,879	28,066	215,843	76,131
Caps	21	316	19	437	708	773	89,121	88,041	28,291	212,881	82,731
Parrots	18	344	19	445	730	778	87,951	86,886	24,973	219,615	73,885
Girl	21	334	19	571	696	778	89,659	88,598	23,926	213,788	82,175
Landscape	12	169	14	365	515	535	60,759	59,795	17,394	142,337	43,458
Headbands	12	163	17	561	520	528	60,870	59,948	15,834	156,253	46,177
Dessert	12	161	16	431	484	535	60,436	59,478	16,465	145,411	49,456
Snowman	14	153	17	516	519	537	61,424	60,410	15,637	142,500	49,228
Cathedrals	12	174	14	407	480	536	63,018	62,040	17,950	140,398	47,191
Beach	12	157	16	639	486	530	62,810	61,874	17,838	144,555	49,608
AVERAGE	14	245	16	479	744	589	67,920	66,938	19,567	161,667	54,016