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CONSTRUCTION OF EQUIDISTANT GRID IN UNIFORM COLOR SPACE, UNIFORMLY FILLING COLOR GAMUT TRANSMITTED AND REPRODUCED BY TELEVISION SYSTEMS

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ПОБУДОВА ЕКВІДИСТАНТНОЇ СІТКИ В РІВНОКОНТРАСТНОМУ КОЛЬОРОВОМУ ПРОСТОРІ, ЩО РІВНОМІРНО ЗАПОВНЮЄ ОБЛАСТЬ КОЛЬОРІВ, ПЕРЕДАВАНИХ ТА ВІДТВОРЮВАНИХ ТЕЛЕВІЗІЙНИМИ СИСТЕМАМИ

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Abstract. A method of constructing a grid of colors in uniform space that uniformly fills color gamut transmitted and reproduced by television systems. Coordinates and position of the mesh of colors in color spaces CAM02-USC, CIECAM02 and Yxy and presented in tables and figures. The method and the coordinates of the mesh nodes can be used to construct the colorimetric measurement objects and evaluating color reproduction quality of light-to-light television path

Анотація. Запропоновано метод побудови сітки кольорів у рівноконтрастному просторі, що рівномірно заповнює область кольорів, переданих і відтворюваних телевізійними системами. Координати і положення вузлів сітки кольорів у колірних просторах CAM02-USC, CIECAM02 і Yxy представлено в таблицях і рисунках. Метод і координати вузлів сітки може бути використано для побудови колориметричних вимірювальних об'єктів і для оцінки якості кольоровідтворення в телевізійному тракті "від світла до світла"

In this paper a method of constructing mesh in uniform color space that equidistantly fills color gamut transmitted and reproduced by television systems is proposed. The method and an example of colors mesh developed for HDTV system by authors formed trhe basis of Ukrainian contributions [1,2].

As the color space used the CAM02-USC space of coordinates J', a'_M, b'_M proposed by Luo et al. [4] transformation of color appearance model CIECAM02 [3], which can be considered now the most perfect colour appearance model [5] in which color differences are correlated well with the distances between color points is applied.

The method of constructing a grid of colors, uniformly filling a color gamut region transmitted and reproduced by TV system is as follows:

– set the chromaticity coordinates $x_R, x_G, x_B, y_R, y_G, y_B, z_R, z_G, z_B$ of primary colors and of reference white x_W, y_W, z_W of TV system;

– set the parameters of the color: luminance L_{DW} of white, which corresponds to the adapting luminance L_A of the viewer and the conditions of the environment – average, which corresponds to the actual conditions of TV image viewing;

– define the boundaries of a cuboid, covering the projection of body of color gamut, transmitted and reproduced by TV system in the space of J', a'_M, b'_M coordinates;

– build an array of spatial CAM02-USC J', a'_M, b'_M coordinates, evenly filling a cuboid;

– for each of the points with CAM02-USC space J', a'_M, b'_M coordinates carry out the transition to CIECAM02 coordinates J, a_M, b_M and then to the CIE-31 luminance and chrominance coordinates Y, x, y, and then check belonging the point (x, y) to color gamut transmitted and reproduced by television system area for luminance value Y with use of method presented in [6] and exclude color points not belonging to color gamut;

– ordering array of color points in the domain of color gamut transmitted and reproduced by TV system for each level of J' coordinate.

In Figures 1, 5, 9, 13, 17, 21, 25, 29, 33 and tables 1…9 here are presented color points in coordinates J', a'_M, b'_M of CAM02-USC space, which are the nodes of the equidistant three-dimensional orthogonal grid with 5 CIE units step belonging to color gamut transmitted and reproduced by HDTV system, built for the luminance of white $L_{DW} = 250$ cd/m^2, which corresponds to the adapting luminance $L_A = 50$ cd/m^2.

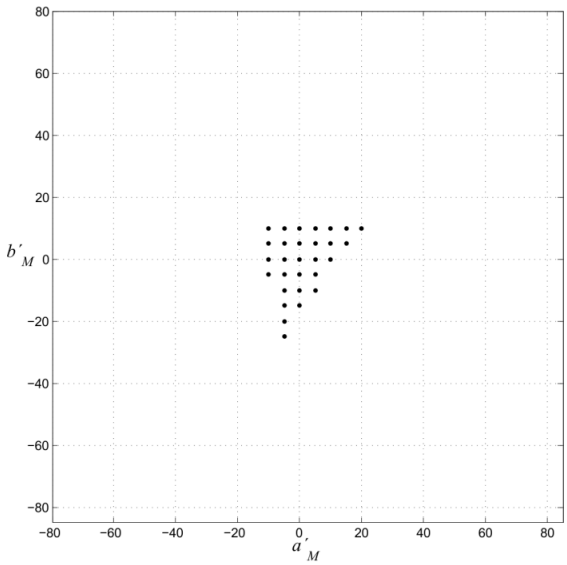

Figure 1 – Color points of color gamut transmitted and reproduced by HDTV system for $J' = 10$ on the a'_M, b'_M plane of the CAM02–UCS space

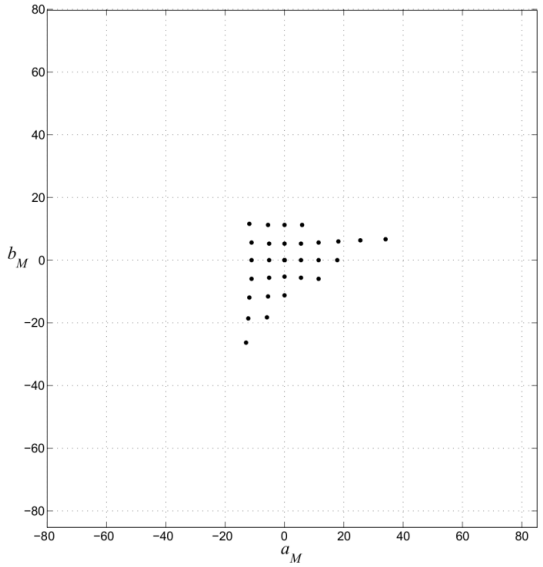

Figure 2 – Color points of color gamut transmitted and reproduced by HDTV system for on the a_M, b_M plane of the CIECAM02 space

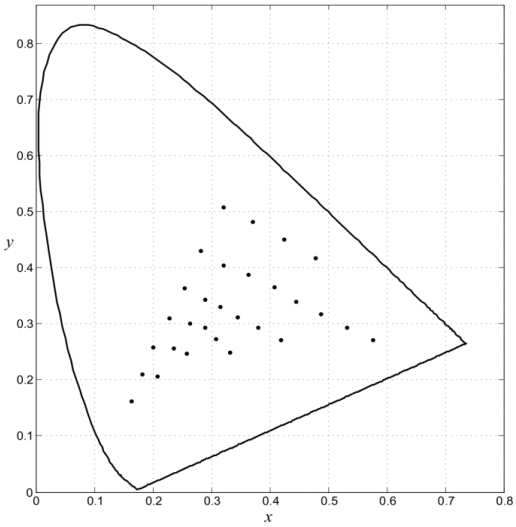

Figure 3 – Color points of color gamut transmitted and reproduced by HDTV system for $J' = 10$ on the x, y plane of the CIE-31 space

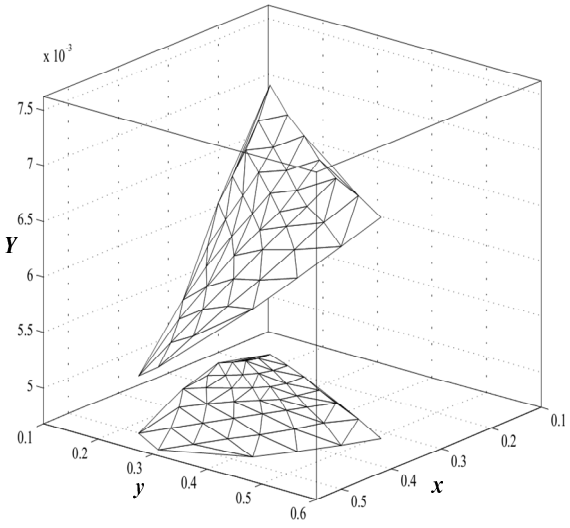

Figure 4 – Y variation for $J' = 10$ as a function of x, y coordinates

Table 1 – Values of CAM02-UCS, CIECAM02 and Yxy color grid coordinates calculated for $J' = 10$ and $J = 6.13$

a'_M	b'_M	a_M	b_M	Y	x	y
–5	–10	5.69	11.39	0.60	0.47	0.41
0	–10	0.00	11.23	0.62	0.42	0.45
5	–10	–5.69	11.39	0.64	0.37	0.48
10	–10	–11.80	11.80	0.66	0.31	0.50
–25	–5	33.90	6.78	0.51	0.57	0.27
–20	–5	25.53	6.38	0.54	0.53	0.29
–15	–5	18.06	6.02	0.56	0.48	0.31
–10	–5	11.39	5.69	0.58	0.44	0.34
–5	–5	5.42	5.42	0.60	0.40	0.36
0	–5	0.00	5.29	0.62	0.36	0.38
5	–5	–5.42	5.42	0.64	0.32	0.40
10	–5	–11.39	5.69	0.66	0.28	0.43
–15	0	17.88	0.00	0.56	0.41	0.27
–10	0	11.23	0.00	0.59	0.38	0.29

a'_M	b'_M	a_M	b_M	Y	x	y
–5	0	5.29	0.00	0.61	0.34	0.31
0	0	0.00	0.00	0.63	0.31	0.32
5	0	–5.29	0.00	0.64	0.28	0.34
10	0	–11.23	0.00	0.67	0.25	0.36
–10	5	11.39	–5.69	0.59	0.33	0.24
–5	5	5.42	–5.42	0.62	0.30	0.27
0	5	0.0	–5.29	0.63	0.28	0.29
5	5	–5.42	–5.42	0.65	0.26	0.30
10	5	–11.39	–5.69	0.67	0.22	0.31
0	10	0.00	–11.23	0.64	0.25	0.24
5	10	–5.69	–11.39	0.65	0.23	0.25
10	10	–11.80	–11.80	0.68	0.20	0.25
5	15	–6.02	–18.06	0.66	0.20	0.20
10	15	–12.36	–18.55	0.69	0.18	0.21
10	20	–13.04	–26.08	0.71	0.16	0.16

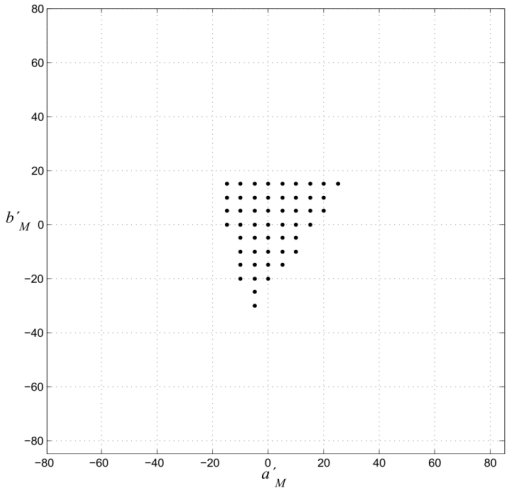

Figure 5 – Color points of color gamut transmitted and reproduced by HDTV system for $J' = 20$ on the a'_M, b'_M plane of the CAM02–UCS space

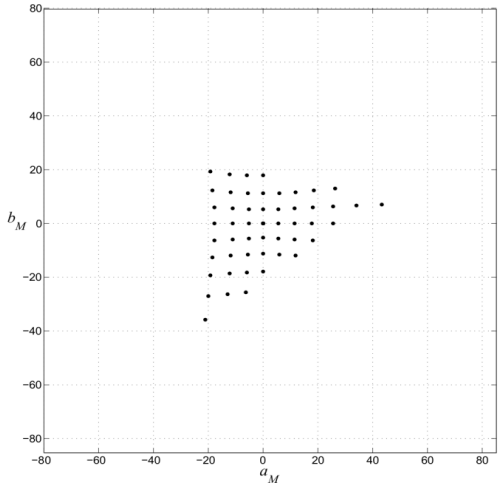

Figure 6 – Color points of color gamut transmitted and reproduced by HDTV system for on the a_M, b_M plane of the CIECAM02 space

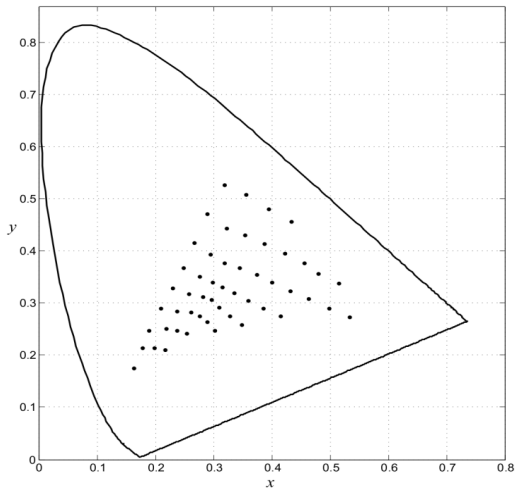

Figure 7 – Color points of color gamut transmitted and reproduced by HDTV system for $J' = 20$ on the x, y plane of the CIE-31 space

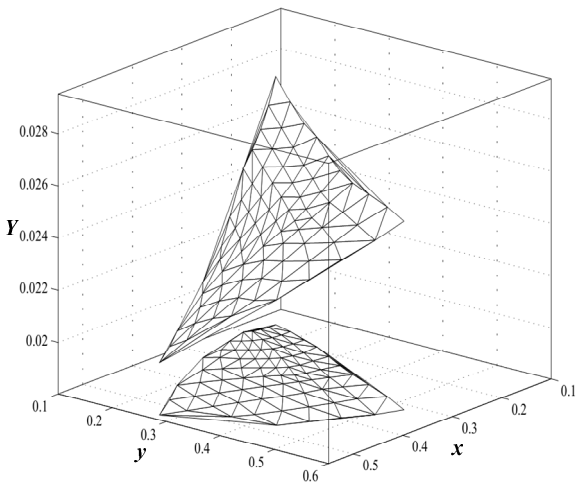

Figure 8 – Y variation for $J' = 20$ as a function of x, y coordinates

Table 2 – Values of CAM02-UCS, CIECAM02 and Yxy color grid coordinates calculated for $J' = 20$ and $J = 12.82$

a'_M	b'_M	a_M	b_M	Y	x	y
0	–15	0.00	17.88	2.34	0.43	0.45
5	–15	–6.02	18.06	2.40	0.39	0.48
10	–15	–12.36	18.55	2.47	0.35	0.50
15	–15	–19.29	19.29	2.52	0.31	0.52
–20	–10	26.08	13.04	2.12	0.51	0.33
–15	–10	18.55	12.36	2.18	0.48	0.35
–10	–10	11.80	11.80	2.24	0.45	0.37
–5	–10	5.69	11.39	2.30	0.42	0.39
0	–10	0.00	11.23	2.36	0.38	0.41
5	–10	–5.69	11.39	2.41	0.35	0.42
10	–10	–11.80	11.80	2.46	0.32	0.44
15	–10	–18.55	12.36	2.52	0.28	0.47
–30	–5	43.28	7.21	2.00	0.53	0.27
–25	–5	33.90	6.78	2.07	0.49	0.29
–20	–5	25.53	6.38	2.14	0.46	0.30
–15	–5	18.06	6.02	2.20	0.43	0.32
–10	–5	11.39	5.69	2.26	0.40	0.33
–5	–5	5.42	5.42	2.31	0.37	0.35
0	–5	0.00	5.29	2.37	0.34	0.36
5	–5	–5.42	5.42	2.42	0.31	0.37
10	–5	–11.39	5.69	2.47	0.29	0.39
15	–5	–18.06	6.02	2.53	0.26	0.41
–20	0	25.33	0.00	2.15	0.41	0.27
–15	0	17.88	0.00	2.22	0.38	0.29
–10	0	11.23	0.00	2.28	0.35	0.30
–5	0	5.29	0.00	2.34	0.33	0.31

a'_M	b'_M	a_M	b_M	Y	x	y
0	0	0.00	0.00	2.38	0.31	0.32
5	0	–5.29	0.00	2.42	0.29	0.33
10	0	–11.23	0.00	2.47	0.27	0.35
15	0	–17.88	0.00	2.53	0.24	0.36
–15	5	18.06	–6.02	2.23	0.34	0.25
–10	5	11.39	–5.69	2.30	0.32	0.27
–5	5	5.42	–5.42	2.35	0.30	0.29
0	5	0.00	–5.29	2.39	0.29	0.30
5	5	–5.42	–5.42	2.43	0.28	0.31
10	5	–11.39	–5.69	2.48	0.25	0.31
15	5	–18.06	–6.02	2.54	0.22	0.32
–10	10	11.80	–11.80	2.31	0.30	0.24
–5	10	5.69	–11.39	2.36	0.28	0.26
0	10	0.00	–11.23	2.40	0.27	0.27
5	10	–5.69	–11.39	2.44	0.26	0.28
10	10	–11.80	–11.80	2.50	0.23	0.28
15	10	–18.55	–12.36	2.57	0.21	0.28
0	15	0.00	–17.88	2.41	0.25	0.24
5	15	–6.02	–18.06	2.46	0.23	0.24
10	15	–12.36	–18.55	2.52	0.21	0.25
15	15	–19.29	–19.29	2.60	0.18	0.24
5	20	–6.38	–25.53	2.49	0.21	0.21
10	20	–13.04	–26.08	2.55	0.19	0.21
15	20	–20.21	–26.95	2.63	0.17	0.21
15	25	–21.30	–35.50	2.68	0.16	0.17

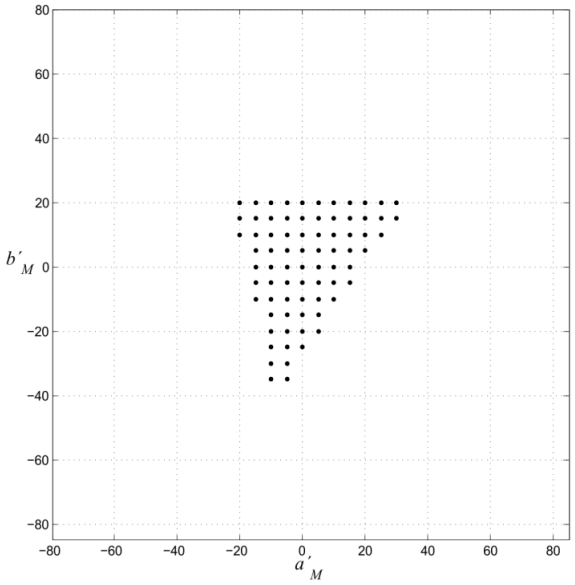

Figure 9 – Color points of color gamut transmitted and reproduced by HDTV system for $J' = 30$ on the a'_M, b'_M plane of the CAM02–UCS space

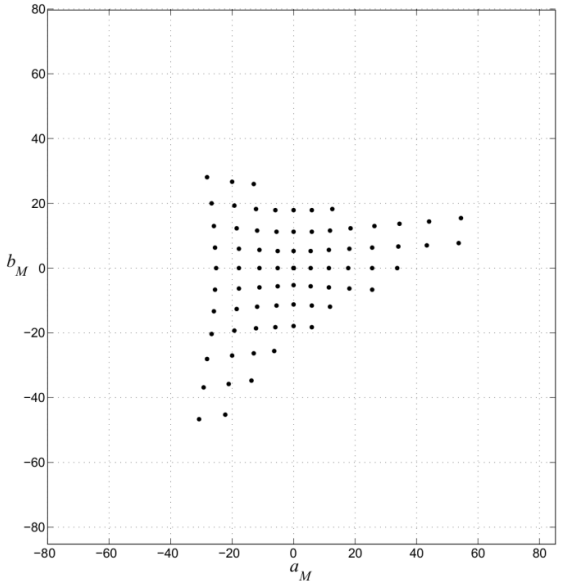

Figure 10 – Color points of color gamut transmitted and reproduced by HDTV system for on the a_M, b_M plane of the CIECAM02 space

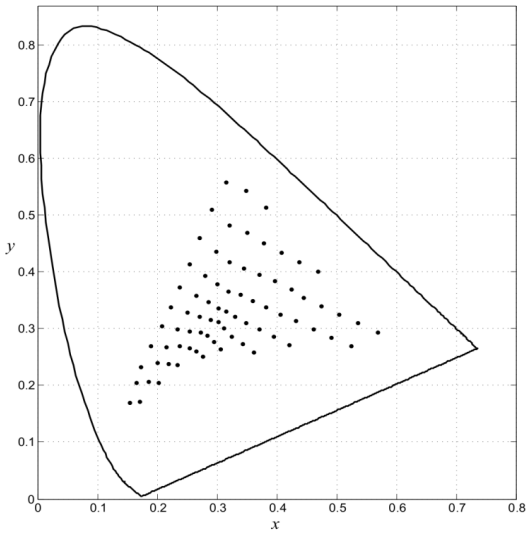

Figure 11 – Color points of color gamut transmitted and reproduced by HDTV system for $J' = 30$ on the x, y plane of the CIE-31 space

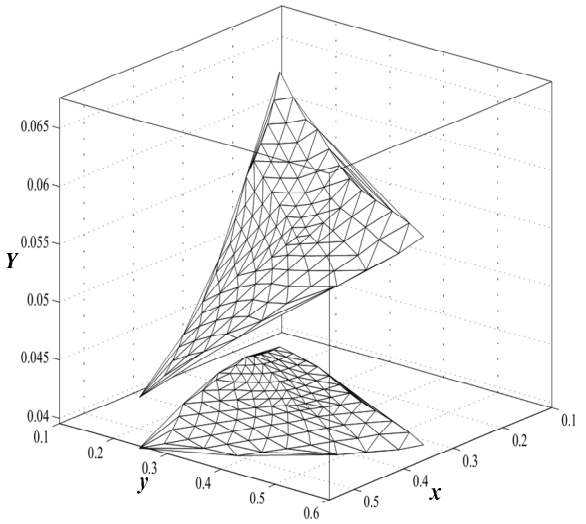

Figure 12 – Y variation for $J' = 30$ as a function of x, y coordinates

Table 3 – Values of CAM02-UCS, CIECAM02 and Yxy color grid coordinates calculated for $J' = 30$ and $J' = 20.13$

a'_M	b'_M	a_M	b_M	Y	x	y
10	–20	–13.04	26.08	5.52	0.38	0.51
15	–20	–20.21	26.95	5.64	0.34	0.54
20	–20	–28.09	28.09	5.74	0.31	0.55
–10	–15	12.36	18.55	5.08	0.46	0.39
–5	–15	6.02	18.06	5.20	0.43	0.41
0	–15	0.00	17.88	5.31	0.40	0.43
5	–15	–6.02	18.06	5.42	0.37	0.45
10	–15	–12.36	18.55	5.53	0.34	0.46
15	–15	–19.29	19.29	5.63	0.32	0.48
20	–15	–26.95	20.21	5.75	0.29	0.51
–35	–10	54.53	15.58	4.52	0.56	0.29
–30	–10	43.95	14.65	4.65	0.53	0.30
–25	–10	34.51	13.80	4.78	0.50	0.32
–20	–10	26.08	13.04	4.90	0.47	0.34
–15	–10	18.55	12.36	5.02	0.44	0.35
–10	–10	11.80	11.80	5.12	0.42	0.36
–5	–10	5.69	11.39	5.23	0.39	0.38
0	–10	0.00	11.23	5.34	0.36	0.39
5	–10	–5.69	11.39	5.44	0.34	0.40
10	–10	–11.80	11.80	5.53	0.32	0.41
15	–10	–18.55	12.36	5.63	0.29	0.43
20	–10	–26.08	13.04	5.76	0.26	0.46
–35	–5	53.80	7.68	4.53	0.52	0.26
–30	–5	43.28	7.21	4.67	0.49	0.28
–25	–5	33.90	6.78	4.81	0.46	0.29
–20	–5	25.53	6.38	4.94	0.43	0.31
–15	–5	18.06	6.02	5.06	0.40	0.32
–5	–5	5.42	5.42	5.26	0.35	0.34
0	–5	0.00	5.29	5.36	0.33	0.35
5	–5	–5.42	5.42	5.45	0.31	0.36
10	–5	–11.39	5.69	5.53	0.30	0.37
15	–5	–18.06	6.02	5.64	0.27	0.39
20	–5	–25.53	6.38	5.76	0.25	0.41
–25	0	33.69	0.00	4.83	0.42	0.27
–20	0	25.33	0.00	4.97	0.39	0.28
–15	0	17.88	0.00	5.09	0.37	0.29
–10	0	11.23	0.00	5.21	0.34	0.31
–5	0	5.29	0.00	5.30	0.32	0.32
0	0	0.00	0.00	5.38	0.31	0.32
5	0	–5.29	0.00	5.45	0.30	0.33
10	0	–11.23	0.00	5.53	0.28	0.34
15	0	–17.88	0.00	5.64	0.26	0.35
20	0	–25.33	0.00	5.77	0.23	0.37
–20	5	25.53	–6.38	5.00	0.36	0.25
–15	5	18.06	–6.02	5.12	0.34	0.27
–10	5	11.39	–5.69	5.24	0.32	0.28
–5	5	5.42	–5.42	5.33	0.31	0.30
0	5	0.00	–5.29	5.40	0.30	0.31
5	5	–5.42	–5.42	5.46	0.28	0.31
10	5	–11.39	–5.69	5.55	0.27	0.32
15	5	–18.06	–6.02	5.66	0.24	0.32
20	5	–25.53	–6.38	5.80	0.22	0.33
–10	10	11.80	–11.80	5.26	0.30	0.26

Table 3 (End)

a'_M	b'_M	a_M	b_M	Y	x	y
0	10	0.00	–11.23	5.41	0.28	0.28
5	10	–5.69	–11.39	5.49	0.27	0.29
10	10	–11.80	–11.80	5.58	0.25	0.29
15	10	–18.55	–12.36	5.69	0.23	0.29
20	10	–26.08	–13.04	5.84	0.20	0.30
–5	15	6.02	–18.06	5.36	0.27	0.25
0	15	0.00	–17.88	5.44	0.26	0.26
5	15	–6.02	–18.06	5.52	0.25	0.26
10	15	–12.36	–18.55	5.61	0.23	0.26
15	15	–19.29	–19.29	5.75	0.21	0.26

a'_M	b'_M	a_M	b_M	Y	x	y
20	15	–26.95	–20.21	5.90	0.18	0.26
5	20	–6.38	–25.53	5.56	0.23	0.23
10	20	–13.04	–26.08	5.66	0.21	0.23
15	20	–20.21	–26.95	5.79	0.20	0.23
20	20	–28.09	–28.09	6.00	0.17	0.23
10	25	–13.80	–34.51	5.73	0.20	0.20
15	25	–21.30	–35.50	5.87	0.18	0.20
20	25	–29.45	–36.81	6.04	0.16	0.20
15	30	–22.52	–45.05	5.97	0.17	0.17
20	30	–31.02	–46.53	6.16	0.15	0.17

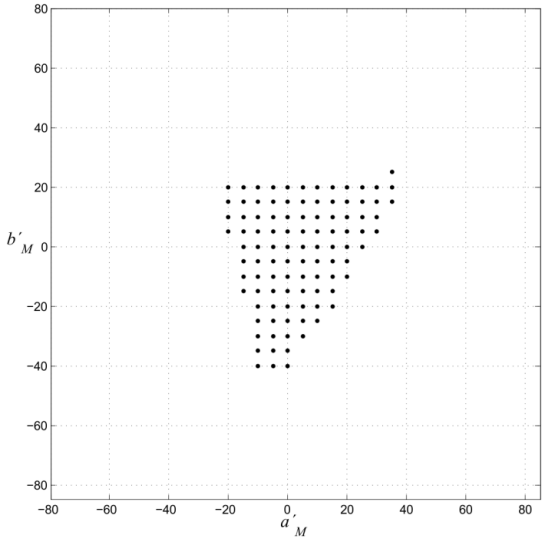

Figure 13 – Color points of color gamut transmitted and reproduced by HDTV system for $J' = 40$ on the a'_M, b'_M plane of the CAM02–UCS space

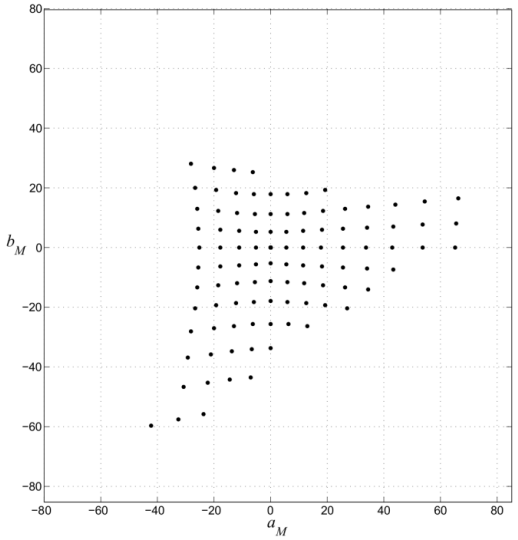

Figure 14 – Color points of color gamut transmitted and reproduced by HDTV system for on the a_M, b_M plane of the CIECAM02 space

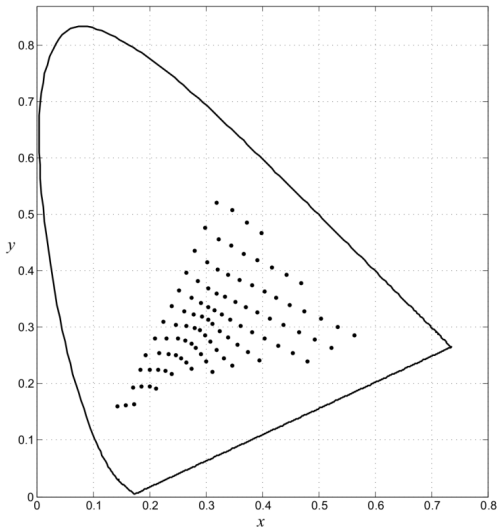

Figure 15 – Color points of color gamut transmitted and reproduced by HDTV system for $J' = 40$ on the x, y plane of the CIE-31 space

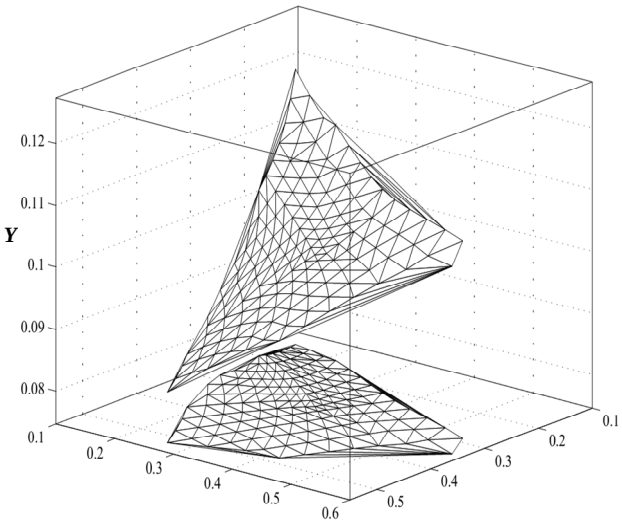

Figure 16 – Y variation for $J' = 40$ as a function of x, y coordinates

Table 4 – Values of CAM02-UCS, CIECAM02 and Yxy color grid coordinates calculated for $J' = 40$ and $J = 28.16$

a'_M	b'_M	a_M	b_M	Y	x	y
–15	–15	19.29	19.29	9.23	0.46	0.37
–10	–15	12.36	18.55	9.42	0.44	0.39
–5	–15	6.02	18.06	9.60	0.41	0.40
0	–15	0.00	17.88	9.77	0.39	0.41
5	–15	–6.02	18.06	9.94	0.36	0.43
10	–15	–12.36	18.55	10.11	0.34	0.44
15	–15	–19.29	19.29	10.26	0.32	0.45
20	–15	–26.95	20.21	10.45	0.29	0.47
–40	–10	66.38	16.59	8.27	0.56	0.28
–35	–10	54.53	15.58	8.50	0.53	0.30
–30	–10	43.95	14.65	8.72	0.50	0.31
–25	–10	34.51	13.80	8.93	0.47	0.32
–20	–10	26.08	13.04	9.13	0.44	0.34
–15	–10	18.55	12.36	9.32	0.42	0.35
–10	–10	11.80	11.80	9.48	0.40	0.36
–5	–10	5.69	11.39	9.65	0.38	0.37
0	–10	0.00	11.23	9.81	0.36	0.38
5	–10	–5.69	11.39	9.97	0.33	0.39
10	–10	–11.80	11.80	10.11	0.32	0.40
15	–10	–18.55	12.36	10.27	0.30	0.41
20	–10	–26.08	13.04	10.45	0.27	0.43
–40	–5	65.58	8.19	8.29	0.52	0.26
–35	–5	53.80	7.68	8.53	0.49	0.27
–30	–5	43.28	7.21	8.76	0.46	0.29
–25	–5	33.90	6.78	8.98	0.43	0.30
–20	–5	25.53	6.38	9.19	0.41	0.31
–15	–5	18.06	6.02	9.38	0.39	0.32
–10	–5	11.39	5.69	9.55	0.36	0.33
–5	–5	5.42	5.42	9.70	0.35	0.34
0	–5	0.00	5.29	9.85	0.33	0.35
5	–5	–5.42	5.42	9.98	0.31	0.35
10	–5	–11.39	5.69	10.11	0.30	0.36
15	–5	–18.06	6.02	10.27	0.28	0.38
20	–5	–25.53	6.38	10.46	0.26	0.39
–40	0	65.32	0.00	8.30	0.48	0.23
–35	0	53.55	0.00	8.56	0.45	0.25
–30	0	43.06	0.00	8.80	0.42	0.26
–25	0	33.69	0.00	9.03	0.40	0.28
–20	0	25.33	0.00	9.25	0.38	0.29
–15	0	17.88	0.00	9.44	0.36	0.30
–10	0	11.23	0.00	9.61	0.34	0.31
–5	0	5.29	0.00	9.76	0.32	0.32
0	0	0.00	0.00	9.88	0.31	0.32
5	0	–5.29	0.00	9.98	0.30	0.33
10	0	–11.23	0.00	10.11	0.29	0.34
15	0	–17.88	0.00	10.27	0.27	0.35
20	0	–25.33	0.00	10.47	0.25	0.36
–30	5	43.28	–7.21	8.83	0.39	0.24

a'_M	b'_M	a_M	b_M	Y	x	y
–25	5	33.90	–6.78	9.07	0.37	0.25
–20	5	25.53	–6.38	9.29	0.35	0.26
–15	5	18.06	–6.02	9.49	0.33	0.28
–10	5	11.39	–5.69	9.66	0.32	0.29
–5	5	5.42	–5.42	9.80	0.31	0.30
0	5	0.00	–5.29	9.90	0.30	0.31
5	5	–5.42	–5.42	10.00	0.29	0.31
10	5	–11.39	–5.69	10.13	0.27	0.32
15	5	–18.06	–6.02	10.30	0.26	0.32
20	5	–25.53	–6.38	10.50	0.23	0.33
–25	10	34.51	–13.80	9.10	0.34	0.23
–20	10	26.08	–13.04	9.32	0.33	0.24
–15	10	18.55	–12.36	9.52	0.31	0.25
–10	10	11.80	–11.80	9.69	0.30	0.27
–5	10	5.69	–11.39	9.83	0.29	0.28
0	10	0.00	–11.23	9.93	0.28	0.29
5	10	–5.69	–11.39	10.04	0.27	0.29
10	10	–11.80	–11.80	10.18	0.26	0.30
15	10	–18.55	–12.36	10.35	0.24	0.30
20	10	–26.08	–13.04	10.56	0.22	0.30
–20	15	26.95	–20.21	9.34	0.31	0.22
–15	15	19.29	–19.29	9.55	0.30	0.23
–10	15	12.36	–18.55	9.71	0.29	0.25
–5	15	6.02	–18.06	9.85	0.28	0.26
0	15	0.00	–17.88	9.97	0.27	0.27
5	15	–6.02	–18.06	10.09	0.26	0.27
10	15	–12.36	–18.55	10.23	0.24	0.27
15	15	–19.29	–19.29	10.42	0.22	0.27
20	15	–26.95	–20.21	10.65	0.20	0.28
–10	20	13.04	–26.08	9.74	0.27	0.22
–5	20	6.38	–25.53	9.88	0.26	0.23
0	20	0.00	–25.33	10.01	0.25	0.24
5	20	–6.38	–25.53	10.15	0.24	0.25
10	20	–13.04	–26.08	10.30	0.23	0.25
15	20	–20.21	–26.95	10.48	0.21	0.25
20	20	–28.09	–28.09	10.77	0.19	0.25
0	25	0.00	–33.69	10.07	0.23	0.21
5	25	–6.78	–33.90	10.22	0.22	0.22
10	25	–13.80	–34.51	10.39	0.21	0.22
15	25	–21.30	–35.50	10.59	0.20	0.22
20	25	–29.45	–36.81	10.84	0.18	0.22
5	30	–7.21	–43.28	10.32	0.21	0.19
10	30	–14.65	–43.95	10.51	0.19	0.19
15	30	–22.52	–45.05	10.73	0.18	0.19
20	30	–31.02	–46.53	11.00	0.16	0.19
15	35	–23.88	–55.73	10.91	0.17	0.16
20	35	–32.79	–57.38	11.21	0.15	0.16
25	35	–42.47	–59.46	11.58	0.14	0.15

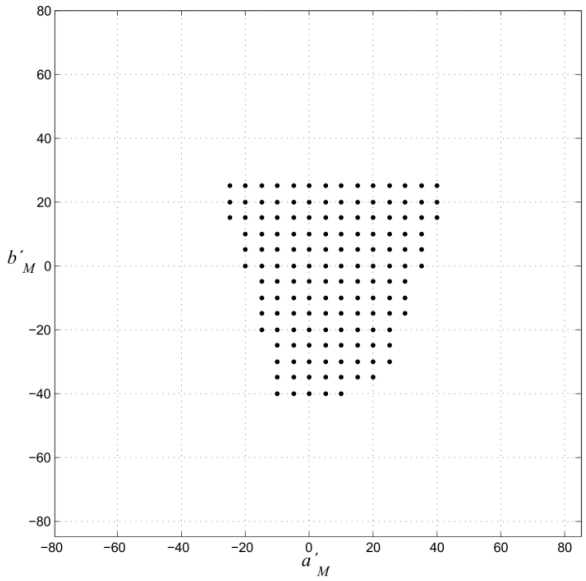

Figure 17 – Color points of color gamut transmitted and reproduced by HDTV system for $J' = 50$ on the a'_M, b'_M plane of the CAM02–UCS space

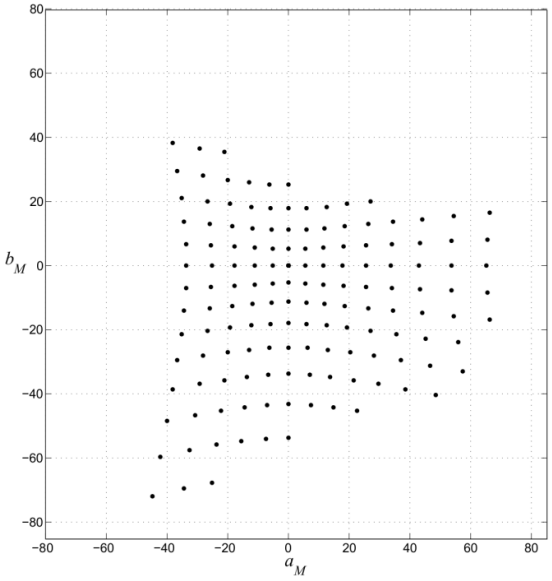

Figure 18 – Color points of color gamut transmitted and reproduced by HDTV system for on the a_M, b_M plane of the CIECAM02 space

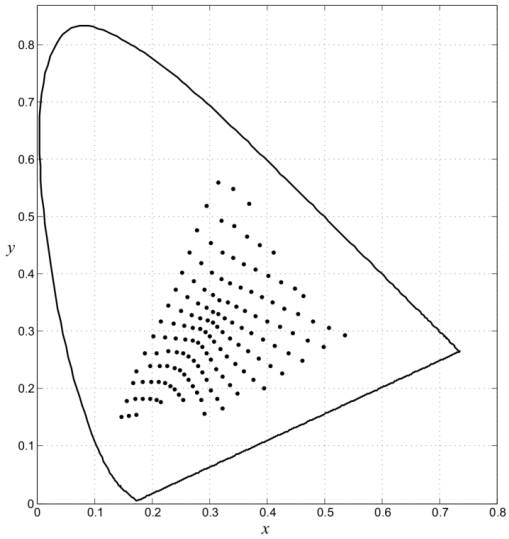

Figure 19 – Color points of color gamut transmitted and reproduced by HDTV system for $J' = 50$ on the x, y plane of the CIE-31 space

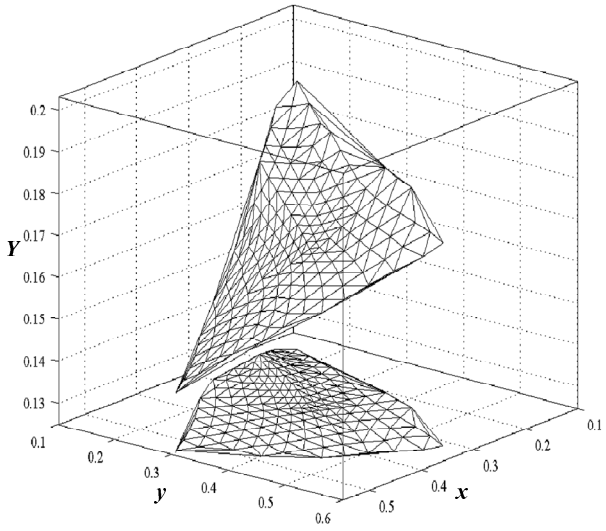

Figure 20 – Y variation for $J' = 50$ as a function of x, y coordinates

Table 5 – Values of CAM02-UCS, CIECAM02 and Yxy color grid coordinates calculated for $J' = 50$ and $J = 37.03$

a'_M	b'_M	a_M	b_M	Y	x	y
15	–25	–21.30	35.50	16.79	0.36	0.52
20	–25	–29.45	36.81	17.10	0.34	0.54
25	–25	–38.43	38.43	17.34	0.31	0.55
0	–20	0.00	25.33	16.01	0.41	0.43
5	–20	–6.38	25.53	16.27	0.38	0.45
10	–20	–13.04	26.08	16.53	0.36	0.46
15	–20	–20.21	26.95	16.80	0.34	0.48
20	–20	–28.09	28.09	17.04	0.32	0.49
25	–20	–36.81	29.45	17.34	0.29	0.51

a'_M	b'_M	a_M	b_M	Y	x	y
–15	–15	19.29	19.29	15.29	0.44	0.37
–10	–15	12.36	18.55	15.57	0.42	0.38
–5	–15	6.02	18.06	15.83	0.40	0.39
0	–15	0.00	17.88	16.08	0.38	0.40
5	–15	–6.02	18.06	16.32	0.35	0.41
10	–15	–12.36	18.55	16.55	0.34	0.42
15	–15	–19.29	19.29	16.78	0.32	0.43
20	–15	–26.95	20.21	17.04	0.30	0.45
25	–15	–35.50	21.30	17.35	0.27	0.47

Table 5 (Continue)

$a'_м$	$b'_м$	$a_м$	$b_м$	Y	x	y
–35	–10	54.53	15.58	14.21	0.50	0.30
–30	–10	43.95	14.65	14.55	0.47	0.31
–25	–10	34.51	13.80	14.86	0.45	0.32
–20	–10	26.08	13.04	15.15	0.43	0.34
–15	–10	18.55	12.36	15.43	0.40	0.35
–10	–10	11.80	11.80	15.66	0.39	0.36
–5	–10	5.69	11.39	15.91	0.37	0.36
0	–10	0.00	11.23	16.14	0.35	0.37
5	–10	–5.696	11.39	16.36	0.33	0.38
10	–10	–11.80	11.80	16.56	0.32	0.39
15	–10	–18.55	12.36	16.78	0.30	0.40
20	–10	–26.08	13.04	17.04	0.28	0.41
25	–10	–34.51	13.80	17.35	0.26	0.43
–40	–5	65.58	8.19	13.90	0.49	0.27
–35	–5	53.80	7.68	14.27	0.47	0.28
–30	–5	43.28	7.21	14.62	0.44	0.29
–25	–5	33.90	6.78	14.94	0.42	0.30
–20	–5	25.53	6.38	15.25	0.39	0.31
–15	–5	18.06	6.02	15.52	0.37	0.32
–10	–5	11.39	5.69	15.77	0.36	0.33
–5	–5	5.42	5.42	15.98	0.34	0.34
0	–5	0.00	5.29	16.19	0.33	0.35
5	–5	–5.42	5.42	16.37	0.31	0.35
10	–5	–11.39	5.69	16.56	0.30	0.36
15	–5	–18.06	6.02	16.78	0.29	0.37
20	–5	–25.53	6.38	17.04	0.27	0.38
25	–5	–33.90	6.78	17.36	0.25	0.40
–40	0	65.32	0.00	13.94	0.46	0.24
–35	0	53.55	0.00	14.32	0.43	0.26
–30	0	43.06	0.00	14.69	0.41	0.27
–25	0	33.69	0.00	15.02	0.39	0.28
–20	0	25.33	0.00	15.33	0.37	0.29
–15	0	17.88	0.00	15.61	0.35	0.30
–10	0	11.23	0.00	15.86	0.33	0.31
–5	0	5.29	0.00	16.07	0.32	0.32
0	0	0.00	0.00	16.24	0.31	0.32
5	0	–5.29	0.00	16.38	0.30	0.33
10	0	–11.23	0.00	16.56	0.29	0.34
15	0	–17.88	0.00	16.79	0.27	0.34
20	0	–25.33	0.00	17.06	0.26	0.35
25	0	–33.69	0.00	17.38	0.24	0.37
–40	5	65.58	–8.19	13.96	0.42	0.22
–35	5	53.80	–7.68	14.36	0.40	0.23
–30	5	43.28	–7.21	14.74	0.38	0.25
–25	5	33.90	–6.78	15.09	0.36	0.26
–20	5	25.53	–6.38	15.40	0.35	0.27
–15	5	18.06	–6.02	15.68	0.33	0.28
–10	5	11.39	–5.69	15.92	0.32	0.29
–5	5	5.42	–5.42	16.13	0.31	0.30
0	5	0.00	–5.29	16.27	0.30	0.31
5	5	–5.42	–5.42	16.40	0.29	0.32
10	5	–11.39	–5.69	16.59	0.28	0.32
15	5	–18.06	–6.02	16.82	0.26	0.32
20	5	–25.53	–6.38	17.10	0.25	0.33
25	5	–33.90	–6.78	17.44	0.22	0.34
–40	10	66.38	–16.59	13.97	0.39	0.20
–35	10	54.53	–15.58	14.39	0.37	0.21
–30	10	43.95	–14.65	14.78	0.35	0.22
–25	10	34.51	–13.80	15.13	0.34	0.24
–20	10	26.08	–13.04	15.45	0.33	0.25
–15	10	18.55	–12.36	15.73	0.31	0.26
–10	10	11.80	–11.80	15.97	0.30	0.28
–5	10	5.69	–11.39	16.16	0.29	0.29
0	10	0.00	–11.23	16.31	0.29	0.29
5	10	–5.69	–11.39	16.46	0.28	0.30
10	10	–11.80	–11.80	16.65	0.27	0.30
15	10	–18.55	–12.36	16.88	0.25	0.30
20	10	–26.08	–13.04	17.17	0.23	0.31
25	10	–34.51	–13.80	17.53	0.21	0.31
–35	15	55.73	–23.88	14.39	0.34	0.19
–30	15	45.05	–22.52	14.79	0.33	0.20
–25	15	35.50	–21.30	15.16	0.32	0.22
–20	15	26.95	–20.21	15.48	0.31	0.23
–15	15	19.29	–19.29	15.77	0.30	0.25
–10	15	12.36	–18.55	16.00	0.29	0.26
–5	15	6.02	–18.06	16.19	0.28	0.27
0	15	0.00	–17.88	16.36	0.27	0.27
5	15	–6.02	–18.06	16.52	0.26	0.28
10	15	–12.36	–18.55	16.72	0.25	0.28
15	15	–19.29	–19.29	16.98	0.24	0.28
20	15	–26.95	–20.21	17.29	0.22	0.28
25	15	–35.50	–21.30	17.66	0.20	0.29
–35	20	57.38	–32.79	14.37	0.32	0.16
–30	20	46.53	–31.02	14.79	0.31	0.18
–25	20	36.81	–29.45	15.16	0.30	0.19
–20	20	28.09	–28.09	15.54	0.29	0.21
–15	20	20.21	–26.95	15.80	0.28	0.22
–10	20	13.04	–26.08	16.03	0.27	0.24
–5	20	6.38	–25.53	16.23	0.27	0.24
0	20	0.00	–25.33	16.42	0.26	0.25
5	20	–6.38	–25.53	16.61	0.25	0.26
10	20	–13.04	–26.08	16.82	0.24	0.26
15	20	–20.21	–26.95	17.0	0.22	0.26
20	20	–28.09	–28.09	17.44	0.20	0.26
25	20	–36.81	–29.45	17.85	0.18	0.26
–30	25	48.38	–40.32	14.77	0.28	0.15
–25	25	38.43	–38.43	15.25	0.28	0.18
–20	25	29.45	–36.81	15.56	0.27	0.19

Table 5 (End)

a'_M	b'_M	a_M	b_M	Y	x	y
–15	25	21.30	–35.50	15.83	0.27	0.20
–10	25	13.80	–34.51	16.07	0.26	0.21
–5	25	6.78	–33.90	16.29	0.25	0.22
0	25	0.00	–33.69	16.49	0.24	0.23
5	25	–6.78	–33.90	16.71	0.23	0.23
10	25	–13.80	–34.51	16.94	0.22	0.23
15	25	–21.30	–35.50	17.21	0.21	0.23
20	25	–29.45	–36.81	17.54	0.19	0.23
25	25	–38.43	–38.43	18.10	0.17	0.23
–15	30	22.52	–45.05	15.87	0.25	0.18
–10	30	14.65	–43.95	16.12	0.24	0.19
–5	30	7.21	–43.28	16.36	0.23	0.19
0	30	0.00	–43.06	16.59	0.23	0.20
5	30	–7.21	–43.28	16.83	0.22	0.20
10	30	–14.65	–43.95	17.09	0.21	0.21
15	30	–22.52	–45.05	17.39	0.19	0.21
20	30	–31.02	–46.53	17.76	0.18	0.21
25	30	–40.32	–48.38	18.19	0.16	0.20
0	35	0.00	–53.55	16.71	0.21	0.17
5	35	–7.68	–53.80	16.98	0.20	0.18
10	35	–15.58	–54.53	17.28	0.19	0.18
15	35	–23.88	–55.73	17.62	0.18	0.18
20	35	–32.79	–57.38	18.02	0.17	0.18
25	35	–42.47	–59.46	18.51	0.15	0.17
15	40	–25.38	–67.70	17.91	0.17	0.15
20	40	–34.76	–69.52	18.36	0.15	0.15
25	40	–44.89	–71.83	18.91	0.14	0.15

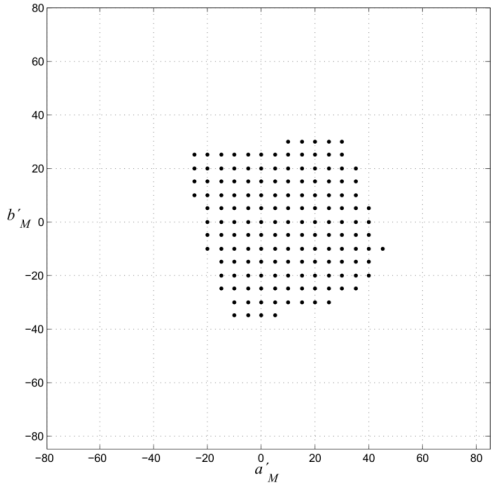

Figure 21 – Color points of color gamut transmitted and reproduced by HDTV system for $J' = 60$ on the a'_M, b'_M plane of the CAM02–UCS space

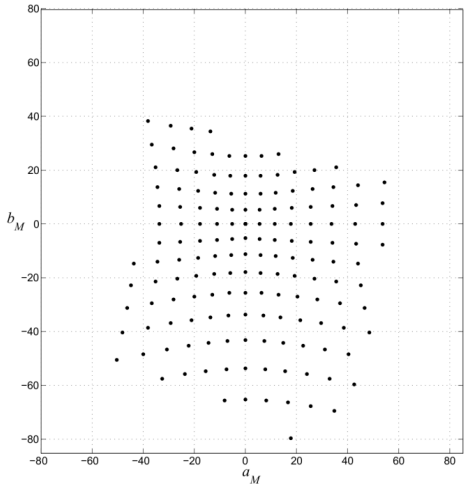

Figure 22 – Color points of color gamut transmitted and reproduced by HDTV system for on the a_M, b_M plane of the CIECAM02 space

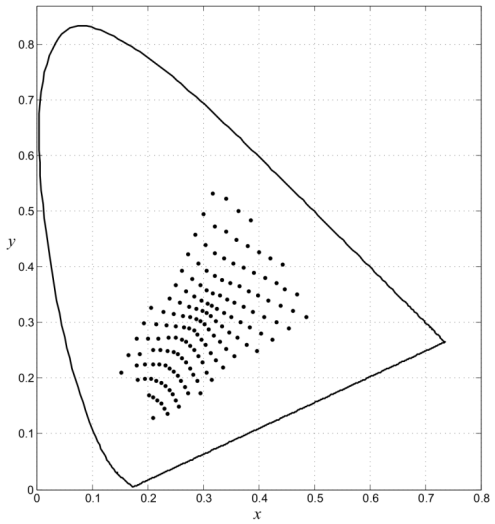

Figure 23 – Color points of color gamut transmitted and reproduced by HDTV system for $J' = 60$ on the x, y plane of the CIE-31 space

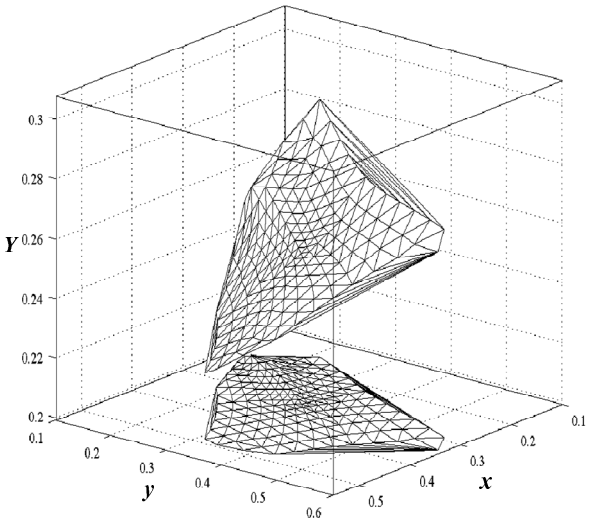

Figure 24 – Y variation for $J' = 60$ as a function of x, y coordinates

Table 6 – Values of CAM02-UCS, CIECAM02 and Yxy color grid coordinates calculated for $J' = 60$ and $J = 46.87$

a'_M	b'_M	a_M	b_M	Y	x	y
10	–25	–13.80	34.51	25.27	0.38	0.48
15	–25	–21.30	35.50	25.66	0.36	0.50
20	–25	–29.45	36.81	26.08	0.34	0.52
25	–25	–38.43	38.43	26.42	0.31	0.53
–10	–20	13.04	26.08	23.88	0.44	0.40
–5	–20	6.38	25.53	24.25	0.42	0.41
0	–20	0.00	25.33	24.62	0.39	0.42
5	–20	–6.38	25.53	24.97	0.37	0.43
10	–20	–13.04	26.08	25.32	0.35	0.44
15	–20	–20.21	26.95	25.68	0.34	0.46
20	–20	–28.09	28.09	26.01	0.32	0.47
25	–20	–36.81	29.45	26.42	0.29	0.49
–25	–15	35.50	21.30	22.90	0.46	0.35
–20	–15	26.95	20.21	23.31	0.44	0.36
–15	–15	19.29	19.29	23.63	0.43	0.37
–10	–15	12.36	18.55	24.01	0.41	0.38
–5	–15	6.02	18.06	24.36	0.39	0.39
0	–15	0.00	17.88	24.71	0.37	0.39
5	–15	–6.02	18.06	25.03	0.35	0.40
10	–15	–12.36	18.55	25.35	0.33	0.41
15	–15	–19.29	19.29	25.65	0.32	0.42
20	–15	–26.95	20.21	26.01	0.30	0.43
25	–15	–35.50	21.30	26.42	0.28	0.45
–35	–10	54.53	15.58	22.11	0.48	0.30
–30	–10	43.95	14.65	22.59	0.46	0.32
–25	–10	34.51	13.80	23.03	0.43	0.33
–20	–10	26.08	13.04	23.44	0.41	0.33
–15	–10	18.55	12.36	23.81	0.39	0.34
–10	–10	11.80	11.80	24.14	0.38	0.35
–5	–10	5.69	11.39	24.47	0.36	0.36
0	–10	0.00	11.23	24.79	0.34	0.37
5	–10	–5.69	11.39	25.08	0.33	0.37
10	–10	–11.80	11.80	25.35	0.31	0.38
15	–10	–18.55	12.36	25.65	0.30	0.39
20	–10	–26.08	13.04	26.01	0.29	0.40
25	–10	–34.51	13.80	26.42	0.27	0.42
–35	–5	53.80	7.68	22.21	0.45	0.28
–30	–5	43.28	7.21	22.70	0.43	0.30
–25	–5	33.90	6.78	23.15	0.40	0.31
–20	–5	25.53	6.38	23.57	0.38	0.31
–15	–5	18.06	6.02	23.95	0.37	0.32
–10	–5	11.39	5.69	24.28	0.35	0.33
–5	–5	5.42	5.42	24.58	0.34	0.34
0	–5	0.00	5.29	24.86	0.32	0.34
5	–5	–5.42	5.42	25.11	0.31	0.35
10	–5	–11.39	5.69	25.36	0.30	0.35
15	–5	–18.06	6.02	25.65	0.29	0.36
20	–5	–25.53	6.38	26.00	0.27	0.37

a'_M	b'_M	a_M	b_M	Y	x	y
25	–5	–33.90	6.78	26.43	0.26	0.39
–35	0	53.55	0.00	22.30	0.42	0.26
–30	0	43.06	0.00	22.80	0.40	0.28
–25	0	33.69	0.00	23.27	0.38	0.29
–20	0	25.33	0.00	23.69	0.36	0.30
–15	0	17.88	0.00	24.07	0.35	0.30
–10	0	11.23	0.00	24.41	0.33	0.31
–5	0	5.29	0.00	24.70	0.32	0.32
0	0	0.00	0.00	24.92	0.31	0.32
5	0	–5.29	0.00	25.11	0.30	0.33
10	0	–11.23	0.00	25.36	0.29	0.33
15	0	–17.88	0.00	25.66	0.28	0.34
20	0	–25.33	0.00	26.02	0.26	0.35
25	0	–33.69	0.00	26.45	0.24	0.36
–35	5	53.80	–7.68	22.37	0.39	0.24
–30	5	43.28	–7.21	22.89	0.37	0.26
–25	5	33.90	–6.78	23.36	0.36	0.27
–20	5	25.53	–6.38	23.79	0.34	0.28
–15	5	18.06	–6.02	24.17	0.33	0.29
–10	5	11.39	–5.69	24.50	0.32	0.30
–5	5	5.42	–5.42	24.77	0.31	0.31
0	5	0.00	–5.29	24.96	0.30	0.31
5	5	–5.42	–5.42	25.15	0.29	0.32
10	5	–11.39	–5.69	25.39	0.28	0.32
15	5	–18.06	–6.02	25.70	0.27	0.32
20	5	–25.53	–6.38	26.07	0.25	0.33
25	5	–33.90	–6.78	26.52	0.23	0.34
–30	10	43.95	–14.65	22.94	0.35	0.24
–25	10	34.51	–13.80	23.43	0.34	0.25
–20	10	26.08	–13.04	23.86	0.32	0.26
–15	10	18.55	–12.36	24.24	0.31	0.27
–10	10	11.80	–11.80	24.56	0.30	0.28
–5	10	5.69	–11.39	24.81	0.30	0.29
0	10	0.00	–11.23	25.02	0.29	0.30
5	10	–5.69	–11.39	25.21	0.28	0.30
10	10	–11.80	–11.80	25.47	0.27	0.30
15	10	–18.55	–12.36	25.78	0.26	0.31
20	10	–26.08	–13.04	26.16	0.24	0.31
25	10	–34.51	–13.80	26.63	0.22	0.32
30	10	–43.95	–14.65	27.20	0.20	0.32
–30	15	45.05	–22.52	22.98	0.33	0.21
–25	15	35.50	–21.30	23.47	0.32	0.23
–20	15	26.95	–20.21	23.90	0.31	0.24
–15	15	19.29	–19.29	24.30	0.30	0.25
–10	15	12.36	–18.55	24.60	0.29	0.27
–5	15	6.02	–18.06	24.86	0.28	0.27
0	15	0.00	–17.88	25.08	0.28	0.28
5	15	–6.02	–18.06	25.30	0.27	0.28

Table 6 (End)

a'_M	b'_M	a_M	b_M	Y	x	y
10	15	–12.36	–18.55	25.56	0.26	0.29
15	15	–19.29	–19.29	25.91	0.24	0.29
20	15	–26.95	–20.21	26.31	0.23	0.29
25	15	–35.50	–21.30	26.80	0.21	0.29
30	15	–45.05	–22.52	27.40	0.19	0.29
–30	20	46.53	–31.02	22.98	0.31	0.19
–25	20	36.81	–29.45	23.48	0.30	0.21
–20	20	28.09	–28.09	23.98	0.29	0.22
–15	20	20.21	–26.95	24.34	0.28	0.23
–10	20	13.04	–26.08	24.65	0.28	0.25
–5	20	6.38	–25.53	24.92	0.27	0.25
0	20	0.00	–25.33	25.16	0.26	0.26
5	20	–6.38	–25.53	25.41	0.26	0.26
10	20	–13.04	–26.08	25.69	0.25	0.27
15	20	–20.21	–26.95	26.02	0.23	0.27
20	20	–28.09	–28.09	26.51	0.21	0.27
25	20	–36.81	–29.45	27.03	0.20	0.27
30	20	–46.53	–31.02	27.68	0.17	0.27
–30	25	48.38	–40.32	22.96	0.29	0.17
–25	25	38.43	–38.43	23.59	0.28	0.19
–20	25	29.45	–36.81	24.01	0.28	0.20
–15	25	21.30	–35.50	24.37	0.27	0.21
–10	25	13.80	–34.51	24.70	0.26	0.22
–5	25	6.78	–33.90	24.99	0.26	0.23
0	25	0.00	–33.69	25.26	0.25	0.24
5	25	–6.78	–33.90	25.54	0.24	0.24
10	25	–13.80	–34.51	25.85	0.23	0.24
15	25	–21.30	–35.50	26.21	0.22	0.25
20	25	–29.45	–36.81	26.64	0.20	0.25
25	25	–38.43	–38.43	27.34	0.18	0.24
30	25	–48.38	–40.32	28.05	0.16	0.24
–25	30	40.32	–48.38	23.60	0.27	0.17
–20	30	31.02	–46.53	24.04	0.26	0.18
–15	30	22.52	–45.05	24.42	0.25	0.19
–10	30	14.65	–43.95	24.76	0.25	0.20
–5	30	7.21	–43.28	25.08	0.24	0.21
0	30	0.00	–43.06	25.39	0.23	0.21
5	30	–7.21	–43.28	25.70	0.23	0.22
10	30	–14.65	–43.95	26.05	0.22	0.22
15	30	–22.52	–45.05	26.44	0.20	0.22
20	30	–31.02	–46.53	26.91	0.19	0.22
25	30	–40.32	–48.38	27.48	0.17	0.22
30	30	–50.57	–50.57	28.54	0.15	0.21
–25	35	42.47	–59.46	23.62	0.25	0.14
–20	35	32.79	–57.38	24.07	0.25	0.16
–15	35	23.88	–55.73	24.48	0.24	0.17
–10	35	15.58	–54.53	24.85	0.23	0.17
–5	35	7.68	–53.80	25.20	0.23	0.18
0	35	0.00	–53.55	25.54	0.22	0.19
5	35	–7.68	–53.80	25.90	0.21	0.19
10	35	–15.58	–54.53	26.29	0.20	0.19
15	35	–23.88	–55.73	26.73	0.19	0.19
20	35	–32.79	–57.38	27.25	0.18	0.19
–20	40	34.76	–69.52	24.13	0.23	0.13
–15	40	25.38	–67.70	24.56	0.22	0.14
–10	40	16.59	–66.38	24.97	0.22	0.15
–5	40	8.19	–65.58	25.36	0.21	0.16
0	40	0.00	–65.32	25.74	0.20	0.16
5	40	–8.19	–65.58	26.14	0.20	0.16
–10	45	17.70	–79.66	25.13	0.20	0.12

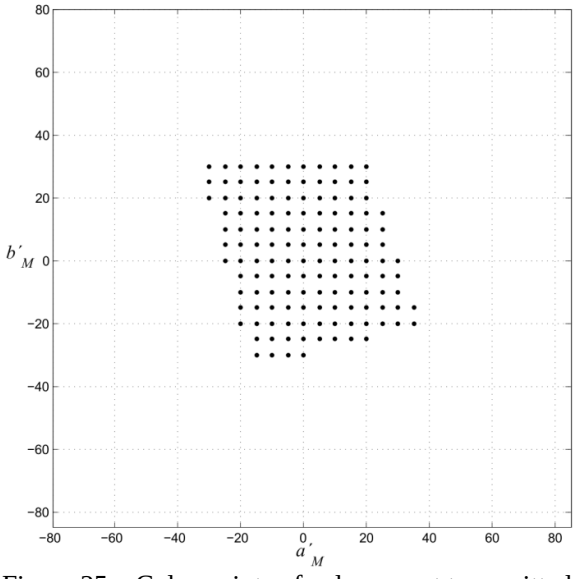

Figure 25 – Color points of color gamut transmitted and reproduced by HDTV system for $J' = 70$ on the a'_M, b'_M plane of the CAM02–UCS space

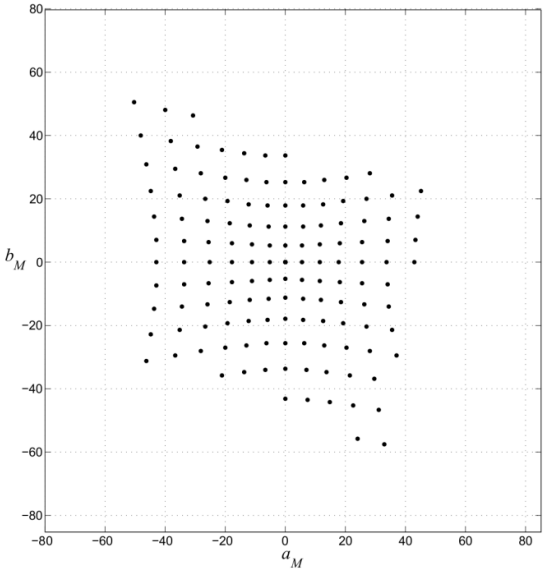

Figure 26 – Color points of color gamut transmitted and reproduced by HDTV system for on the a_M, b_M plane of the CIECAM02 space

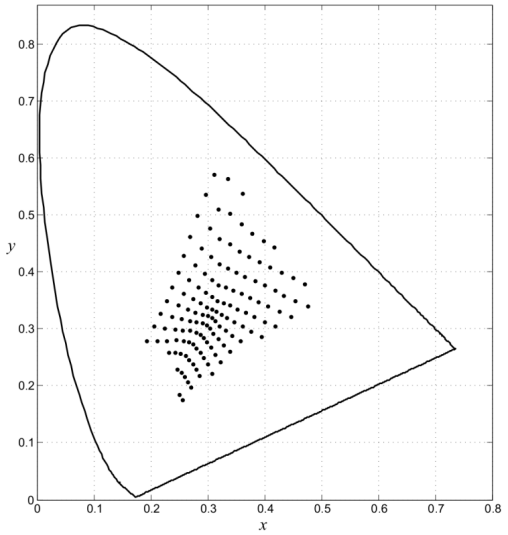

Figure 27 – Color points of color gamut transmitted and reproduced by HDTV system for $J' = 70$ on the x, y plane of the CIE-31 space

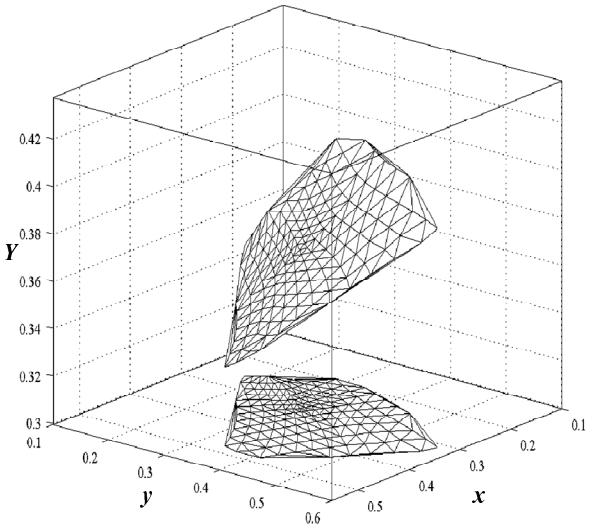

Figure 28 – Y variation for $J' = 70$ as a function of x, y coordinates

Table 7 – Values of CAM02-UCS, CIECAM02 and Yxy color grid coordinates calculated for $J' = 70$ and $J = 57.85$

a'_M	b'_M	a_M	b_M	Y	x	y
20	–30	–31.02	46.5	38.10	0.36	0.53
25	–30	–40.32	48.38	38.74	0.33	0.56
30	–30	–50.57	50.57	39.18	0.31	0.57
0	–25	0.00	33.69	36.05	0.41	0.44
5	–25	–6.78	33.90	36.54	0.39	0.45
10	–25	–13.80	34.51	37.04	0.37	0.46
15	–25	–21.30	35.50	37.55	0.35	0.48
20	–25	–29.45	36.81	38.09	0.33	0.50
25	–25	–38.43	38.43	38.55	0.31	0.51
30	–25	–48.38	40.32	39.18	0.29	0.53
–20	–20	28.09	28.09	34.12	0.47	0.37
–15	–20	20.21	26.95	34.67	0.44	0.38
–10	–20	13.04	26.08	35.19	0.42	0.39
–5	–20	6.38	25.53	35.69	0.40	0.40
0	–20	0.00	25.33	36.17	0.39	0.41
5	–20	–6.38	25.53	36.64	0.37	0.42
10	–20	–13.04	26.08	37.09	0.35	0.43
15	–20	–20.21	26.95	37.56	0.33	0.44
20	–20	–28.09	28.09	38.00	0.32	0.45
25	–20	–36.81	29.45	38.55	0.30	0.47
30	–20	–46.53	31.02	39.18	0.28	0.49
–30	–15	45.05	22.52	33.29	0.47	0.33
–25	–15	35.50	21.30	33.88	0.45	0.34
–20	–15	26.95	20.21	34.43	0.43	0.35
–15	–15	19.29	19.29	34.87	0.41	0.36
–10	–15	12.36	18.55	35.37	0.40	0.37
–5	–15	6.02	18.06	35.84	0.38	0.38
0	–15	0.00	17.88	36.29	0.36	0.39
5	–15	–6.02	18.06	36.72	0.34	0.39
10	–15	–12.36	18.55	37.13	0.33	0.40
15	–15	–19.29	19.29	37.53	0.32	0.41
20	–15	–26.95	20.21	38.00	0.30	0.42
25	–15	–35.50	21.30	38.54	0.28	0.44
30	–15	–45.05	22.52	39.17	0.26	0.46
–30	–10	43.95	14.65	33.47	0.44	0.32
–25	–10	34.51	13.80	34.06	0.42	0.33
–20	–10	26.08	13.04	34.61	0.40	0.33
–15	–10	18.55	12.36	35.11	0.38	0.34
–10	–10	11.80	11.80	35.55	0.37	0.35
–5	–10	5.69	11.39	35.99	0.35	0.36
0	–10	0.00	11.23	36.40	0.34	0.36
5	–10	–5.69	11.39	36.79	0.33	0.37
10	–10	–11.80	11.80	37.14	0.31	0.37
15	–10	–18.55	12.36	37.54	0.30	0.38
20	–10	–26.08	13.04	38.00	0.29	0.39
25	–10	–34.51	13.80	38.53	0.27	0.41
30	–10	–43.95	14.65	39.17	0.25	0.42
–30	–5	43.28	7.21	33.63	0.41	0.30
–25	–5	33.90	6.78	34.24	0.39	0.31
–20	–5	25.53	6.38	34.79	0.38	0.32
–15	–5	18.06	6.02	35.29	0.36	0.32
–10	–5	11.39	5.69	35.74	0.35	0.33
–5	–5	5.42	5.42	36.13	0.33	0.34
0	–5	0.00	5.29	36.50	0.32	0.34
5	–5	–5.42	5.42	36.82	0.31	0.34
10	–5	–11.39	5.69	37.15	0.30	0.35
15	–5	–18.06	6.02	37.53	0.29	0.36
20	–5	–25.53	6.38	37.99	0.28	0.37

Table 7 (End)

$a'_м$	$b'_м$	$a_м$	$b_м$	Y	x	y
25	–5	–33.90	6.78	38.54	0.26	0.38
30	–5	–43.28	7.21	39.18	0.24	0.39
–30	0	43.06	0.00	33.78	0.39	0.28
–25	0	33.69	0.00	34.40	0.37	0.29
–20	0	25.33	0.00	34.96	0.36	0.30
–15	0	17.88	0.00	35.46	0.34	0.31
–10	0	11.23	0.00	35.91	0.33	0.31
–5	0	5.29	0.00	36.29	0.32	0.32
0	0	0.00	0.00	36.58	0.31	0.32
5	0	–5.29	0.00	36.82	0.30	0.33
10	0	–11.23	0.00	37.14	0.29	0.33
15	0	–17.88	0.00	37.54	0.28	0.34
20	0	–25.33	0.00	38.01	0.27	0.35
25	0	–33.69	0.00	38.57	0.25	0.36
30	0	–43.06	0.00	39.23	0.23	0.37
–25	5	33.90	–6.78	34.53	0.35	0.27
–20	5	25.53	–6.38	35.10	0.34	0.28
–15	5	18.06	–6.02	35.60	0.33	0.29
–10	5	11.39	–5.69	36.03	0.32	0.30
–5	5	5.42	–5.42	36.38	0.31	0.31
0	5	0.00	–5.29	36.63	0.30	0.31
5	5	–5.42	–5.42	36.87	0.30	0.32
10	5	–11.39	–5.69	37.19	0.29	0.32
15	5	–18.06	–6.02	37.58	0.27	0.32
20	5	–25.53	–6.38	38.07	0.26	0.33
25	5	–33.90	–6.78	38.64	0.24	0.34
30	5	–43.28	–7.21	39.34	0.22	0.34
–25	10	34.51	–13.80	34.62	0.33	0.26
–20	10	26.08	–13.04	35.19	0.32	0.27
–15	10	18.55	–12.36	35.68	0.31	0.28
–10	10	11.80	–11.80	36.11	0.30	0.29
–5	10	5.69	–11.39	36.44	0.30	0.30
0	10	0.00	–11.23	36.70	0.29	0.30
5	10	–5.69	–11.39	36.96	0.29	0.30
10	10	–11.80	–11.80	37.29	0.28	0.31
15	10	–18.55	–12.36	37.69	0.26	0.31
20	10	–26.08	–13.04	38.18	0.25	0.31
25	10	–34.51	–13.80	38.78	0.23	0.32
30	10	–43.95	–14.65	39.50	0.21	0.32

$a'_м$	$b'_м$	$a_м$	$b_м$	Y	x	y
–25	15	35.50	–21.30	34.68	0.32	0.24
–20	15	26.95	–20.21	35.25	0.31	0.25
–15	15	19.29	–19.29	35.76	0.30	0.26
–10	15	12.36	–18.55	36.16	0.29	0.27
–5	15	6.02	–18.06	36.50	0.29	0.28
0	15	0.00	–17.88	36.78	0.28	0.29
5	15	–6.02	–18.06	37.07	0.27	0.29
10	15	–12.36	–18.55	37.41	0.26	0.29
15	15	–19.29	–19.29	37.85	0.25	0.29
20	15	–26.95	–20.21	38.36	0.24	0.29
25	15	–35.50	–21.30	38.99	0.22	0.30
30	15	–45.05	–22.52	39.75	0.20	0.30
–25	20	36.81	–29.45	34.71	0.30	0.22
–20	20	28.09	–28.09	35.34	0.29	0.23
–15	20	20.21	–26.95	35.81	0.29	0.24
–10	20	13.04	–26.08	36.22	0.28	0.25
–5	20	6.38	–25.53	36.57	0.28	0.26
0	20	0.00	–25.33	36.89	0.27	0.27
5	20	–6.38	–25.53	37.21	0.26	0.27
10	20	–13.04	–26.08	37.57	0.25	0.27
15	20	–20.21	–26.95	38.00	0.24	0.27
20	20	–28.09	–28.09	38.61	0.22	0.27
25	20	–36.81	–29.45	39.27	0.21	0.27
30	20	–46.53	–31.02	40.08	0.19	0.27
–20	25	29.45	–36.81	35.38	0.28	0.21
–15	25	21.30	–35.50	35.86	0.27	0.22
–10	25	13.80	–34.51	36.28	0.27	0.23
–5	25	6.78	–33.90	36.66	0.26	0.24
0	25	0.00	–33.69	37.02	0.26	0.25
5	25	–6.78	–33.90	37.38	0.25	0.25
10	25	–13.80	–34.51	37.78	0.24	0.25
15	25	–21.30	–35.50	38.24	0.23	0.25
–20	30	31.02	–46.53	35.42	0.27	0.19
–15	30	22.52	–45.05	35.92	0.26	0.20
–10	30	14.65	–43.95	36.37	0.25	0.21
–5	30	7.21	–43.28	36.78	0.25	0.22
0	30	0.00	–43.06	37.17	0.24	0.22
–20	35	32.79	–57.38	35.47	0.25	0.17
–15	35	23.88	–55.73	36.00	0.25	0.18

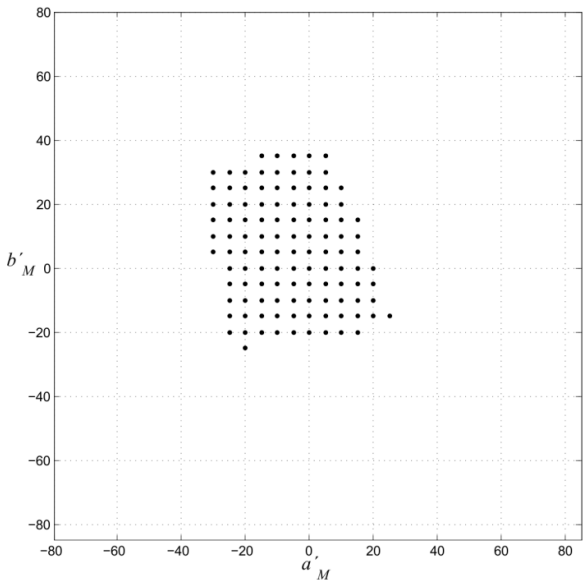

Figure 29 – Color points of color gamut transmitted and reproduced by HDTV system for $J' = 80$ on the a'_M, b'_M plane of the CAM02–UCS space

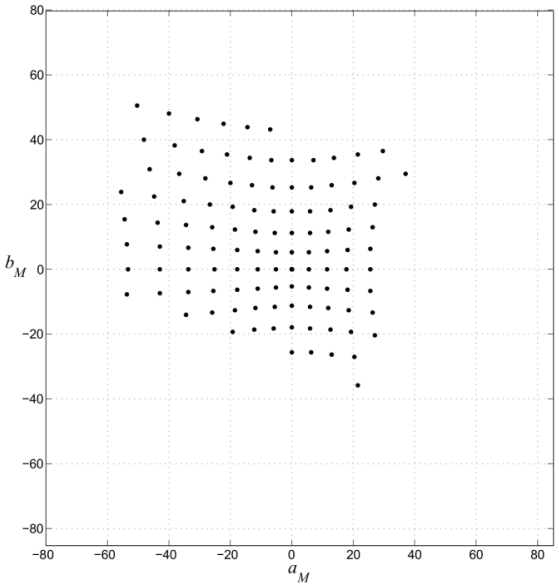

Figure 30 – Color points of color gamut transmitted and reproduced by HDTV system for on the a_M, b_M plane of the CIECAM02 space

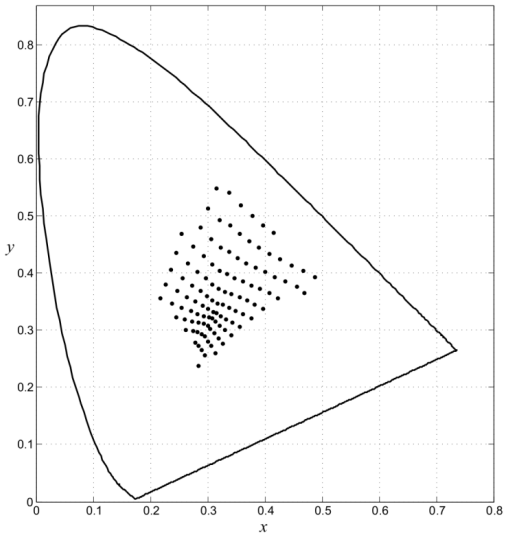

Figure 31 – Color points of color gamut transmitted and reproduced by HDTV system for $J' = 80$ on the x, y plane of the CIE-31 space

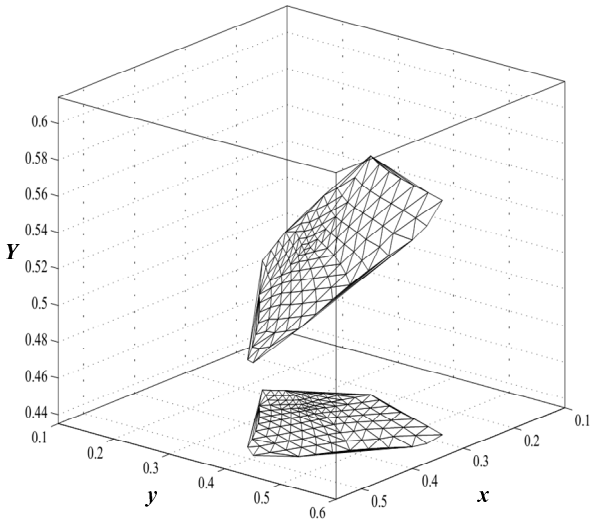

Figure 32 – Y variation for $J' = 80$ as a function of x, y coordinates

Table 8 – Values of CAM02-UCS, CIECAM02 and Yxy color grid coordinates calculated for $J' = 80$ and $J = 70.17$

a'_M	b'_M	a_M	b_M	Y	x	y
5	–30	–7.21	43.28	51.89	0.41	0.47
10	–30	–14.65	43.95	52.57	0.39	0.48
15	–30	–22.52	45.05	53.28	0.37	0.50
20	–30	–31.02	46.53	54.03	0.35	0.51
25	–30	–40.32	48.38	54.85	0.33	0.54
30	–30	–50.57	50.57	55.45	0.31	0.54
–20	–25	29.45	36.81	48.59	0.48	0.39
–15	–25	21.30	35.50	49.33	0.46	0.40
–10	–25	13.80	34.51	50.04	0.44	0.41

a'_M	b'_M	a_M	b_M	Y	x	y
0	–25	0.00	33.69	51.38	0.40	0.43
5	–25	–6.78	33.90	52.03	0.38	0.44
10	–25	–13.80	34.51	52.66	0.37	0.45
15	–25	–21.30	35.50	53.32	0.35	0.46
20	–25	–29.45	36.81	54.02	0.33	0.48
25	–25	–38.43	38.43	54.62	0.32	0.49
30	–25	–48.38	40.32	55.44	0.30	0.51
–25	–20	36.81	29.45	48.31	0.46	0.36
–20	–20	28.09	28.09	48.88	0.45	0.37

Table 8 (End)

a'_M	b'_M	a_M	b_M	Y	x	y
–10	–20	13.04	26.08	50.28	0.41	0.39
–5	–20	6.38	25.53	50.93	0.39	0.40
0	–20	0.00	25.33	51.55	0.38	0.40
5	–20	–6.38	25.53	52.15	0.36	0.41
10	–20	–13.04	26.08	52.74	0.35	0.42
15	–20	–20.21	26.95	53.34	0.33	0.43
20	–20	–28.09	28.09	53.91	0.32	0.44
25	–20	–36.81	29.45	54.61	0.30	0.46
30	–20	–46.53	31.02	55.42	0.28	0.48
–20	–15	26.95	20.21	49.28	0.42	0.35
–15	–15	19.29	19.29	49.87	0.40	0.36
–10	–15	12.36	18.55	50.51	0.39	0.37
–5	–15	6.02	18.06	51.13	0.37	0.37
0	–15	0.00	17.88	51.71	0.36	0.38
5	–15	–6.02	18.06	52.26	0.34	0.39
10	–15	–12.36	18.55	52.79	0.33	0.39
15	–15	–19.29	19.29	53.31	0.32	0.40
20	–15	–26.95	20.21	53.91	0.30	0.41
25	–15	–35.50	21.30	54.60	0.29	0.43
30	–15	–45.05	22.52	55.40	0.27	0.44
35	–15	–55.73	23.88	56.33	0.25	0.46
–20	–10	26.08	13.04	49.53	0.39	0.33
–15	–10	18.55	12.36	50.18	0.38	0.34
–10	–10	11.80	11.80	50.75	0.36	0.35
–5	–10	5.69	11.39	51.31	0.35	0.35
0	–10	0.00	11.23	51.85	0.34	0.36
5	–10	–5.69	11.39	52.34	0.32	0.36
10	–10	–11.80	11.80	52.80	0.31	0.37
15	–10	–18.55	12.36	53.31	0.30	0.38
20	–10	–26.08	13.04	53.89	0.29	0.39
25	–10	–34.51	13.80	54.58	0.28	0.40
30	–10	–43.95	14.65	55.38	0.26	0.41
35	–10	–54.53	15.58	56.33	0.24	0.43
–20	–5	25.53	6.38	49.77	0.37	0.32
–15	–5	18.06	6.02	50.42	0.36	0.32
–10	–5	11.39	5.69	50.99	0.34	0.33
–5	–5	5.42	5.42	51.50	0.33	0.33
0	–5	0.00	5.29	51.98	0.32	0.34
5	–5	–5.42	5.42	52.39	0.31	0.34
10	–5	–11.39	5.69	52.80	0.30	0.35
15	–5	–18.06	6.02	53.29	0.29	0.36
20	–5	–25.53	6.38	53.88	0.28	0.36
25	–5	–33.90	6.78	54.57	0.27	0.37
30	–5	–43.28	7.21	55.40	0.25	0.39
35	–5	–53.80	7.68	56.37	0.23	0.40
–20	0	25.33	0.00	50.00	0.35	0.30
–15	0	17.88	0.00	50.64	0.34	0.31
–5	0	5.29	0.00	51.70	0.32	0.32
0	0	0.00	0.00	52.08	0.31	0.32
5	0	–5.29	0.00	52.39	0.30	0.33
10	0	–11.23	0.00	52.80	0.30	0.33
15	0	–17.88	0.00	53.30	0.29	0.34
20	0	–25.33	0.00	53.90	0.27	0.35
25	0	–33.69	0.00	54.61	0.26	0.35
30	0	–43.06	0.00	55.45	0.24	0.36
35	0	–53.55	0.00	56.45	0.22	0.38
–20	5	25.53	–6.38	50.17	0.34	0.29
–15	5	18.06	–6.02	50.82	0.32	0.29
–10	5	11.39	–5.69	51.37	0.32	0.30
–5	5	5.42	–5.42	51.82	0.31	0.31
0	5	0.00	–5.29	52.15	0.30	0.32
5	5	–5.42	–5.42	52.45	0.30	0.32
10	5	–11.39	–5.69	52.85	0.29	0.32
15	5	–18.06	–6.02	53.36	0.28	0.32
20	5	–25.53	–6.38	53.97	0.26	0.33
25	5	–33.90	–6.78	54.70	0.25	0.34
30	5	–43.28	–7.21	55.57	0.23	0.34
35	5	–53.80	–7.68	56.61	0.21	0.35
–20	10	26.08	–13.04	50.30	0.32	0.27
–15	10	18.55	–12.36	50.93	0.31	0.28
–10	10	11.80	–11.80	51.47	0.31	0.29
–5	10	5.69	–11.39	51.89	0.30	0.30
0	10	0.00	–11.23	52.23	0.29	0.30
5	10	–5.69	–11.39	52.56	0.29	0.31
10	10	–11.80	–11.80	52.98	0.28	0.31
15	10	–18.55	–12.36	53.49	0.27	0.31
20	10	–26.08	–13.04	54.11	0.25	0.31
25	10	–34.51	–13.80	54.87	0.24	0.32
–20	15	26.95	–20.21	50.38	0.31	0.26
–15	15	19.29	–19.29	51.03	0.30	0.27
–10	15	12.36	–18.55	51.54	0.30	0.28
–5	15	6.02	–18.06	51.97	0.29	0.28
0	15	0.00	–17.88	52.34	0.28	0.29
5	15	–6.02	–18.06	52.71	0.28	0.29
10	15	–12.36	–18.55	53.13	0.27	0.29
15	15	–19.29	–19.29	53.69	0.26	0.30
–15	20	20.21	–26.95	51.10	0.29	0.25
–10	20	13.04	–26.08	51.61	0.28	0.26
–5	20	6.38	–25.53	52.06	0.28	0.27
0	20	0.00	–25.33	52.47	0.27	0.27
–15	25	21.30	–35.50	51.16	0.28	0.23

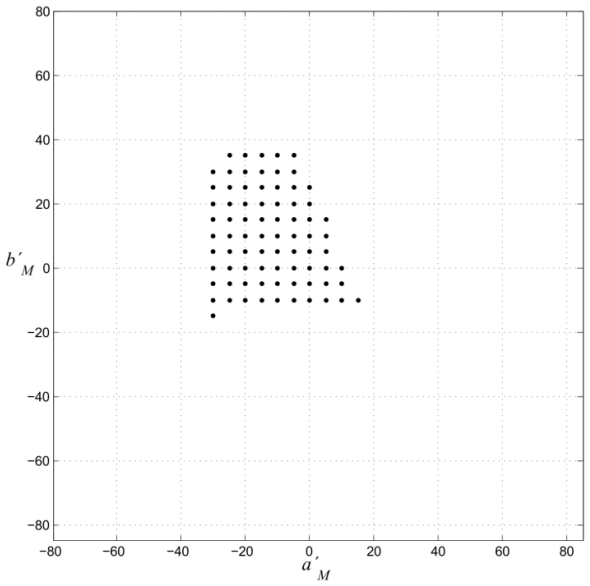

Figure 33 – Color points of color gamut transmitted and reproduced by HDTV system for $J' = 90$ on the a'_M, b'_M plane of the CAM02–UCS space

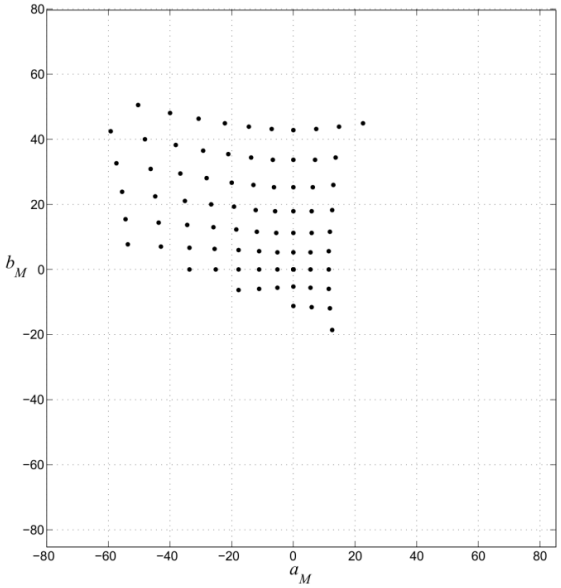

Figure 34 – Color points of color gamut transmitted and reproduced by HDTV system for on the a_M, b_M plane of the CIECAM02 space

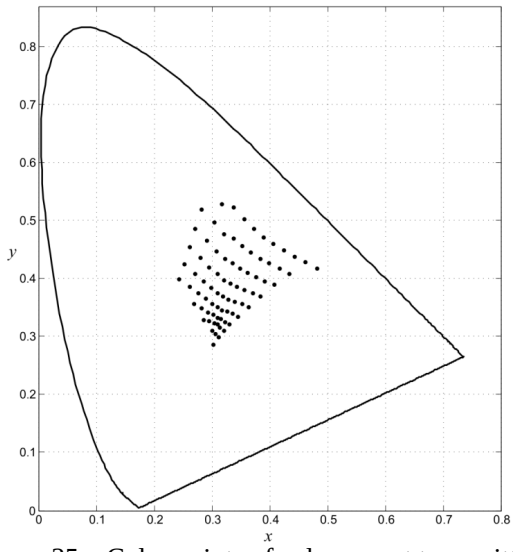

Figure 35 – Color points of color gamut transmitted and reproduced by HDTV system for $J' = 90$ on the x, y plane of the CIE-31 space

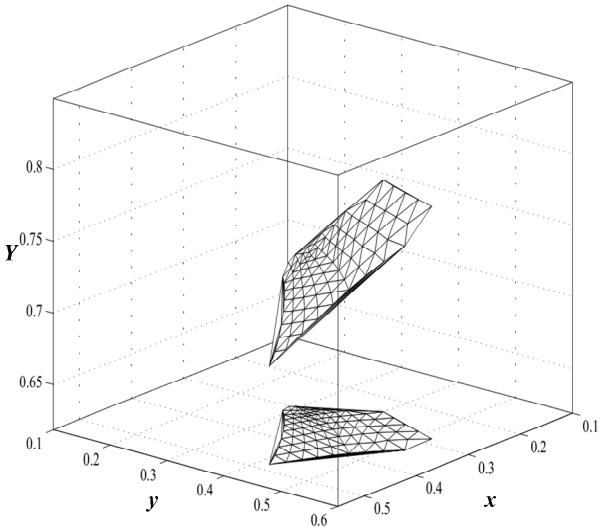

Figure 36 – Y variation for $J' = 90$ as a function of x, y coordinates

Table 9 – Values of CAM02-UCS, CIECAM02 and Yxy color grid coordinates calculated for $J' = 90$ and $J = 84.11$

a'_M	b'_M	a_M	b_M	Y	x	y
–15	–30	22,52	45,05	68,73	0,48	0,41
–10	–30	14,65	43,95	69,68	0,46	0,42
–5	–30	7,21	43,28	70,60	0,44	0,43
0	–30	0.00	43,06	71,49	0,42	0,44
5	–30	–7,21	43,28	72,37	0,40	0,45
10	–30	–14,65	43,95	73,24	0,38	0,47
15	–30	–22,52	45,05	74,13	0,37	0,48
20	–30	–31,02	46,53	75,08	0,35	0,50

a'_M	b'_M	a_M	b_M	Y	x	y
25	–30	–40,32	48,38	76,12	0,33	0,52
30	–30	–50,57	50,57	76,91	0,31	0,52
–10	–25	13,80	34,51	70,00	0,43	0,40
–5	–25	6,78	33,90	70,88	0,41	0,41
0	–25	0.00	33,69	71,72	0,39	0,42
5	–25	–6,78	33,90	72,54	0,38	0,43
10	–25	–13,80	34,51	73,35	0,36	0,44
15	–25	–21,30	35,50	74,18	0,35	0,45

Table 9 (End)

a'_M	b'_M	a_M	b_M	Y	x	y
20	–25	–29,45	36,81	75,07	0,33	0,46
25	–25	–38,43	38,43	75,85	0,32	0,47
30	–25	–48,38	40,32	76,88	0,30	0,49
35	–25	–59,46	42,47	78,06	0,28	0,51
–10	–20	13,04	26,08	70,32	0,40	0,38
–5	–20	6,38	25,53	71,15	0,39	0,39
0	–20	0.00	25,33	71,94	0,37	0,40
5	–20	–6,38	25,53	72,70	0,36	0,40
10	–20	–13,04	26,08	73,44	0,34	0,41
15	–20	–20,21	26,95	74,21	0,33	0,42
20	–20	–28,09	28,09	74,94	0,32	0,43
25	–20	–36,81	29,45	75,83	0,30	0,44
30	–20	–46,53	31,02	76,85	0,29	0,46
35	–20	–57,38	32,79	78,02	0,27	0,48
–10	–15	12,36	18,55	70,62	0,38	0,36
–5	–15	6,02	18,06	71,40	0,36	0,37
0	–15	0.00	17,88	72,14	0,35	0,38
5	–15	–6,02	18,06	72,84	0,34	0,38
10	–15	–12,36	18,55	73,51	0,33	0,39
15	–15	–19,29	19,29	74,17	0,32	0,39
20	–15	–26,95	20,21	74,93	0,30	0,40
25	–15	–35,50	21,30	75,80	0,29	0,42
30	–15	–45,05	22,52	76,81	0,27	0,43
35	–15	–55,73	23,88	77,99	0,26	0,45
–10	–10	11,80	11,80	70,92	0,36	0,35
–5	–10	5,69	11,39	71,64	0,35	0,35
0	–10	0.00	11,23	72,33	0,33	0,36
5	–10	–5,69	11,39	72,95	0,32	0,36
10	–10	–11,80	11,80	73,53	0,31	0,36
15	–10	–18,55	12,36	74,17	0,30	0,37
20	–10	–26,08	13,04	74,91	0,29	0,38
25	–10	–34,51	13,80	75,77	0,28	0,39
30	–10	–43,95	14,65	76,78	0,27	0,40
35	–10	–54,53	15,58	77,97	0,25	0,42
–10	–5	11,39	5,69	71,24	0,34	0,33
–5	–5	5,42	5,42	71,88	0,33	0,33
0	–5	0.00	5,29	72,49	0,32	0,34
5	–5	–5,42	5,42	73,00	0,31	0,34
10	–5	–11,39	5,69	73,53	0,30	0,35
15	–5	–18,06	6,02	74,15	0,30	0,35
20	–5	–25,53	6,38	74,89	0,28	0,36
25	–5	–33,90	6,78	75,76	0,27	0,37
30	–5	–43,28	7,21	76,79	0,26	0,38
35	–5	–53,80	7,68	78,01	0,24	0,39
–10	0	11,23	0.00	71,52	0,33	0,32
–5	0	5,29	0.00	72,14	0,32	0,32
0	0	0.00	0.00	72,62	0,31	0,32
5	0	–5,29	0.00	73,01	0,30	0,33
10	0	–11,23	0.00	73,53	0,30	0,33
15	0	–17,88	0.00	74,15	0,29	0,34
20	0	–25,33	0.00	74,91	0,28	0,34
25	0	–33,69	0.00	75,80	0,26	0,35
–10	5	11,39	–5,69	71,72	0,31	0,30
–5	5	5,42	–5,42	72,29	0,31	0,31
0	5	0.00	–5,29	72,70	0,30	0,32
5	5	–5,42	–5,42	73,08	0,30	0,32
10	5	–11,39	–5,69	73,59	0,29	0,32
15	5	–18,06	–6,02	74,23	0,28	0,32
–10	10	11,80	–11,80	71,85	0,31	0,29
–5	10	5,69	–11,39	72,38	0,30	0,30
0	10	0.00	–11,23	72,81	0,30	0,31
–10	15	12,36	–18,55	71,94	0,30	0,28

Figures 37–39 show halftone characteristics for given combinations of opponent coordinates a'_M, b'_M wnich define the same visual chromaticity of halftone scale for all levels of lightness. From this figures it is seen that halftone characteristics for different visual chromaticities are close to gray scale halftone characteristic.

The method of construction presented here CAM02-USC equidistant orthogonal mesh in uniform color space may be used for construction another types of equidistant meshes such as polar, hexahonal etc.

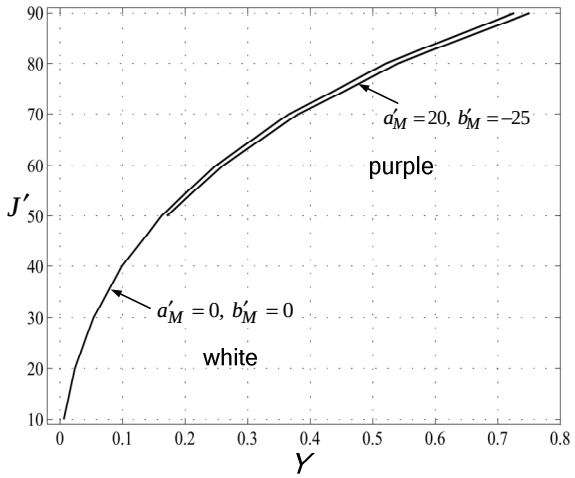

Figure 37 – Halftone scale for grayt and purple

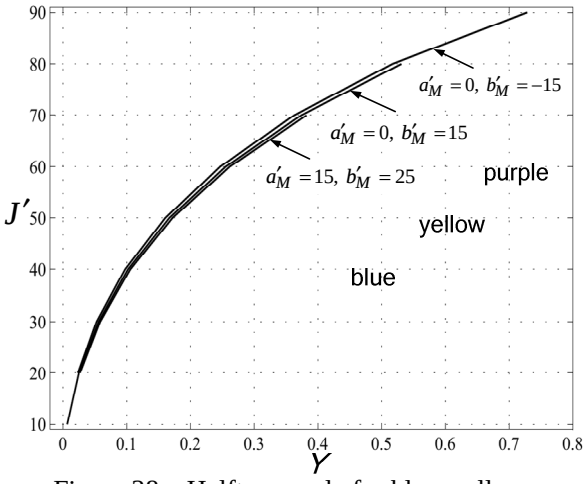

Figure 38 – Halftone scale for blue, yellow and purple

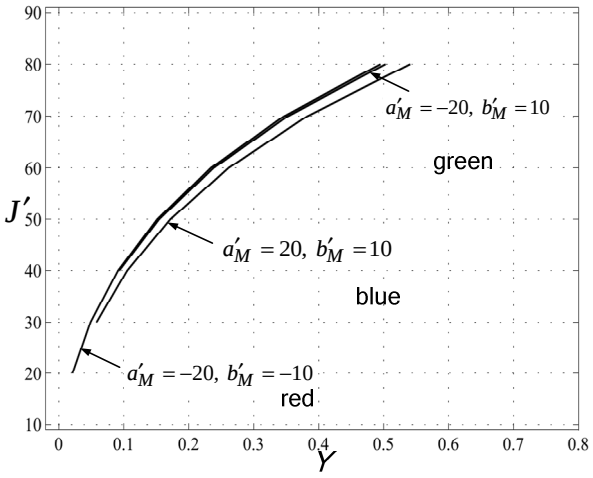

Figure 39 – Halftone scale for red, blue and green

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