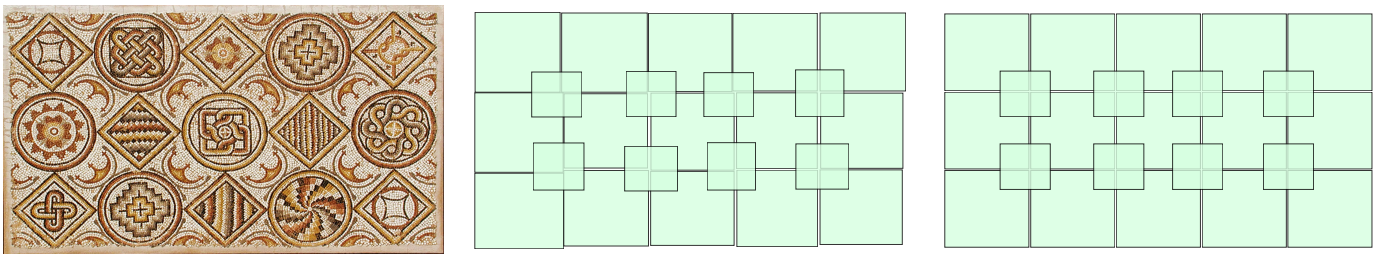
Automatic Constraint Detection for 2D Layout Regularization

Haiyong Jiang, Liangliang Nan, Dong-Ming Yan, Weiming Dong, Xiaopeng Zhang, Peter Wonka

TABLE 1 We give the precision (P), recall (R) and F-measure (F) evaluated on all constraints of our paper and the same size constraints with the number of rectangles (#Box), labels (#Label), constraints (#Constr), running time (in seconds) for integer programming (T_IP) and quadratic programming (T_QP).

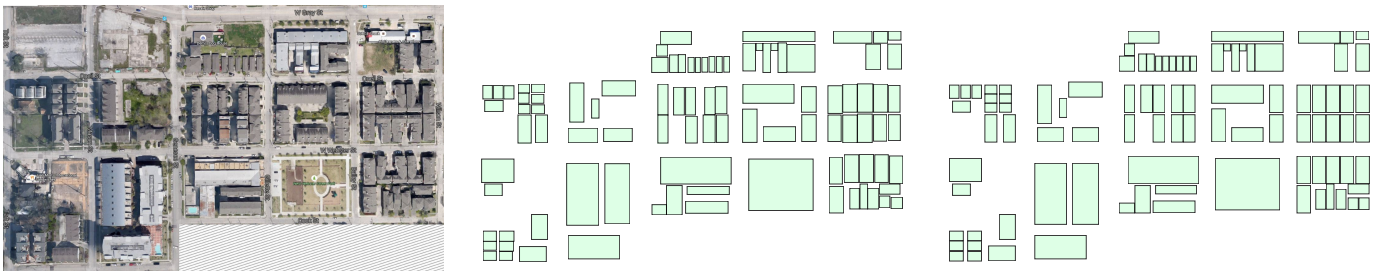
						All			Same Size		
Fig	**#Box**	**#Label**	**#Constr**	**T_IP**	**T_QP**	**P**	**R**	**F**	**P**	**R**	**F**
1	79	21	486	0.282	3.092	0.946	0.948	0.947	0.966	0.950	0.958
2	71	21	404	0.266	2.488	0.884	0.887	0.885	0.940	0.959	0.949
3	85	10	547	1.092	0.190	0.922	0.965	0.943	0.987	1.000	0.993
4	127	20	828	0.907	10.834	0.846	0.871	0.858	0.981	0.991	0.986
5	81	13	539	0.613	4.459	0.985	0.957	0.971	1.000	0.986	0.993
6	109	22	702	0.779	7.186	0.943	0.928	0.935	1.000	1.000	1.000
7	87	25	485	2.833	3.868	0.898	0.922	0.910	1.000	1.000	1.000
8	99	11	662	0.433	8.644	0.862	0.864	0.863	1.000	1.000	1.000
9	82	18	510	0.380	3.997	0.888	0.963	0.924	0.969	0.969	0.969
10	43	8	266	0.144	0.838	0.801	0.959	0.873	0.914	1.000	0.955
11	37	13	201	0.121	0.710	0.966	0.934	0.950	1.000	0.960	0.980
12	48	9	304	0.149	1.220	0.917	0.920	0.919	0.974	1.000	0.987
13	57	13	336	0.198	1.535	0.949	0.888	0.917	1.000	0.978	0.989
14	67	16	422	0.233	2.446	0.900	0.941	0.920	1.000	0.962	0.981
15	39	17	213	0.129	0.701	0.915	0.925	0.920	0.880	1.000	0.936
16	47	44	161	1.377	0.703	0.916	0.866	0.890	0.833	0.455	0.588
17	69	11	428	0.195	2.608	0.948	0.886	0.916	1.000	0.968	0.984
18	39	10	229	0.113	0.734	0.945	0.913	0.929	1.000	0.935	0.967
19	22	3	120	0.103	0.234	0.931	0.989	0.959	1.000	1.000	1.000
20	31	4	189	0.168	0.583	0.994	0.899	0.944	1.000	1.000	1.000
21	41	21	157	0.117	0.488	0.876	0.916	0.896	0.900	0.947	0.923
22	53	19	274	0.158	1.254	0.921	0.944	0.932	1.000	0.971	0.986
23	121	8	927	1.017	10.478	0.964	0.921	0.942	1.000	0.991	0.996
24	35	4	267	0.121	0.968	0.987	0.959	0.973	1.000	1.000	1.000
25	95	52	423	5.928	3.139	0.856	0.844	0.850	0.857	0.875	0.866
26	87	54	430	1.912	3.916	0.849	0.858	0.853	0.744	0.879	0.806
27	50	1	319	0.161	1.147	0.900	0.935	0.917	1.000	1.000	1.000
28	23	3	144	0.102	0.281	0.976	0.916	0.945	1.000	1.000	1.000
29	31	9	177	0.130	0.512	0.935	0.917	0.926	1.000	1.000	1.000
30	17	8	71	0.089	0.128	0.952	0.819	0.881	1.000	1.000	1.000
31	37	6	252	0.126	0.726	0.986	0.960	0.973	1.000	1.000	1.000
32	84	25	586	1.681	4.167	0.971	0.934	0.952	0.969	0.912	0.939

In Fig.1-5, we show some additional applications of our algorithm. We also demonstrate the application on a hierarchical layout in Fig.6. Finally, we show the detected constraints and regularized layouts of our method on the test dataset in the following pages. In the constraint visualization, colors indicate different constraints and elements with gray color do not have any constraints. In the input and regularized layout, different colors are used to encode element labels.



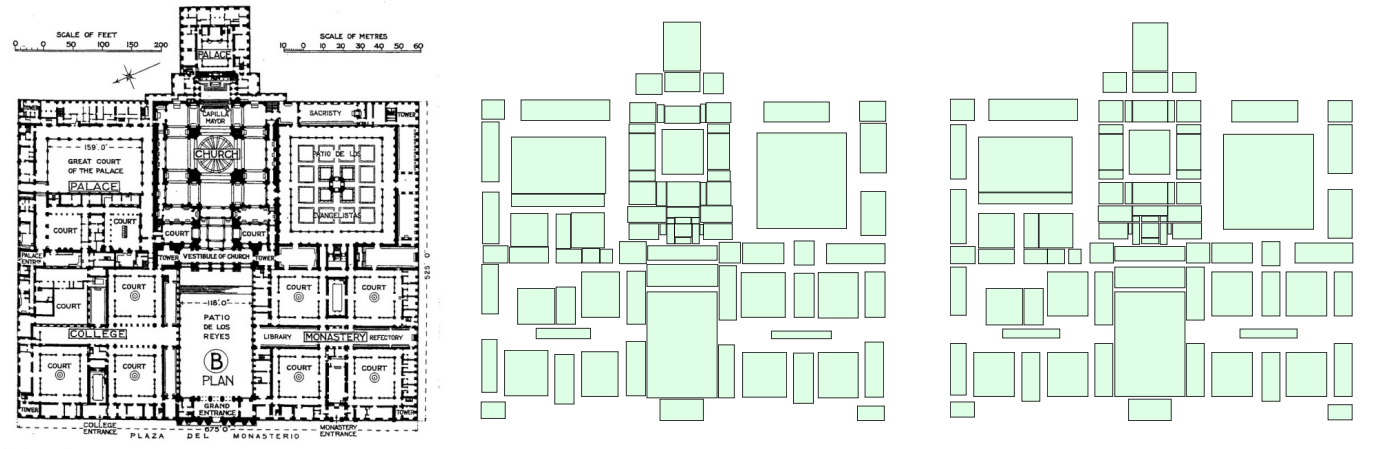
(a) Input Design **(b)** Input Layout **(c)** Regularized Result

Fig. 1 Rome mosaic.



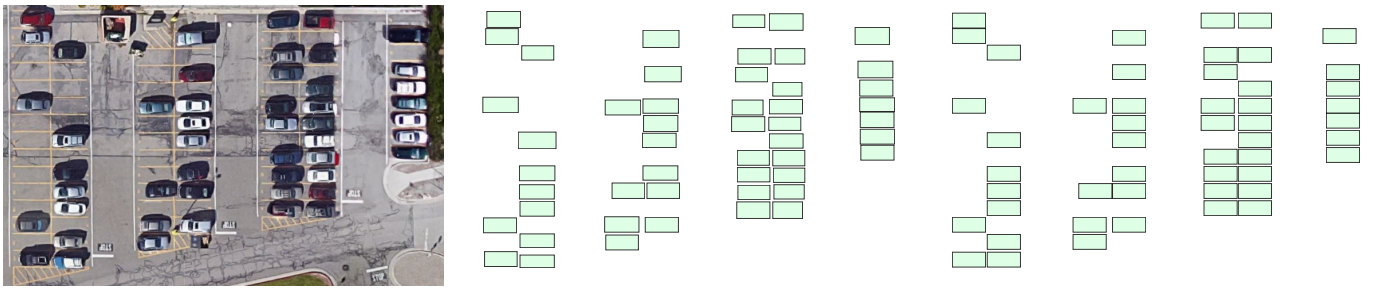
(a) Input Design **(b)** Input Layout **(c)** Regularized Result

Fig. 2 An urban layout from the city of Houston, USA.



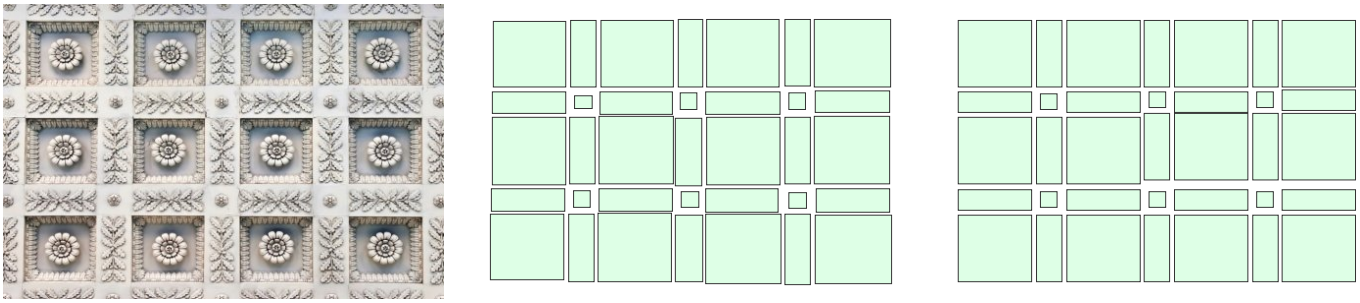
(a) Input Design **(b)** Input Layout **(c)** Regularized Result

Fig. 3 The layout plan of Palace Escorial, Spain.



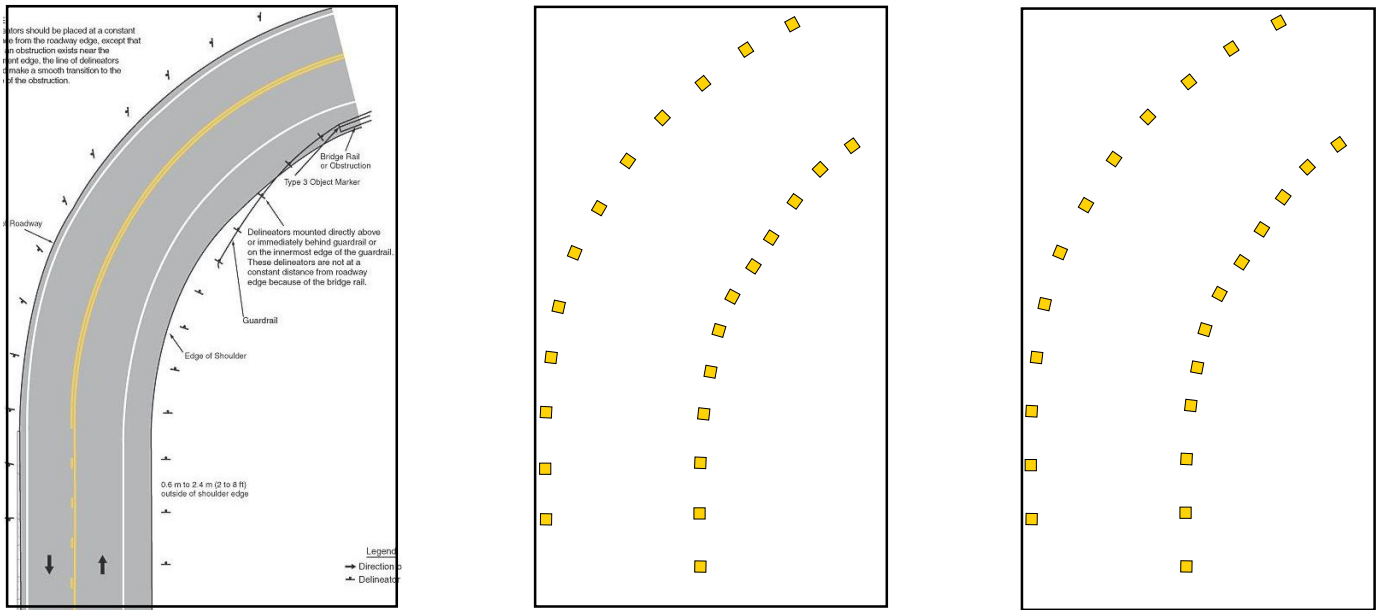
(a) Input Design **(b)** Input Layout **(c)** Regularized Result

Fig. 4 The layout of a parking lot.



(a) Input Design **(b)** Input Layout **(c)** Regularized Result

Fig. 5 The layout of decorative patterns.



(a) Input Design **(b)** Input Layout **(c)** Regularized Layout

Fig. 6 The regularization of curves. Along each side of the road, there is a set of road markers that hold the same arc-length constraints. We can see our algorithm can automatically regularize these road markers.



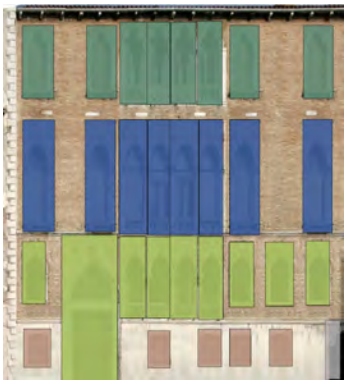
Left Alignment



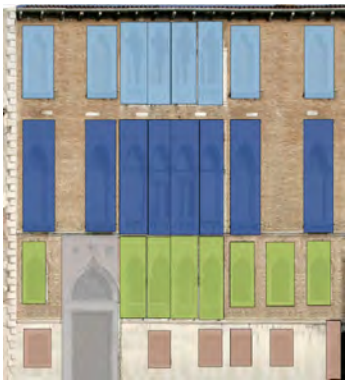
CenterX Alignment



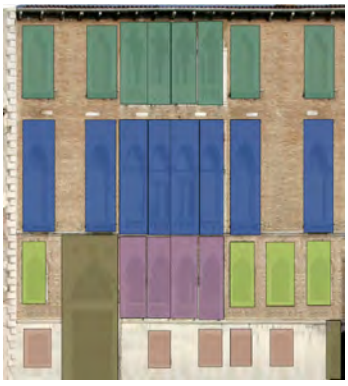
Right Alignment



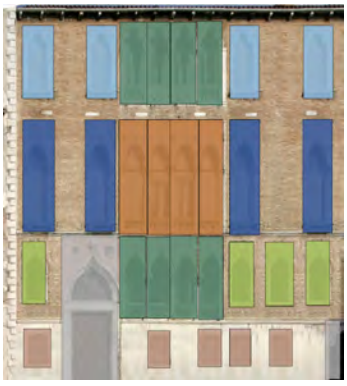
Top Alignment



CenterY Alignment



Bottom Alignment



Same Size



Same Spacing in the horizontal direction



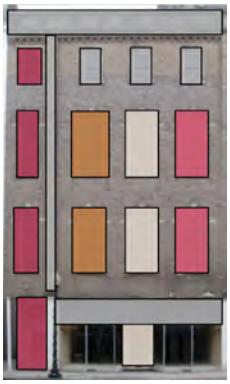
Same Spacing in the vertical direction



Input Layout



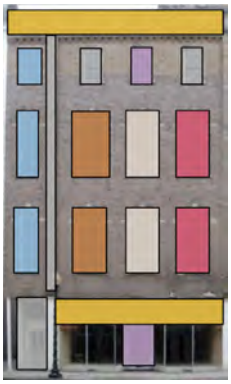
Regularized Layout



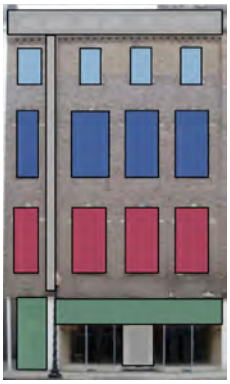
Left Alignment



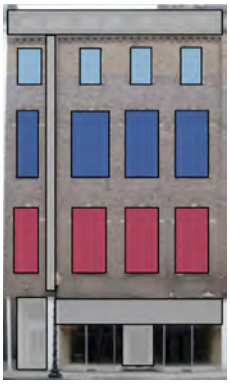
CenterX Alignment



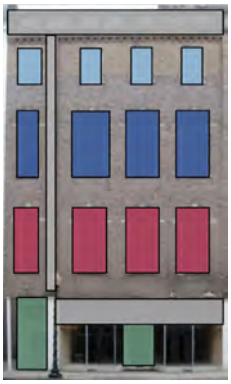
Right Alignment



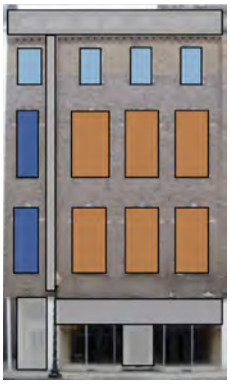
Top Alignment



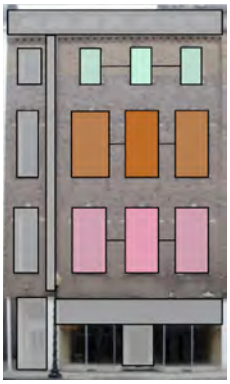
CenterY Alignment



Bottom Alignment



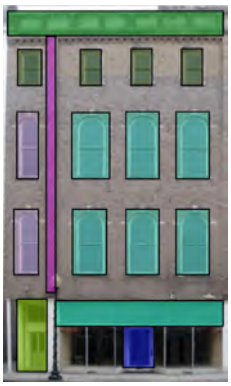
Same Size



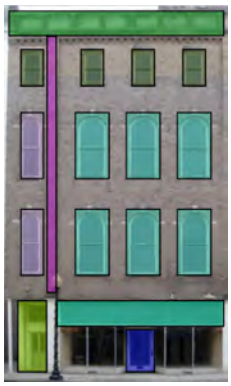
Same Spacing in the horizontal direction



Same Spacing in the vertical direction



Input Layout



Regularized Layout



Left Alignment



CenterX Alignment



Right Alignment



Top Alignment



CenterY Alignment



Bottom Alignment



Same Size



Same Spacing in the horizontal direction



Same Spacing in the vertical direction



Input Layout



Regularized Layout



Left Alignment



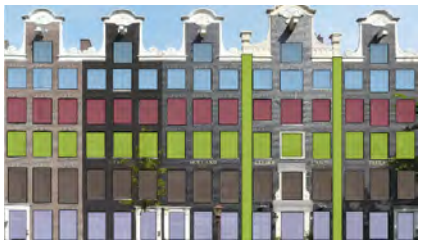
CenterX Alignment



Right Alignment



Top Alignment



CenterY Alignment



Bottom Alignment



Same Size



Same Spacing in the horizontal direction



Same Spacing in the vertical direction



Input Layout



Regularized Layout



Left Alignment



CenterX Alignment



Right Alignment



Top Alignment



CenterY Alignment



Bottom Alignment



Same Size



Same Spacing in the horizontal direction



Same Spacing in the vertical direction



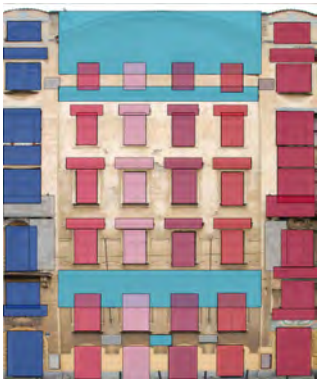
Input Layout



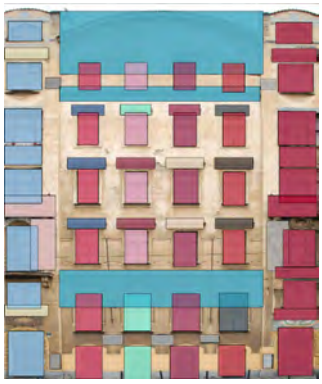
Regularized Layout



Left Alignment



CenterX Alignment



Right Alignment



Top Alignment



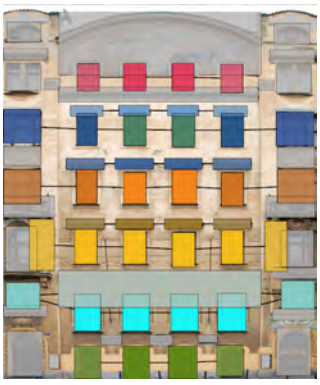
CenterY Alignment



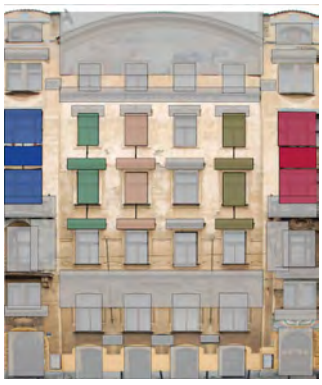
Bottom Alignment



Same Size



Same Spacing in the horizontal direction



Same Spacing in the vertical direction



Input Layout



Regularized Layout



Left Alignment



CenterX Alignment



Right Alignment



Top Alignment



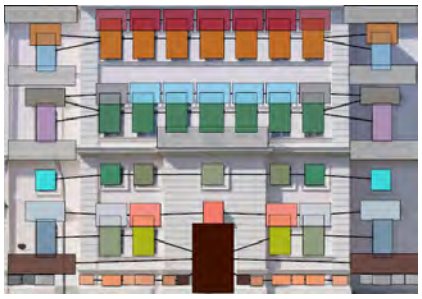
CenterY Alignment



Bottom Alignment



Same Size



Same Spacing in the horizontal direction



Same Spacing in the vertical direction



Input Layout



Regularized Layout



Left Alignment



CenterX Alignment



Right Alignment



Top Alignment



CenterY Alignment



Bottom Alignment



Same Size



Same Spacing in the horizontal direction



Same Spacing in the vertical direction



Input Layout



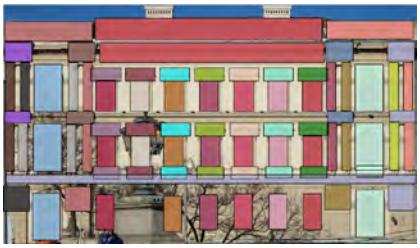
Regularized Layout



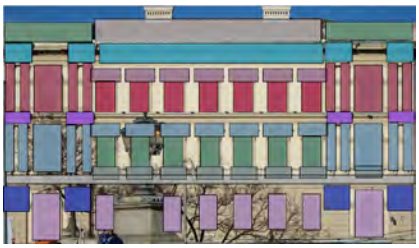
Left Alignment



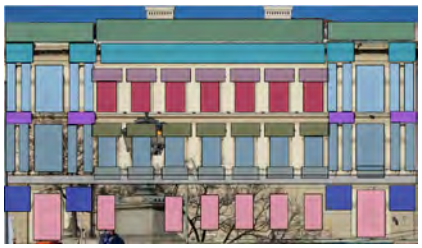
CenterX Alignment



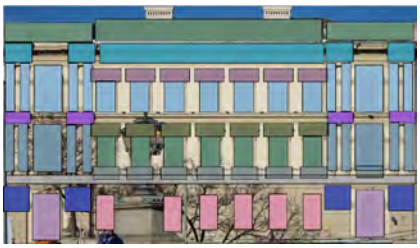
Right Alignment



Top Alignment



CenterY Alignment



Bottom Alignment



Same Size



Same Spacing in the horizontal direction



Same Spacing in the vertical direction



Input Layout



Regularized Layout



Left Alignment



CenterX Alignment



Right Alignment



Top Alignment



CenterY Alignment



Bottom Alignment



Same Size



Same Spacing in the horizontal direction



Same Spacing in the vertical direction



Input Layout



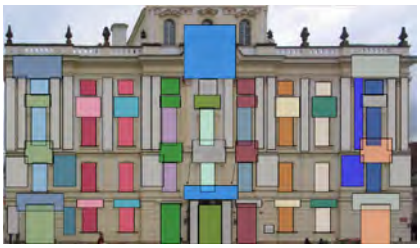
Regularized Layout



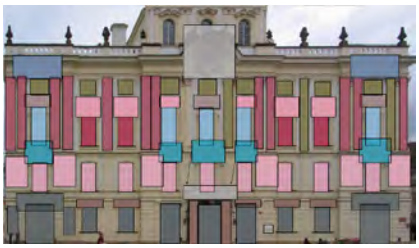
Left Alignment



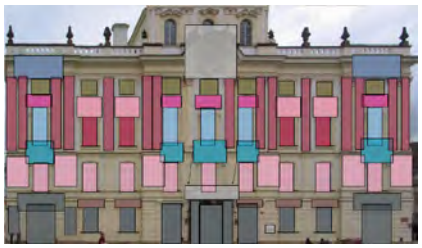
CenterX Alignment



Right Alignment



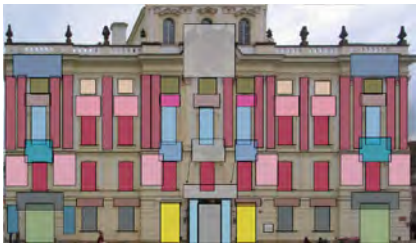
Top Alignment



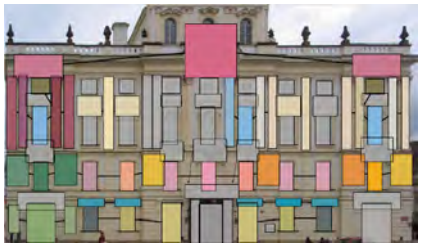
CenterY Alignment



Bottom Alignment



Same Size



Same Spacing in the horizontal direction



Same Spacing in the vertical direction



Input Layout



Regularized Layout



Left Alignment



CenterX Alignment



Right Alignment



Top Alignment



CenterY Alignment



Bottom Alignment



Same Size



Same Spacing in the horizontal direction



Same Spacing in the vertical direction



Input Layout



Regularized Layout



Left Alignment



CenterX Alignment



Right Alignment



Top Alignment



CenterY Alignment



Bottom Alignment



Same Size



Same Spacing in the horizontal direction



Same Spacing in the vertical direction



Input Layout



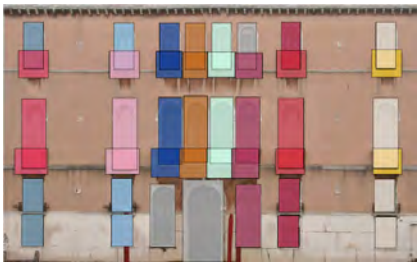
Regularized Layout



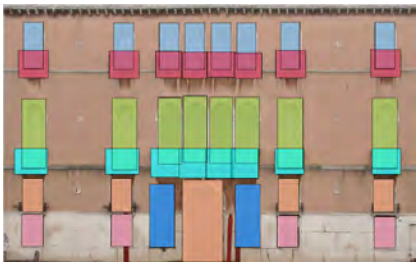
Left Alignment



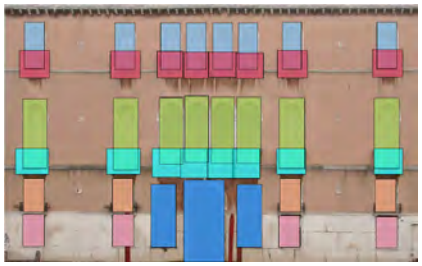
CenterX Alignment



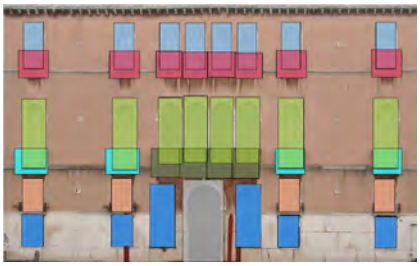
Right Alignment



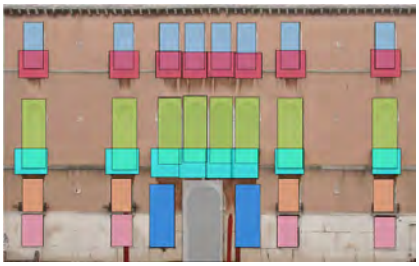
Top Alignment



CenterY Alignment



Bottom Alignment



Same Size



Same Spacing in the horizontal direction



Same Spacing in the vertical direction



Input Layout



Regularized Layout



Left Alignment



CenterX Alignment



Right Alignment



Top Alignment



CenterY Alignment



Bottom Alignment



Same Size



Same Spacing in the horizontal direction



Same Spacing in the vertical direction



Input Layout



Regularized Layout



Left Alignment



CenterX Alignment



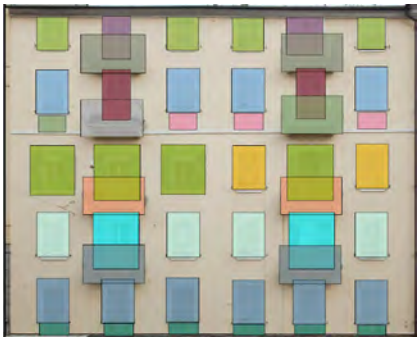
Right Alignment



Top Alignment



CenterY Alignment



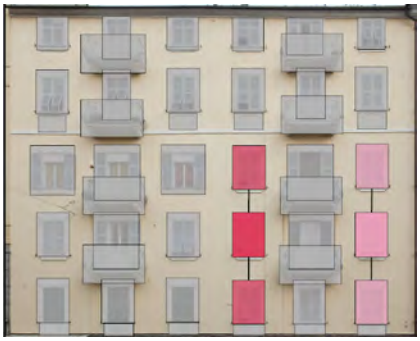
Bottom Alignment



Same Size



Same Spacing in the horizontal direction



Same Spacing in the vertical direction



Input Layout



Regularized Layout



Left Alignment



CenterX Alignment



Right Alignment



Top Alignment



CenterY Alignment



Bottom Alignment



Same Size



Same Spacing in the horizontal direction



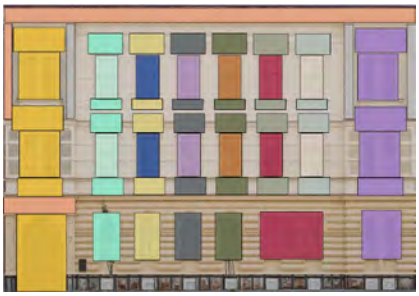
Same Spacing in the vertical direction



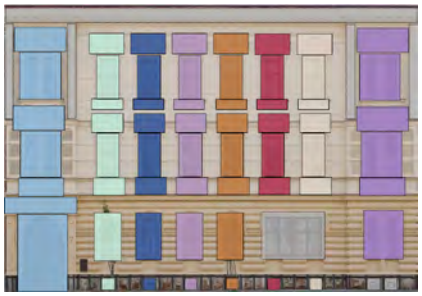
Input Layout



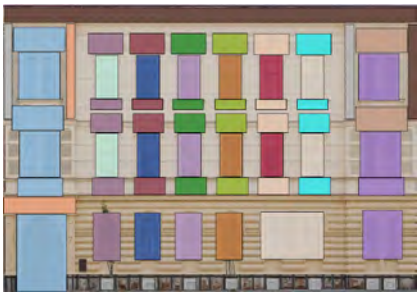
Regularized Layout



Left Alignment



CenterX Alignment



Right Alignment



Top Alignment



CenterY Alignment



Bottom Alignment



Same Size



Same Spacing in the horizontal direction



Same Spacing in the vertical direction



Input Layout



Regularized Layout



Left Alignment



CenterX Alignment



Right Alignment



Top Alignment



CenterY Alignment



Bottom Alignment



Same Size



Same Spacing in the horizontal direction



Same Spacing in the vertical direction



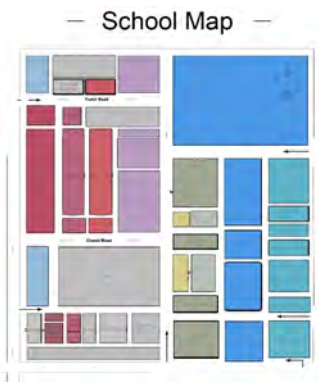
Input Layout



Regularized Layout



Left Alignment



CenterX Alignment



Right Alignment



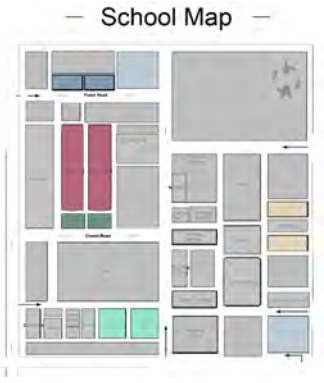
Top Alignment



CenterY Alignment



Bottom Alignment



Same Size



Same Spacing in the horizontal direction



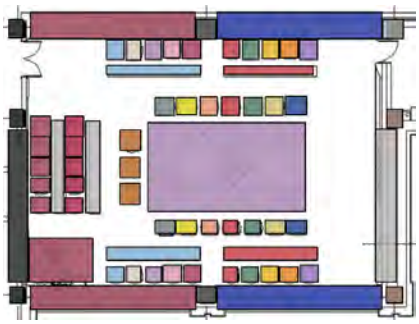
Same Spacing in the vertical direction



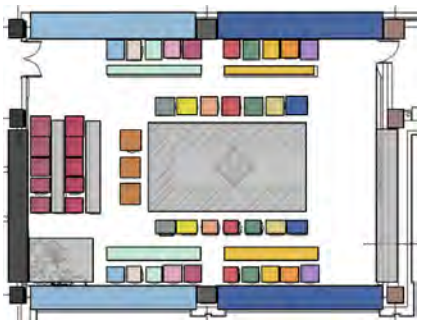
Input Layout



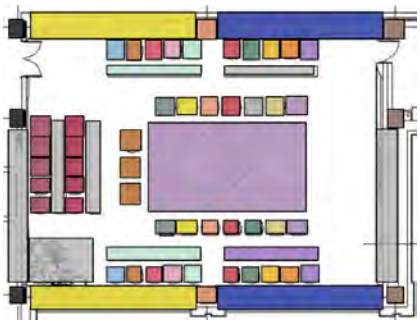
Regularized Layout



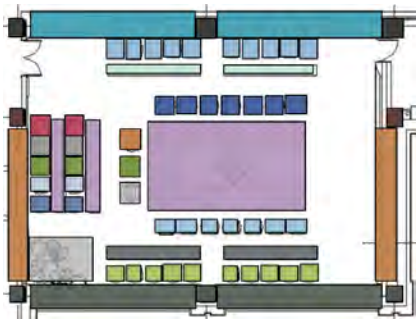
Left Alignment



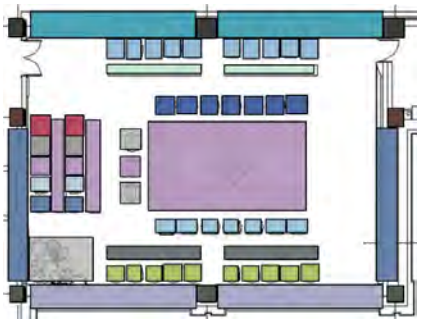
CenterX Alignment



Right Alignment



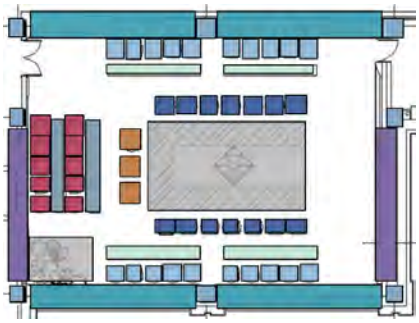
Top Alignment



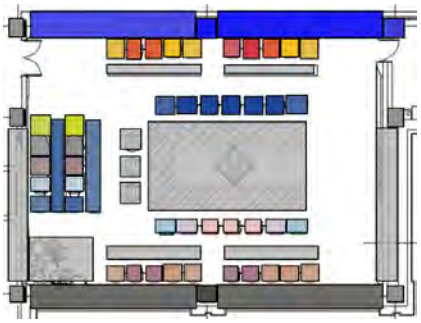
CenterY Alignment



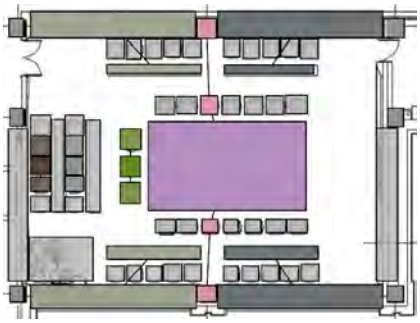
Bottom Alignment



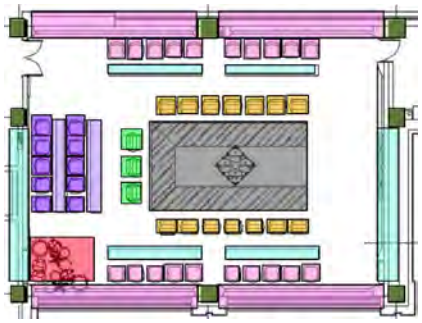
Same Size



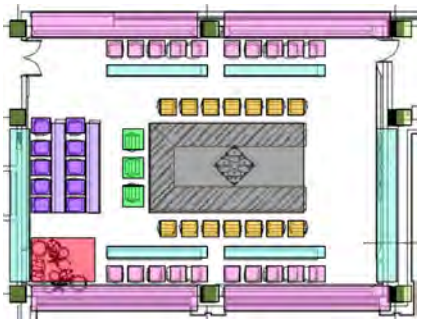
Same Spacing in the horizontal direction



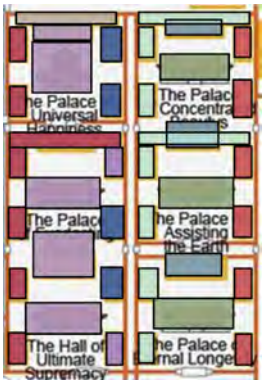
Same Spacing in the vertical direction



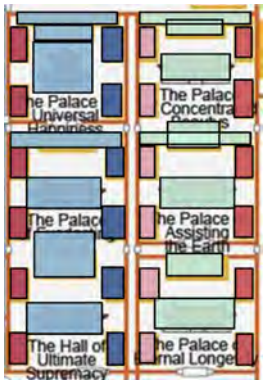
Input Layout



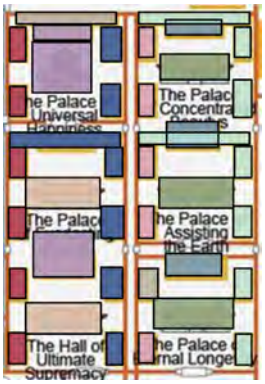
Regularized Layout



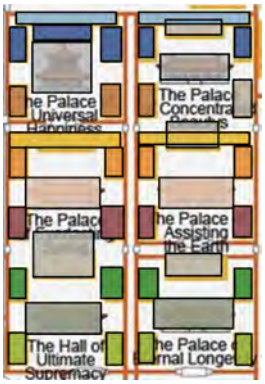
Left Alignment



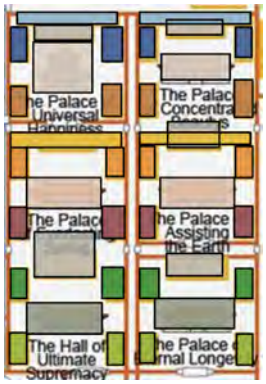
CenterX Alignment



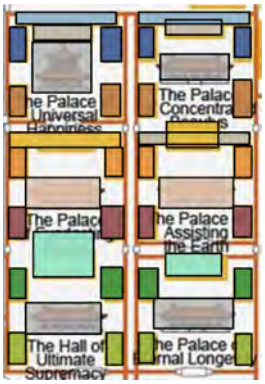
Right Alignment



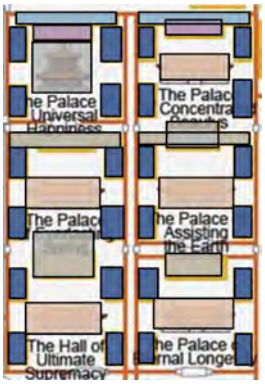
Top Alignment



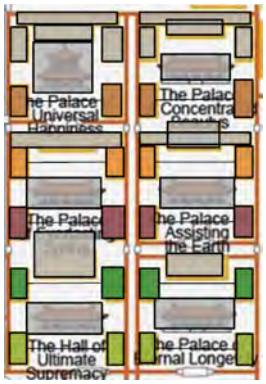
CenterY Alignment



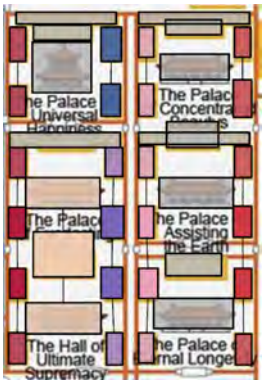
Bottom Alignment



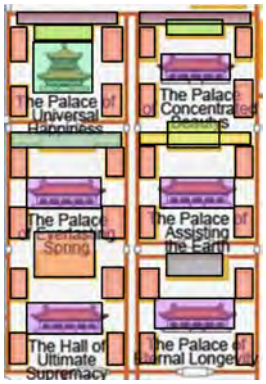
Same Size



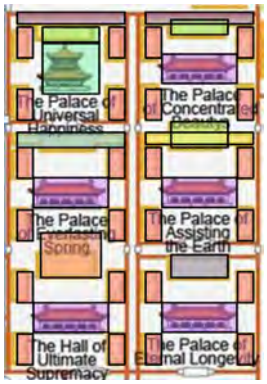
Same Spacing in the horizontal direction



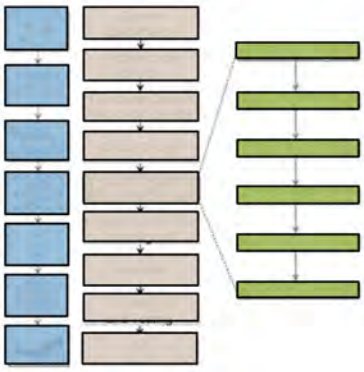
Same Spacing in the vertical direction



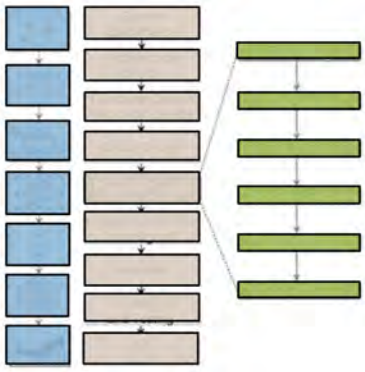
Input Layout



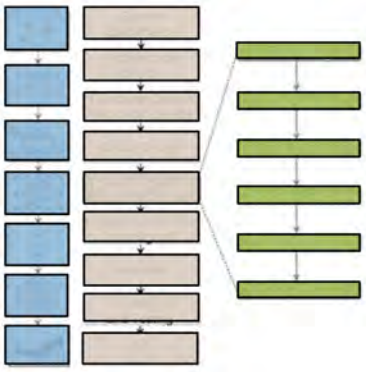
Regularized Layout



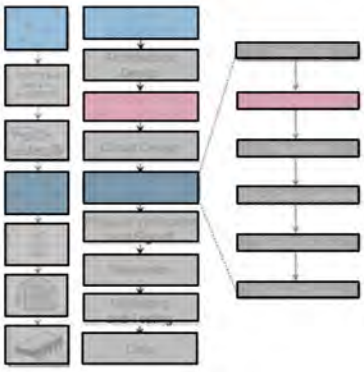
Left Alignment



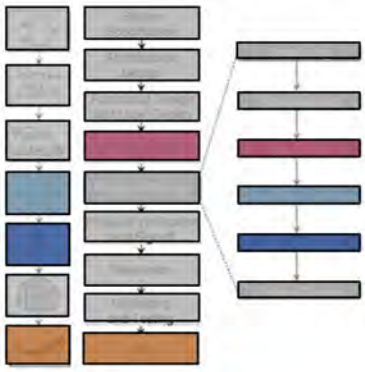
CenterX Alignment



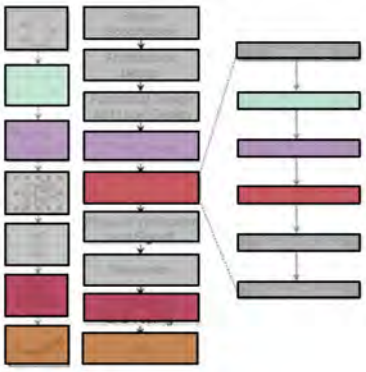
Right Alignment



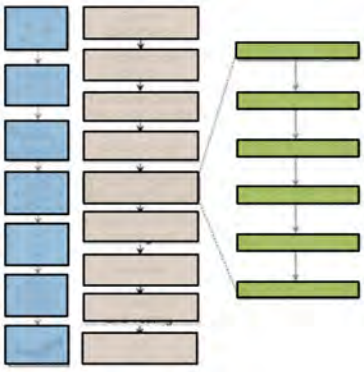
Top Alignment



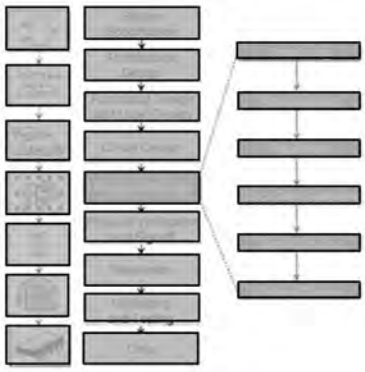
CenterY Alignment



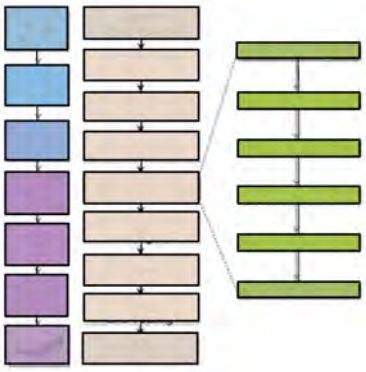
Bottom Alignment



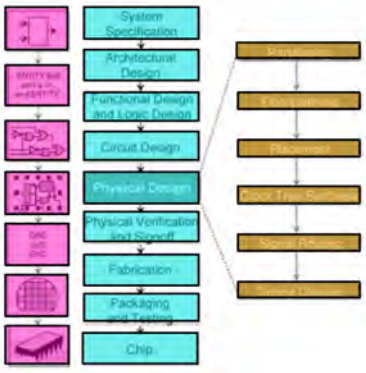
Same Size



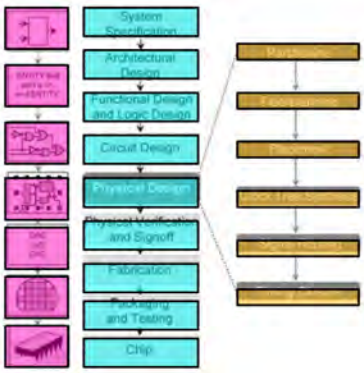
Same Spacing in the horizontal direction



Same Spacing in the vertical direction



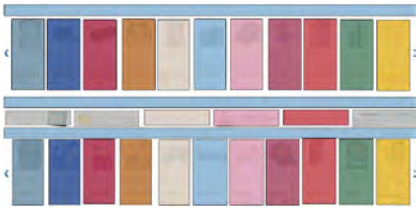
Input Layout



Regularized Layout



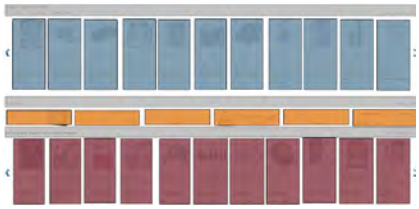
Left Alignment



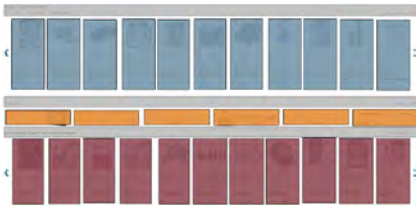
CenterX Alignment



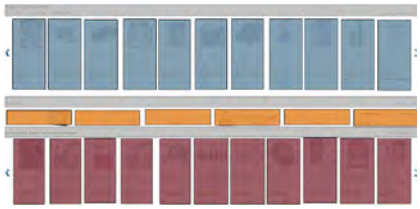
Right Alignment



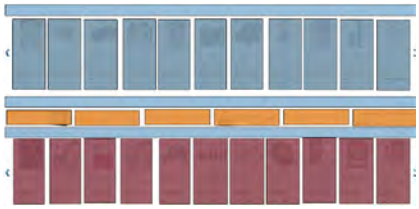
Top Alignment



CenterY Alignment



Bottom Alignment



Same Size



Same Spacing in the horizontal direction



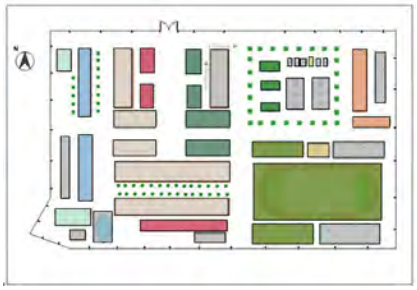
Same Spacing in the vertical direction



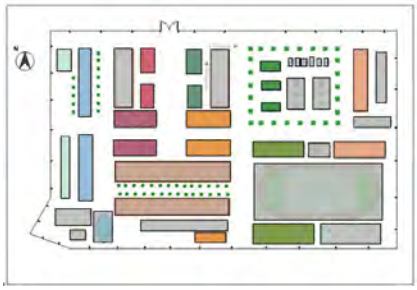
Input Layout



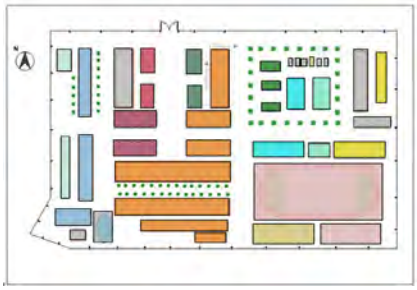
Regularized Layout



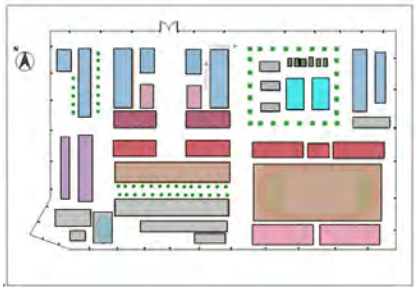
Left Alignment



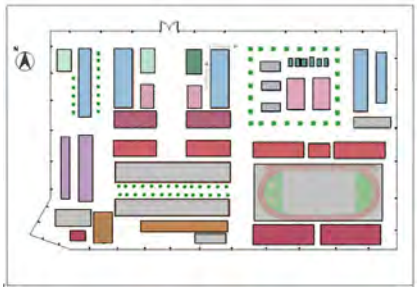
CenterX Alignment



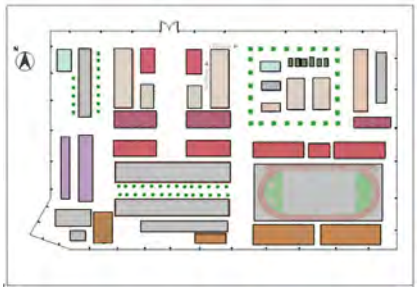
Right Alignment



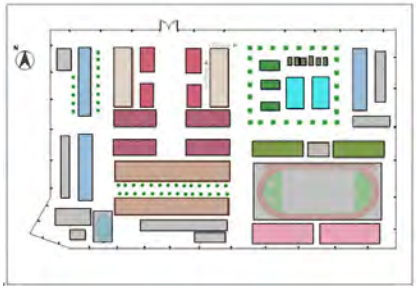
Top Alignment



CenterY Alignment



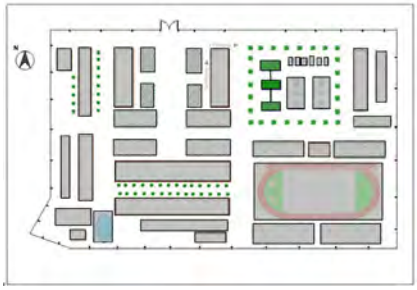
Bottom Alignment



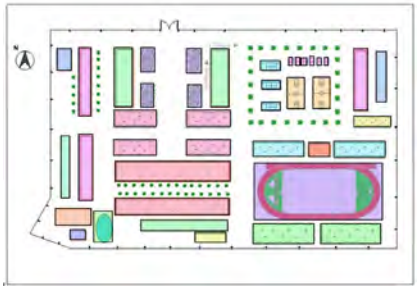
Same Size



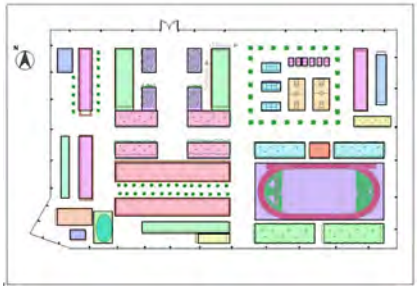
Same Spacing in the horizontal direction



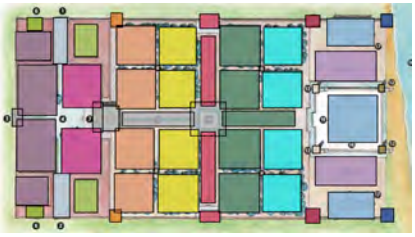
Same Spacing in the vertical direction



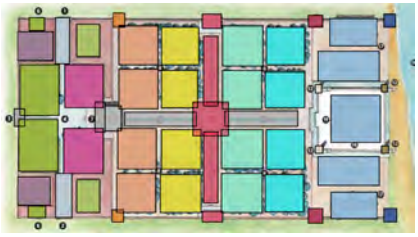
Input Layout



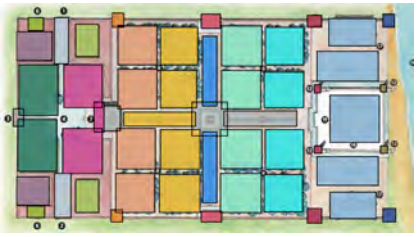
Regularized Layout



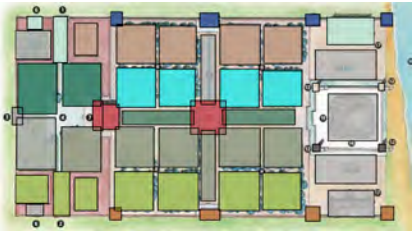
Left Alignment



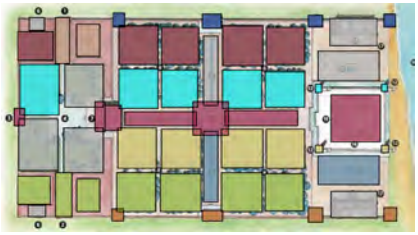
CenterX Alignment



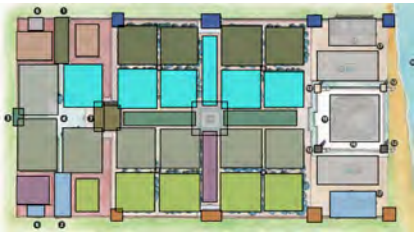
Right Alignment



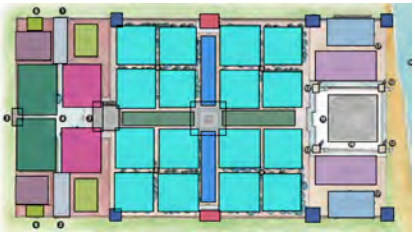
Top Alignment



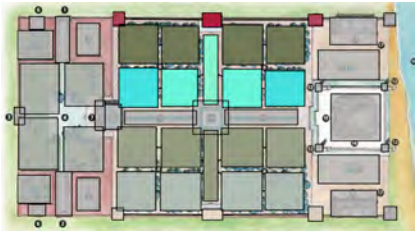
CenterY Alignment



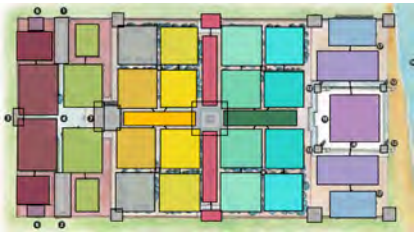
Bottom Alignment



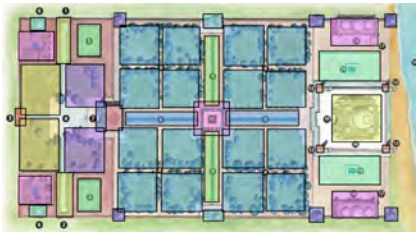
Same Size



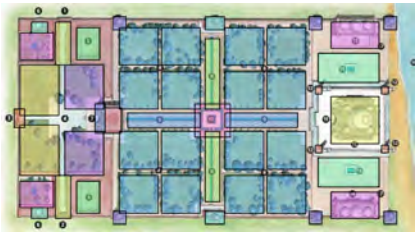
Same Spacing in the horizontal direction



Same Spacing in the vertical direction



Input Layout



Regularized Layout