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Skeleton Primitive Extraction Method on Textures with Different Nonlinear Wavelets

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Abstract: Problem Statement: A novel method for dominant skeleton extraction of textures using different nonlinear wavelet transforms is proposed in this study. In the present study 3×3 masks are used for extraction of skeleton primitives. For a 3×3 skeleton primitive there will be 2^9 skeleton primitive combinations. But the present study considered a skeleton primitive for the skeletonization purpose if and only if its center pixel is one and skeleton primitives are represented by the corresponding skeleton primitive weight. By this, there will be 2^8 combinations of skeleton primitives. Approach: The skeleton primitive are used for evaluating skeleton points. The skeleton of an object has the property that it is reduced to one point when the skeleton primitive used for the skeletonization is exactly homothetic to the object. The dominant skeleton subset is evaluated by counting the skeleton points. The skeleton subset that leads to the least skeleton points will be the resultant skeleton subset. The present study classified the textures based on two methods. In the first method textures are classified based on skeleton primitive weight, which is nothing but based on skeleton primitive combination. In the second method classification is made based on distance function of skeleton points. Results: The proposed method is applied on 24 Brodatz textures using the three nonlinear wavelet transformed textures. By this the dominant skeleton primitive weight is obtained for each texture. Based on the number of skeleton points distance measures are calculated based on which texture classification is obtained. **Conclusions**: The two methods are applied on Brodatz textures using different nonlinear wavelet transforms which classified the textures. The first method is appropriate if one need to classify based on skeleton subsets. The second method is appropriate if the classification is to be done based on least number of skeleton points.

Keywords: Dominant skeleton subset, combinations of skeleton primitives, homothetic, skeleton points, nonlinear wavelets

INTRODUCTION

Texture is the term used to characterize the surface of a given phenomenon in an image and it is undoubtedly one of the principal features used in image processing. The different texture analysis methods are structural, statistical, model based and transform based methods. Structural approaches represent texture by well defined primitives (microtexture) and a hierarchy of spatial arrangements (macrotexture) of those primitives. Statistical approaches represent the texture indirectly by the non-deterministic properties that govern the distributions and relationships between the grey levels of an image. Model based texture analysis using fractal and stochastic models, attempt to interpret an image texture by use of generative image model and stochastic model respectively. Transform methods of texture analysis, such as Fourier and wavelet transforms^[1-3] represent an image in a space whose coordinate system has an interpretation that is closely related to the characteristics of a texture. Texture classification plays an important role in the interpretation and analysis of terrain images, as well as radiographic and microscopic images. Method of texture classification can be broadly divided into two major categories. The first is texture segmentation, based on features with a high degree of spatial localization e.g. with some form of edge detection. The second approach to texture classification is based on a discrimination function using several texture characteristics. Scientists and practitioners have made great efforts in developing advance classification

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approaches and techniques for improving classification accuracy^[4-6].

Study of patterns on textures is recognized as an important step in characterization and classification of textures. Textures are classified recently by various pattern methods: preprocessed images^[13], long linear patterns^[8,12] and edge direction movements^[7], Avoiding Complex Patterns^[11], marble texture description^[10] etc. Textures are also described and classified by using various wavelet transforms: One based on primitive patterns^[14] and another based on statistical parameters^[9].

Skeletonization is a global space domain technique for shape representation^[15]. It has been studied extensively since skeletons have attractive properties which make them suitable for structural pattern recognition^[15,16]. There are two types of skeletonization methods: Pixel-based and non-pixel-based. In a pixelbased method, all pixels inside a shape are used in the skeletonization process. Pixel based methods often use thinning techniques^[16,17] or distance transforms^[17,18]. In a non-pixel-based method, only the contour pixels of a shape are used for skeletonization. The skeleton of the shape is analytically derived from its contour^[19,20]. Skeletonization has been a part of image processing for a wide variety of applications^[21]. Digital skeletons, generated by thinning algorithms, are often used to represent objects in a binary digital image for shape analysis and classification. Thinning is a process of reducing patterns to their skeleton; however, skeleton is defined as a set of thin lines, arcs and curves (usually one pixel thick), which are connected with each other in such a way that the geometrical and topological properties of its originating object must be preserved.

Wavelet analysis is known as a linear tool. However, it is to be recognized that nonlinear extensions are possible^[23-25]. The *lifting scheme*, recently introduced by Sweldens^[22,26,27] for a predecessor of this scheme, known as a ladder network, has provided a useful tool for constructing nonlinear wavelet transforms. The enormous flexibility and freedom that the lifting scheme offers has challenged researchers to develop various nonlinear wavelet transforms^[23-25]. Here we present a family of nonlinear wavelets based on morphological operators. The simplest nontrivial example of a morphological wavelet is the so called morphological Haar wavelet. The morphological haar wavelets are of two types: Morphological Haar Erosion Wavelet (MHEW) and Morphological Haar Dilation Wavelet (MHDW). The other nonlinear wavelet is Morphological Binary Wavelet transform (MBW).

MATERIALS AND METHODS

On a 3×3 mask by assuming center pixel as one always, one can have 2^8 combinations. However the present study has not considered the following skeleton primitive as shown in Fig. 1 for extracting skeleton primitives. By this there will be a total of 255 skeleton primitives on a 3×3 mask. These skeleton primitives are used for evaluating skeleton points. The skeleton primitives are represented by weight based system as shown in Fig. 2 which are called as skeleton primitive weight (SPW). Some of the skeleton primitive elements with their weights are represented in the Fig. 3.

0	0	0
0	1	0
0	0	0

Fig. 1: Skeleton primitive that is not been considered for skeletonization

p×2 ⁰	$p \times 2^1$	$p \times 2^2$
$p{\times}2^4$		p×23
$p{\times}2^5$	$p \times 2^6$	$p \times 2^7$

Fig. 2: Skeleton primitive weight representation

1	1	0	1	0	1		1	1	1
0	1	0	0	1	0		0	1	0
0	0	0	0	0	0		0	0	0
	(a)			(b)				(c)	
1	1	1	1	1	1		1	1	1
1	1	0	1	1	0		1	1	1
0	0	0	0	0	0		1	0	0
	(d)			(e)				(f)	
1	0	1	1	1	1		1	1	1
0	1	0	0	1	1		1	1	1
1	0	1	0	1	1		1	1	1
	(g)			(h)		-		(i)	

Fig. 3: Representation of Skeleton primitives with corresponding weights (a) 3 (b) 5 (c) 7 (d) 23 (e) 31 (f) 63 (g) 165 (h) 207 (i) 255

We propose in this study a novel method of the texture primitive description that requires no assumption on the distribution of grain sizes or the granulometric moments of the primitives. We employ the morphological skeleton for this method. The most commonly employed morphological skeleton of a binary object is explained intuitively as follows: At first we locate the largest magnification included within the object and cover the object by sweeping the magnification within the object. Then gradually smaller magnifications are employed for covering the residual area until the whole object is covered. The skeleton varies depending on the shape of the skeleton primitive. If the skeleton primitive is homothetic to the object, the object is covered with only one magnification of the skeleton primitive. In this case the skeleton is reduced to one point. We consider here obtaining the skeleton from a binary texture. It is derived from the above property that the total number of pixels within the skeleton is the minimum when the skeleton primitive is homothetic to the primitive, if we assume that the texture is composed of one primitive, i.e. contains grains that are magnifications of the primitive. This indicates that the primitive is described by the optimal skeleton primitive minimizing the total number of pixels within the skeleton. This primitive description method has an advantage that no assumption on the sizing distribution of grains in the texture is required.

Skeletonization is done according to Algorithm 1. The proposed texture skeleton primitive extraction method on nonlinear wavelets is given in the form of flowchart in Fig. 4. The three nonlinear wavelet transforms used in the present study are MHEW, MHDW and MBW.

Algorithm 1: To find Skeleton of an image *Begin*

- 1. Let k=1 and A be the image.
- 2. *E*(*A*,*kB*),Erode the image k number of times with skeleton primitive B.
- 3. O(A,B) Open the image with skeleton primitive B.
- 4. Find the k^{th} Skeleton Subset $S_k = E(A, kB) O(E(A, kB))$.
- 5. k = k + 1
- 6. T(A)=E(A,kB).
- 7. If $(T(A)\neq \varphi)$ goto 4.
- 8. SK(A,B) is the union of all the Skeleton Subsets $S_k(A)$.

End

RESULTS

Evaluation: The proposed Texture Skeleton Primitive extraction method on nonlinear wavelets is applied on 24 Brodatz textures^[28] shown in Fig. 5, using 255 skeleton primitive combinations. The process of applying all skeleton primitive combinations for skeletonization is tedious; however it gives accurate

result i.e. the exact combination of skeleton subset. The Table 1, 2 and 3 indicates the dominant skeleton primitive and the corresponding *SPW* for all 24 Brodatz textures using MHEW, MHDW and MBW wavelet transform respectively.

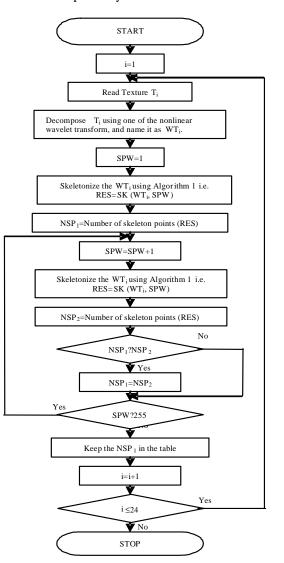


Fig. 4: Flow chart for texture skeleton primitive extraction using nonlinear wavelets.

Based on these results, the textures are classified. From the number of skeleton points, the distance measures are calculated and shown in Table 4, 5 and 6 for the MHE, MHD and MB wavelets respectively. The textures are classified based on these distance measures also. The classification results with lag values 30 and 50 are calculated and are shown in Tables 7 and 8.

DISCUSSION

From Table 1, 2 and 3 it is clearly evident that a total of 17, 20 and 18 textures are showing a dominant skeleton primitive with a weight of 255 for MHE, MHD and MB wavelet transforms respectively as show below.

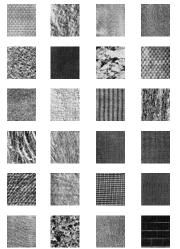


Fig. 5: Twenty four textures from Brodatz album. Row 1: D_1 , D_2 , D_3 , D_4 . Row 2: D_5 , D_6 . D_7 , D_8 . Row 3: D_9 , D_{10} , D_{11} , D_{12} . Row 4: D_{13} , D_{15} , D_{16} , D_{17} . Row 5: D_{18} , D_{19} , D_{20} , D_{21} . Row 6: D_{22} , D_{23} , D_{24} , D_{25} .

Table 1: Textures with corresponding skeleton primitive weights by using MHEWT

	No. of skeleton	Dominant skeleton				
Texture	points	primitive weight				
D ₁	3940	255				
D_2	4265	255				
D_3	6881	19				
D_4	7155	223				
D ₅	4428	255				
D_6	3904	24				
D_7	3717	255				
D_8	2222	255				
D_9	6182	255				
D_{10}	5600	255				
D ₁₁	6379	255				
D ₁₂	4532	255				
D ₁₃	3850	255				
D ₁₅	6020	255				
D ₁₆	7648	255				
D ₁₇	7550	139				
D ₁₈	3822	255				
D ₁₉	5321	255				
D ₂₀	2688	255				
D ₂₁	2974	24				
D ₂₂	5384	206				
D ₂₃	3429	255				
D ₂₄	6989	66				
D ₂₅	3980	255				

Texture	No. of skeleton points	Dominant skeleton primitive weight				
D ₁	5463	255				
D_2	4684	255				
D_3	8201	255				
D_4	7698	251				
D ₅	4772	255				
D_6	5469	153				
D_7	3111	255				
D_8	2167	255				
D_9	7216	255				
D_{10}	6371	255				
D ₁₁	6181	255				
D ₁₂	5715	255				
D ₁₃	4545	255				
D ₁₅	6868	255				
D ₁₆	6128	255				
D ₁₇	6898	54				
D ₁₈	4177	255				
D ₁₉	5763	255				
D ₂₀	4683	255				
D ₂₁	6873	112				
D ₂₂	7093	255				
D ₂₃	3524	255				
D ₂₄	8087	255				
D ₂₅	2171	255				

Table 2: Textures with corresponding skeleton primitive weights by using MHDWT

Table 3: Textures with corresponding skeleton primitive weights by using MBWT

using w		5 1 1 1 1
_	No. of	Dominant skeleton
Texture	skeleton points	primitive weight
D_1	4221	255
D_2	4542	255
D_3	8244	255
D_4	7591	223
D ₅	4670	255
D_6	4452	153
D_7	3584	255
D_8	2150	255
D_9	6922	255
D_{10}	5811	255
D ₁₁	6398	255
D ₁₂	5460	255
D ₁₃	4267	255
D ₁₅	6988	255
D ₁₆	5883	255
D ₁₇	6746	109
D_{18}	4032	255
D ₁₉	5717	255
D_{20}	3568	255
D ₂₁	4125	24
D ₂₂	6795	206
D ₂₃	3512	255
D ₂₄	7920	115
D ₂₅	2687	255

$$\begin{split} MHEWC_1 &= \{D_1, \, D_2, \, D_5, \, D_7, \, D_8, \, D_9, \, D_{10}, \, D_{11}, \, D_{12}, \, D_{13}, \\ D_{15}, \, D_{16}, \, D_{18}, \, D_{19}, \, D_{20}, \, D_{23}, \, D_{25} \} \end{split}$$

$$\begin{split} MHDWC_1 &= \{D_1, \, D_2, \, D_3, \, D_5, \, D_7, \, D_8, \, D_9, \, D_{10}, \, D_{11}, \, D_{12}, \\ D_{13}, \, D_{15}, \, D_{16}, \, D_{18}, \, D_{19}, \, D_{20}, \, D_{22}, \, D_{23}, \, D_{24}, \\ D_{25} \end{split}$$

Out of these, 17 textures are having a dominant skeleton primitive with a weight of 255 for all three nonlinear wavelet transforms considered and they are listed below.

 $\{ D_1, \ D_2, \ D_5, \ D_7, \ D_8, \ D_9, \ D_{10}, \ D_{11}, \ D_{12}, \ D_{13}, \ D_{15}, \ D_{16}, \\ D_{18}, \ D_{19}, \ D_{20}, \ D_{23}, \ D_{25} \}$

And no other texture is having any other skeleton primitive with common weight in all three nonlinear wavelet transforms: MHEW, MHDW and MBW. By this, the present study evaluates a common classification rate based on skeleton primitives as 70.83%. Further the present study classified textures based on their least number of skeleton points using distance function as follows. By distance function^[29] we say that two textures are similar if and only if they contain the same number of primitive patterns or same percentage of occurrence of patterns as given in Eq. 1.

$$D(i) = \sum_{j=1}^{p} abs(F_{j}(x) - F_{j}(i)) = 0$$
 (1)

where p stands for the total number of features used, i = 1 to Q (Q is the number of classes in the database), $f_i(x)$, represents the jth feature of unknown texture class

(x) and $f_j(i)$ represents the j^{th} feature of texture belonging to i^{th} class.

Equation 1 is a rare phenomenon for classification of textures based on skeleton points, because they appear in large number. To avoid this, a lag value based distance function is given in the Eq. 2.

$$D(i) = \sum_{j=1}^{p} abs(F_j(x) - F_j(i)) \le l_i$$
(2)

Equation 2 is modified in the present study as:

$$D(WT_i, WT_j) = |NSP_i - NSP_j| \le l_i$$
(3)

where WT_i and WT_j are the wavelet transformed Brodatz textures , $1 \le i$, $j \le 24$, NSP_i and NSP_j are the number of skeleton points in the Skeletons of the two textures. This Eq. 3 suggests that two textures are similar if their distances or percentage of occurrence is less than or equal to lag value 'l_i'. This indicates that lag value plays crucial role and by increasing lag value the percentage of correct classification (PCC) increases. The distances among all 24 textures based on number of skeleton points using MHE, MHD and MB wavelet transform are listed in Table 4, 5 and 6 respectively. Based on the lag value a classification is resulted in the following way. That is two or more textures belong to the same class C_i if they differ with the lag value less than or equal to l_i .

Table 4: Distance among the textures based on number of skeleton points using MHE Wavelet Transform

1 at	4.	DISU	met a	union	g the	ислии		iscu 0	n nunne		KCICU	ni pon	its usin	givinn	_ waw		msion	.11						
	D_1	D_2	D_3	D_4	D_5	D_6	D_7	D_8	D_9	D_{10}	D ₁₁	D ₁₂	D ₁₃	D ₁₅	D ₁₆	D ₁₇	D ₁₈	D19	D ₂₀	D ₂₁	D ₂₂	D ₂₃	D ₂₄	D ₂₅
D_1	0	18	54	57	22	6	15	41	47	41	49	24	9	46	61	60	11	37	35	31	38	23	55	6
D_2	18	0	51	54	13	19	23	45	44	37	46	16	20	42	58	57	21	32	40	36	33	29	52	17
D_3	54	51	0	17	50	55	56	68	26	36	22	48	55	29	28	26	55	39	65	63	39	59	10	54
D_4	57	54	17	0	52	57	59	70	31	39	28	51	57	34	22	20	58	43	67	65	42	61	13	56
D_5	22	13	50	52	0	23	27	47	42	34	44	10	24	40	57	56	25	30	42	38	31	32	51	21
D_6	6	19	55	57	23	0	14	41	48	41	50	25	7	46	61	60	9	38	35	30	38	22	56	9
D_7	15	23	56	59	27	14	0	39	50	43	52	29	12	48	63	62	10	40	32	27	41	17	57	16
D_8	41	45	68	70	47	41	39	0	63	58	64	48	40	62	74	73	40	56	22	27	56	35	69	42
D_9	47	44	26	31	42	48	50	63	0	24	14	41	48	13	38	37	49	29	59	57	28	52	28	47
D_{10}	41	37	36	39	34	41	43	58	24	0	28	33	42	20	45	44	42	17	54	51	15	47	37	40
D ₁₁	49	46	22	28	44	50	52	64	14	28	0	43	50	19	36	34	51	33	61	58	32	54	25	49
D ₁₂	24	16	48	51	10	25	29	48	41	33	43	0	26	39	56	55	27	28	43	39	29	33	50	23
D ₁₃	9	20	55	57	24	7	12	40	48	42	50	26	0	47	62	61	5	38	34	30	39	21	56	11
D ₁₅	46	42	29	34	40	46	48	62	13	20	19	39	47	0	40	39	47	26	58	55	25	51	31	45
D ₁₆	61	58	28	22	57	61	63	74	38	45	36	56	62	40	0	10	62	48	70	68	48	65	26	61
D ₁₇	60	57	26	20	56	60	62	73	37	44	34	55	61	39	10	0	61	47	70	68	47	64	24	60
D ₁₈	11	21	55	58	25	9	10	40	49	42	51	27	5	47	62	61	0	39	34	29	40	20	56	13
D ₁₉	37	32	39	43	30	38	40	56	29	17	33	28	38	26	48	47	39	0	51	48	8	43	41	37
D ₂₀	35	40	65	67	42	35	32	22	59	54	61	43	34	58	70	70	34	51	0	17	52	27	66	36
D ₂₁	31	36	63	65	38	30	27	27	57	51	58	39	30	55	68	68	29	48	17	0	49	21	63	32
D ₂₂	38	33	39	42	31	38	41	56	28	15	32	29	39	25	48	47	40	8	52	49	0	44	40	37
D ₂₃	23	29	59	61	32	22	17	35	52	47	54	33	21	51	65	64	20	43	27	21	44	0	60	23
D ₂₄	55	52	10	13	51	56	57	69	28	37	25	50	56	31	26	24	56	41	66	63	40	60	0	55
D ₂₅	6	17	54	56	21	9	16	42	47	40	49	23	11	45	61	60	13	37	36	32	37	23	55	0

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_	D_1	D_2	D_3	D_4	D_5	D_6	D_7	D_8	D_9	D_{10}	D ₁₁	D ₁₂	D ₁₃	D ₁₅	D ₁₆	D ₁₇	D ₁₈	D ₁₉	D ₂₀	D ₂₁	D ₂₂	D ₂₃	D ₂₄	D ₂₅
D_1	0	28	52	47	26	2	48	57	42	30	27	16	30	37	26	38	36	17	28	38	40	44	51	57
D_2	28	0	59	55	9	28	40	50	50	41	39	32	12	47	38	47	23	33	1	47	49	34	58	50
D_3	52	59	0	22	59	52	71	78	31	43	45	50	60	37	46	36	63	49	59	36	33	68	11	78
D_4	47	55	22	0	54	47	68	74	22	36	39	45	56	29	40	28	59	44	55	29	25	65	20	74
D_5	26	9	59	54	0	26	41	51	49	40	38	31	15	46	37	46	24	31	9	46	48	35	58	51
D_6	2	28	52	47	26	0	49	57	42	30	27	16	30	37	26	38	36	17	28	37	40	44	51	57
D_7	48	40	71	68	41	49	0	31	64	57	55	51	38	61	55	62	33	51	40	61	63	20	71	31
D_8	57	50	78	74	51	57	31	0	71	65	63	60	49	69	63	69	45	60	50	69	70	37	77	2
D_9	42	50	31	22	49	42	64	71	0	29	32	39	52	19	33	18	55	38	50	19	11	61	30	71
D_{10}	30	41	43	36	40	30	57	65	29	0	14	26	43	22	16	23	47	25	41	22	27	53	41	65
D_{11}	27	39	45	39	38	27	55	63	32	14	0	22	40	26	7	27	45	20	39	26	30	52	44	63
D ₁₂	16	32	50	45	31	16	51	60	39	26	22	0	34	34	20	34	39	7	32	34	37	47	49	60
D ₁₃	30	12	60	56	15	30	38	49	52	43	40	34	0	48	40	49	19	35	12	48	50	32	60	49
D ₁₅	37	47	37	29	46	37	61	69	19	22	26	34	48	0	27	5	52	33	47	2	15	58	35	69
D ₁₆	26	38	46	40	37	26	55	63	33	16	7	20	40	27	0	28	44	19	38	27	31	51	44	63
D ₁₇	38	47	36	28	46	38	62	69	18	23	27	34	49	5	28	0	52	34	47	5	14	58	34	69
D ₁₈	36	23	63	59	24	36	33	45	55	47	45	39	19	52	44	52	0	40	22	52	54	26	63	45
D ₁₉	17	33	49	44	31	17	51	60	38	25	20	7	35	33	19	34	40	0	33	33	36	47	48	60
D_{20}	28	1	59	55	9	28	40	50	50	41	39	32	12	47	38	47	22	33	0	47	49	34	58	50
D ₂₁	38	47	36	29	46	37	61	69	19	22	26	34	48	2	27	5	52	33	47	0	15	58	35	69
D ₂₂	40	49	33	25	48	40	63	70	11	27	30	37	50	15	31	14	54	36	49	15	0	60	32	70
D ₂₃	44	34	68	65	35	44	20	37	61	53	52	47	32	58	51	58	26	47	34	58	60	0	68	37
D ₂₄	51	58	11	20	58	51	71	77	30	41	44	49	60	35	44	34	63	48	58	35	32	68	0	77
D ₂₅	57	50	78	74	51	57	31	2	71	65	63	60	49	69	63	69	45	60	50	69	70	37	77	0
Tabl	e 6: I D ₁	$\frac{\text{Distar}}{D_2}$	$\frac{1}{D_3}$	nong t D4	he tex D ₅		based	_	umbe D9	r of sl D ₁₀	keleto D ₁₁	n poin D ₁₂	ts using D ₁₃		_	_	nsform D ₁₈	1 D ₁₉	D	D	D	D ₂₃	D ₂₄	D ₂₅
D_1	0						D_7	D_8	D_{9}				D_{13}	D_{15}	D_{16}	D_{17}			D_{20}	D_{21}	D22	D23		
		18	-					D ₈						D ₁₅	D ₁₆	D ₁₇			D ₂₀	D ₂₁	D ₂₂			
122		18 0	63	58	21	15	25	46	52	40	47	35	7	53	41	50	14	39	26	10	51	27	61	39
D_2 D_2	18	0	63 61	58 55	21 11	15 9	25 31	46 49	52 49	40 36	47 43	35 30	7 17	53 49	41 37	50 47	14 23	39 34	26 31	10 20	51 47	27 32	61 58	39 43
D_3	18 63	0 61	63 61 0	58 55 26	21 11 60	15 9 62	25 31 68	46 49 78	52 49 36	40 36 49	47 43 43	35 30 53	7 17 63	53 49 35	41 37 49	50 47 39	14 23 65	39 34 50	26 31 68	10 20 64	51 47 38	27 32 69	61 58 18	39 43 75
$\begin{array}{c} D_3 \\ D_4 \end{array}$	18 63 58	0 61 55	63 61 0 26	58 55 26 0	21 11 60 54	15 9 62 56	25 31 68 63	46 49 78 74	52 49 36 26	40 36 49 42	47 43 43 35	35 30 53 46	7 17 63 58	53 49 35 25	41 37 49 41	50 47 39 29	14 23 65 60	39 34 50 43	26 31 68 63	10 20 64 59	51 47 38 28	27 32 69 64	61 58 18 18	39 43 75 70
$\begin{array}{c} D_3 \\ D_4 \\ D_5 \end{array}$	18 63 58 21	0 61 55 11	63 61 0 26 60	58 55 26 0 54	21 11 60 54 0	15 9 62 56 15	25 31 68 63 33	46 49 78 74 50	52 49 36 26 47	40 36 49 42 34	47 43 43 35 42	35 30 53 46 28	7 17 63 58 20	53 49 35 25 48	41 37 49 41 35	50 47 39 29 46	14 23 65 60 25	39 34 50 43 32	26 31 68 63 33	10 20 64 59 23	51 47 38 28 46	27 32 69 64 34	61 58 18 18 57	39 43 75 70 45
$\begin{array}{c} D_3\\ D_4\\ D_5\\ D_6 \end{array}$	18 63 58 21 15	0 61 55 11 9	63 61 0 26 60 62	58 55 26 0 54 56	21 11 60 54 0 15	15 9 62 56 15 0	25 31 68 63 33 29	46 49 78 74 50 48	52 49 36 26 47 50	40 36 49 42 34 37	47 43 43 35 42 44	35 30 53 46 28 32	7 17 63 58 20 14	53 49 35 25 48 50	41 37 49 41 35 38	50 47 39 29 46 48	14 23 65 60 25 20	39 34 50 43 32 36	26 31 68 63 33 30	10 20 64 59 23 18	51 47 38 28 46 48	27 32 69 64 34 31	61 58 18 18 57 59	39 43 75 70 45 42
$\begin{array}{c} D_3\\ D_4\\ D_5\\ D_6\\ D_7\end{array}$	18 63 58 21 15 25	0 61 55 11 9 31	63 61 0 26 60 62 68	58 55 26 0 54 56 63	21 11 60 54 0 15 33	15 9 62 56 15 0 29	25 31 68 63 33 29 0	46 49 78 74 50 48 38	52 49 36 26 47 50 58	40 36 49 42 34 37 47	47 43 43 35 42 44 53	35 30 53 46 28 32 43	7 17 63 58 20 14 26	53 49 35 25 48 50 58	41 37 49 41 35 38 48	50 47 39 29 46 48 56	14 23 65 60 25 20 21	39 34 50 43 32 36 46	26 31 68 63 33 30 4	10 20 64 59 23 18 23	51 47 38 28 46 48 57	27 32 69 64 34 31 8	61 58 18 18 57 59 66	39 43 75 70 45 42 30
$\begin{array}{c} D_3\\ D_4\\ D_5\\ D_6\\ D_7\\ D_8 \end{array}$	18 63 58 21 15 25 46	0 61 55 11 9 31 49	63 61 0 26 60 62 68 78	58 55 26 0 54 56 63 74	21 11 60 54 0 15 33 50	15 9 62 56 15 0 29 48	25 31 68 63 33 29 0 38	46 49 78 74 50 48 38 0	52 49 36 26 47 50 58 69	40 36 49 42 34 37 47 61	47 43 43 35 42 44 53 65	35 30 53 46 28 32 43 58	7 17 63 58 20 14 26 46	53 49 35 25 48 50 58 70	41 37 49 41 35 38 48 61	50 47 39 29 46 48 56 68	14 23 65 60 25 20 21 43	39 34 50 43 32 36 46 60	26 31 68 63 33 30 4 38	10 20 64 59 23 18 23 44	51 47 38 28 46 48 57 68	27 32 69 64 34 31 8 37	61 58 18 18 57 59 66 76	39 43 75 70 45 42 30 23
$\begin{array}{c} D_3\\ D_4\\ D_5\\ D_6\\ D_7\\ D_8\\ D_9 \end{array}$	18 63 58 21 15 25 46 52	0 61 55 11 9 31 49 49	63 61 0 26 60 62 68 78 36	58 55 26 0 54 56 63 74 26	21 11 60 54 0 15 33 50 47	15 9 62 56 15 0 29 48 50	25 31 68 63 33 29 0 38 58	46 49 78 74 50 48 38 0 69	52 49 36 26 47 50 58 69 0	40 36 49 42 34 37 47 61 33	47 43 43 35 42 44 53 65 23	35 30 53 46 28 32 43 58 38	7 17 63 58 20 14 26 46 52	53 49 35 25 48 50 58 70 8	41 37 49 41 35 38 48 61 32	50 47 39 29 46 48 56 68 13	14 23 65 60 25 20 21 43 54	39 34 50 43 32 36 46 60 35	26 31 68 63 33 30 4 38 58	10 20 64 59 23 18 23 44 53	51 47 38 28 46 48 57 68 11	27 32 69 64 34 31 8 37 58	61 58 18 18 57 59 66 76 32	39 43 75 70 45 42 30 23 65
$\begin{array}{c} D_{3} \\ D_{4} \\ D_{5} \\ D_{6} \\ D_{7} \\ D_{8} \\ D_{9} \\ D_{10} \end{array}$	18 63 58 21 15 25 46 52 40	0 61 55 11 9 31 49 49 36	63 61 0 26 60 62 68 78 36 49	58 55 26 0 54 56 63 74 26 42	21 11 60 54 0 15 33 50 47 34	15 9 62 56 15 0 29 48 50 37	25 31 68 63 33 29 0 38 58 47	46 49 78 74 50 48 38 0 69 61	52 49 36 26 47 50 58 69 0 33	40 36 49 42 34 37 47 61 33 0	47 43 43 35 42 44 53 65 23 24	35 30 53 46 28 32 43 58 38 19	7 17 63 58 20 14 26 46 52 39	53 49 35 25 48 50 58 70 8 34	41 37 49 41 35 38 48 61 32 8	50 47 39 29 46 48 56 68 13 31	14 23 65 60 25 20 21 43 54 42	39 34 50 43 32 36 46 60 35 10	26 31 68 63 33 30 4 38 58 47	10 20 64 59 23 18 23 44 53 41	51 47 38 28 46 48 57 68 11 31	27 32 69 64 34 31 8 37 58 48	61 58 18 18 57 59 66 76 32 46	39 43 75 70 45 42 30 23 65 56
$\begin{array}{c} D_{3} \\ D_{4} \\ D_{5} \\ D_{6} \\ D_{7} \\ D_{8} \\ D_{9} \\ D_{10} \\ D_{11} \end{array}$	18 63 58 21 15 25 46 52 40 47	0 61 55 11 9 31 49 49 36 43	63 61 0 26 60 62 68 78 36 49 43	58 55 26 0 54 56 63 74 26 42 35	21 11 60 54 0 15 33 50 47 34 42	15 9 62 56 15 0 29 48 50 37 44	25 31 68 63 33 29 0 38 58 47 53	46 49 78 74 50 48 38 0 69 61 65	52 49 36 26 47 50 58 69 0 33 23	40 36 49 42 34 37 47 61 33 0 24	47 43 43 35 42 44 53 65 23 24 0	35 30 53 46 28 32 43 58 38 19 31	7 17 63 58 20 14 26 46 52 39 46	53 49 35 25 48 50 58 70 8 34 24	41 37 49 41 35 38 48 61 32 8 23	50 47 39 29 46 48 56 68 13 31 19	14 23 65 60 25 20 21 43 54 42 49	39 34 50 43 32 36 46 60 35 10 26	26 31 68 63 33 30 4 38 58 47 53	10 20 64 59 23 18 23 44 53 41 48	51 47 38 28 46 48 57 68 11 31 20	27 32 69 64 34 31 8 37 58 48 54	61 58 18 18 57 59 66 76 32 46 39	39 43 75 70 45 42 30 23 65 56 61
$\begin{array}{c} D_{3} \\ D_{4} \\ D_{5} \\ D_{6} \\ D_{7} \\ D_{8} \\ D_{9} \\ D_{10} \\ D_{11} \\ D_{12} \end{array}$	18 63 58 21 15 25 46 52 40 47 35	0 61 55 11 9 31 49 49 36 43 30	63 61 0 26 60 62 68 78 36 49 43 53	58 55 26 0 54 56 63 74 26 42 35 46	21 11 60 54 0 15 33 50 47 34 42 28	15 9 62 56 15 0 29 48 50 37 44 32	25 31 68 63 33 29 0 38 58 47 53 43	46 49 78 74 50 48 38 0 69 61 65 58	52 49 36 26 47 50 58 69 0 33 23 38	40 36 49 42 34 37 47 61 33 0 24 19	47 43 43 35 42 44 53 65 23 24 0 31	35 30 53 46 28 32 43 58 38 19 31 0	7 17 63 58 20 14 26 46 52 39 46 35	53 49 35 25 48 50 58 70 8 34 24 39	41 37 49 41 35 38 48 61 32 8 23 21	50 47 39 29 46 48 56 68 13 31 19 36	14 23 65 60 25 20 21 43 54 42 49 38	39 34 50 43 32 36 46 60 35 10 26 16	26 31 68 63 33 30 4 38 58 47 53 43	10 20 64 59 23 18 23 44 53 41 48 37	51 47 38 28 46 48 57 68 11 31 20 37	27 32 69 64 34 31 8 37 58 48 54 44	61 58 18 18 57 59 66 76 32 46 39 50	39 43 75 70 45 42 30 23 65 56 61 53
$\begin{array}{c} D_{3} \\ D_{4} \\ D_{5} \\ D_{6} \\ D_{7} \\ D_{8} \\ D_{9} \\ D_{10} \\ D_{11} \\ D_{12} \\ D_{13} \end{array}$	18 63 58 21 15 25 46 52 40 47 35 7	0 61 55 11 9 31 49 49 36 43 30 17	63 61 0 26 60 62 68 78 36 49 43 53 63	58 55 26 0 54 56 63 74 26 42 35 46 58	21 11 60 54 0 15 33 50 47 34 42 28 20	15 9 62 56 15 0 29 48 50 37 44 32 14	25 31 68 63 33 29 0 38 58 47 53 43 26	46 49 78 74 50 48 38 0 69 61 65 58 46	52 49 36 26 47 50 58 69 0 33 23 38 52	40 36 49 42 34 37 47 61 33 0 24 19 39	47 43 43 35 42 44 53 65 23 24 0 31 46	35 30 53 46 28 32 43 58 38 19 31 0 35	7 17 63 58 20 14 26 46 52 39 46 35 0	53 49 35 25 48 50 58 70 8 34 24 39 52	41 37 49 41 35 38 48 61 32 8 23 21 40	50 47 39 29 46 48 56 68 13 31 19 36 50	14 23 65 60 25 20 21 43 54 42 49 38 15	39 34 50 43 32 36 46 60 35 10 26 16 38	26 31 68 63 33 30 4 38 58 47 53 43 26	10 20 64 59 23 18 23 44 53 41 48 37 12	51 47 38 28 46 48 57 68 11 31 20 37 50	27 32 69 64 34 31 8 37 58 48 54 44 27	61 58 18 18 57 59 66 76 32 46 39 50 60	39 43 75 70 45 42 30 23 65 56 61 53 40
$\begin{array}{c} D_{3} \\ D_{4} \\ D_{5} \\ D_{6} \\ D_{7} \\ D_{8} \\ D_{9} \\ D_{10} \\ D_{11} \\ D_{12} \\ D_{13} \\ D_{15} \end{array}$	18 63 58 21 15 25 46 52 40 47 35 7 53	0 61 55 11 9 31 49 49 36 43 30 17 49	63 61 0 26 60 62 68 78 36 49 43 53 63 35	58 55 26 0 54 56 63 74 26 42 35 46 58 25	21 11 60 54 0 15 33 50 47 34 42 28 20 48	$ \begin{array}{r} 15 \\ 9 \\ 62 \\ 56 \\ 15 \\ 0 \\ 29 \\ 48 \\ 50 \\ 37 \\ 44 \\ 32 \\ 14 \\ 50 \\ \end{array} $	25 31 68 63 33 29 0 38 58 47 53 43 26 58	46 49 78 74 50 48 38 0 69 61 65 58 46 70	52 49 36 26 47 50 58 69 0 33 23 38 52 8	40 36 49 42 34 37 47 61 33 0 24 19 39 34	47 43 43 35 42 44 53 65 23 24 0 31 46 24	35 30 53 46 28 32 43 58 38 19 31 0 35 39	7 17 63 58 20 14 26 46 52 39 46 35 0 52	53 49 35 25 48 50 58 70 8 34 24 39 52 0	41 37 49 41 35 38 48 61 32 8 23 21 40 33	50 47 39 29 46 48 56 68 13 31 19 36 50 16	14 23 65 60 25 20 21 43 54 42 49 38 15 54	39 34 50 43 32 36 46 60 35 10 26 16 38 36	26 31 68 63 33 30 4 38 58 47 53 43 26 58	10 20 64 59 23 18 23 44 53 41 48 37 12 54	51 47 38 28 46 48 57 68 11 31 20 37 50 14	27 32 69 64 34 31 8 37 58 48 54 44 27 59	61 58 18 18 57 59 66 76 32 46 39 50 60 31	39 43 75 70 45 42 30 23 65 56 61 53 40 66
$\begin{array}{c} D_{3} \\ D_{4} \\ D_{5} \\ D_{6} \\ D_{7} \\ D_{8} \\ D_{9} \\ D_{10} \\ D_{11} \\ D_{12} \\ D_{13} \\ D_{15} \\ D_{16} \end{array}$	18 63 58 21 15 25 46 52 40 47 35 7 53 41	0 61 55 11 9 31 49 49 36 43 30 17 49 37	63 61 0 26 60 62 68 78 36 49 43 53 63 35 49	58 55 26 0 54 56 63 74 26 42 35 46 58 25 41	21 11 60 54 0 15 33 50 47 34 42 28 20 48 35	$ \begin{array}{r} 15 \\ 9 \\ 62 \\ 56 \\ 15 \\ 0 \\ 29 \\ 48 \\ 50 \\ 37 \\ 44 \\ 32 \\ 14 \\ 50 \\ 38 \\ \end{array} $	25 31 68 63 33 29 0 38 58 47 53 43 26 58 48	46 49 78 74 50 48 38 0 69 61 65 58 46 70 61	52 49 36 26 47 50 58 69 0 33 23 38 52 8 32	40 36 49 42 34 37 47 61 33 0 24 19 39 34 8	47 43 43 35 42 44 53 65 23 24 0 31 46 24 23	35 30 53 46 28 32 43 58 38 19 31 0 35 39 21	$7 \\ 17 \\ 63 \\ 58 \\ 20 \\ 14 \\ 26 \\ 46 \\ 52 \\ 39 \\ 46 \\ 35 \\ 0 \\ 52 \\ 40 \\$	53 49 35 25 48 50 58 70 8 34 24 39 52 0 33	41 37 49 41 35 38 48 61 32 8 23 21 40 33 0	50 47 39 29 46 48 56 68 13 31 19 36 50 16 29	$ \begin{array}{r} 14\\23\\65\\60\\25\\20\\21\\43\\54\\42\\49\\38\\15\\54\\43\end{array} $	39 34 50 43 32 36 46 60 35 10 26 16 38 36 13	26 31 68 63 33 30 4 38 58 47 53 43 26 58 48	$ \begin{array}{r} 10\\20\\64\\59\\23\\18\\23\\44\\53\\41\\48\\37\\12\\54\\42\end{array} $	51 47 38 28 46 48 57 68 11 31 20 37 50 14 30	27 32 69 64 34 31 8 37 58 48 54 44 27 59 49	61 58 18 18 57 59 66 76 32 46 39 50 60 31 45	39 43 75 70 45 42 30 23 65 56 61 53 40 66 57
$\begin{array}{c} D_{3} \\ D_{4} \\ D_{5} \\ D_{6} \\ D_{7} \\ D_{8} \\ D_{9} \\ D_{10} \\ D_{11} \\ D_{12} \\ D_{13} \\ D_{15} \\ D_{16} \\ D_{17} \end{array}$	18 63 58 21 15 25 46 52 40 47 35 7 53 41 50	0 61 55 11 9 31 49 49 36 43 30 17 49 37 47	63 61 0 26 60 62 68 78 36 49 43 53 63 35 49 39	58 55 26 0 54 56 63 74 26 42 35 46 58 25 41 29	$\begin{array}{c} 21 \\ 11 \\ 60 \\ 54 \\ 0 \\ 15 \\ 33 \\ 50 \\ 47 \\ 34 \\ 42 \\ 28 \\ 20 \\ 48 \\ 35 \\ 46 \end{array}$	$ \begin{array}{r} 15 \\ 9 \\ 62 \\ 56 \\ 15 \\ 0 \\ 29 \\ 48 \\ 50 \\ 37 \\ 44 \\ 32 \\ 14 \\ 50 \\ 38 \\ 48 \\ \end{array} $	25 31 68 63 33 29 0 38 58 47 53 43 26 58 48 56	46 49 78 74 50 48 38 0 69 61 65 58 46 70 61 68	52 49 36 26 47 50 58 69 0 33 23 38 52 8 32 13	40 36 49 42 34 37 47 61 33 0 24 19 39 34 8 31	47 43 43 35 42 44 53 65 23 24 0 31 46 24 23 19	35 30 53 46 28 32 43 58 38 19 31 0 35 39 21 36	7 17 63 58 20 14 26 46 52 39 46 35 0 52 40 50	53 49 35 25 48 50 58 70 8 34 24 39 52 0 33 16	41 37 49 41 35 38 48 61 32 8 23 21 40 33 0 29	$50 \\ 47 \\ 39 \\ 29 \\ 46 \\ 48 \\ 56 \\ 68 \\ 13 \\ 31 \\ 19 \\ 36 \\ 50 \\ 16 \\ 29 \\ 0$	$ \begin{array}{r} 14\\23\\65\\60\\25\\20\\21\\43\\54\\42\\49\\38\\15\\54\\43\\52\end{array} $	39 34 50 43 32 36 46 60 35 10 26 16 38 36 13 32	26 31 68 63 33 30 4 38 58 47 53 43 26 58 48 56	$ \begin{array}{r} 10\\20\\64\\59\\23\\18\\23\\44\\53\\41\\48\\37\\12\\54\\42\\51\end{array} $	51 47 38 28 46 48 57 68 11 31 20 37 50 14 30 7	27 32 69 64 34 31 8 37 58 48 54 44 27 59 49 57	61 58 18 18 57 59 66 76 32 46 39 50 60 31 45 34	39 43 75 70 45 42 30 23 65 56 61 53 40 66 57 64
$\begin{array}{c} D_{3} \\ D_{4} \\ D_{5} \\ D_{6} \\ D_{7} \\ D_{8} \\ D_{9} \\ D_{10} \\ D_{11} \\ D_{12} \\ D_{13} \\ D_{15} \\ D_{16} \\ D_{17} \\ D_{18} \end{array}$	$ 18 \\ 63 \\ 58 \\ 21 \\ 15 \\ 25 \\ 46 \\ 52 \\ 40 \\ 47 \\ 35 \\ 7 \\ 53 \\ 41 \\ 50 \\ 14 $	0 61 55 11 9 31 49 49 36 43 30 17 49 37 47 23	63 61 0 26 60 62 68 78 36 49 43 53 63 35 49 39 65	58 55 26 0 54 56 63 74 26 42 35 46 58 25 41 29 60	$\begin{array}{c} 21 \\ 11 \\ 60 \\ 54 \\ 0 \\ 15 \\ 33 \\ 50 \\ 47 \\ 34 \\ 42 \\ 28 \\ 20 \\ 48 \\ 35 \\ 46 \\ 25 \end{array}$	15 9 62 56 15 0 29 48 50 37 44 32 14 50 38 48 20	25 31 68 63 33 29 0 38 58 47 53 43 26 58 48 56 21	46 49 78 74 50 48 38 0 69 61 65 58 46 70 61 68 43	52 49 36 26 47 50 58 69 0 33 23 38 52 8 32 13 54	40 36 49 42 34 37 47 61 33 0 24 19 39 34 8 31 42	47 43 43 35 42 44 53 65 23 24 0 31 46 24 23 19 49	35 30 53 46 28 32 43 58 38 19 31 0 35 39 21 36 38	7 17 63 58 20 14 26 46 52 39 46 35 0 52 40 50 15	53 49 35 25 48 50 58 70 8 34 24 39 52 0 33 16 54	41 37 49 41 35 38 48 61 32 8 23 21 40 33 0 29 43	$50 \\ 47 \\ 39 \\ 29 \\ 46 \\ 48 \\ 56 \\ 68 \\ 13 \\ 31 \\ 19 \\ 36 \\ 50 \\ 16 \\ 29 \\ 0 \\ 52 \\$	$\begin{array}{c} 14\\ 23\\ 65\\ 60\\ 25\\ 20\\ 21\\ 43\\ 54\\ 42\\ 49\\ 38\\ 15\\ 54\\ 43\\ 52\\ 0\\ \end{array}$	$\begin{array}{r} 39\\ 34\\ 50\\ 43\\ 32\\ 36\\ 46\\ 60\\ 35\\ 10\\ 26\\ 16\\ 38\\ 36\\ 13\\ 32\\ 41\\ \end{array}$	26 31 68 63 33 30 4 38 58 47 53 43 26 58 48 56 22	$ \begin{array}{r} 10\\20\\64\\59\\23\\18\\23\\44\\53\\41\\48\\37\\12\\54\\42\\51\\10\end{array} $	51 47 38 28 46 48 57 68 11 31 20 37 50 14 30 7 53	27 32 69 64 34 31 8 37 58 48 54 44 27 59 49 57 23	61 58 18 18 57 59 66 76 32 46 39 50 60 31 45 34 62	39 43 75 70 45 42 30 23 65 56 61 53 40 66 57 64 37
$\begin{array}{c} D_{3} \\ D_{4} \\ D_{5} \\ D_{6} \\ D_{7} \\ D_{8} \\ D_{9} \\ D_{10} \\ D_{11} \\ D_{12} \\ D_{13} \\ D_{15} \\ D_{16} \\ D_{17} \\ D_{18} \\ D_{19} \end{array}$	18 63 58 21 15 25 46 52 40 47 35 7 53 41 50 14 39	0 61 55 11 9 31 49 49 36 43 30 17 49 37 47 23 34	63 61 0 26 60 62 68 78 36 49 43 53 63 35 49 39 65 50	58 55 26 0 54 56 63 74 26 63 74 26 42 35 54 42 35 46 58 8 25 41 29 60 43	21 11 60 54 0 15 33 50 47 34 42 28 20 48 35 46 25 32	15 9 62 56 15 0 29 48 50 37 44 32 14 50 38 48 20 36	25 31 68 63 33 29 0 38 58 47 53 43 26 58 48 56 21 46	$\begin{array}{c} 46\\ 49\\ 78\\ 74\\ 50\\ 48\\ 38\\ 0\\ 69\\ 61\\ 65\\ 58\\ 46\\ 70\\ 61\\ 68\\ 43\\ 60\\ \end{array}$	52 49 36 26 47 50 58 69 0 33 23 38 52 8 32 13 54 35	40 36 49 42 34 37 47 61 33 0 24 19 39 34 8 31 42 10	47 43 43 35 42 44 53 65 23 24 0 31 46 24 23 19 49 26	35 30 53 46 28 32 43 58 38 19 31 0 35 39 21 36 38 16	7 17 63 58 20 14 26 46 52 39 46 35 0 52 40 50 15 38	53 49 35 25 48 50 58 70 8 34 24 39 52 0 33 16 54 36	41 37 49 41 35 38 48 61 32 8 23 21 40 33 0 29 43 13	$50 \\ 47 \\ 39 \\ 29 \\ 46 \\ 48 \\ 56 \\ 68 \\ 13 \\ 31 \\ 19 \\ 36 \\ 50 \\ 16 \\ 29 \\ 0 \\ 52 \\ 32 \\$	$\begin{array}{c} 14\\ 23\\ 65\\ 60\\ 25\\ 20\\ 21\\ 43\\ 54\\ 42\\ 49\\ 38\\ 15\\ 54\\ 43\\ 52\\ 0\\ 41\\ \end{array}$	$\begin{array}{c} 39\\ 34\\ 50\\ 43\\ 32\\ 36\\ 46\\ 60\\ 35\\ 10\\ 26\\ 16\\ 38\\ 36\\ 13\\ 32\\ 41\\ 0\\ \end{array}$	26 31 68 63 33 30 4 38 58 47 53 43 26 58 48 56 22 46	$ \begin{array}{c} 10\\20\\64\\59\\23\\18\\23\\44\\53\\41\\48\\37\\12\\54\\42\\51\\10\\40\end{array} $	51 47 38 28 46 48 57 68 11 31 20 37 50 14 30 7 53 33	27 32 69 64 34 31 8 37 58 48 54 44 27 59 49 57 23 47	61 58 18 18 57 59 66 76 32 46 39 50 60 31 45 34 62 47	39 43 75 70 45 42 30 23 65 56 61 53 40 66 57 64 37 55
$\begin{array}{c} D_{3} \\ D_{4} \\ D_{5} \\ D_{6} \\ D_{7} \\ D_{8} \\ D_{9} \\ D_{10} \\ D_{11} \\ D_{12} \\ D_{13} \\ D_{15} \\ D_{16} \\ D_{17} \\ D_{18} \\ D_{19} \\ D_{20} \end{array}$	$\begin{array}{c} 18 \\ 63 \\ 58 \\ 21 \\ 15 \\ 25 \\ 46 \\ 52 \\ 40 \\ 47 \\ 35 \\ 7 \\ 53 \\ 41 \\ 50 \\ 14 \\ 39 \\ 26 \end{array}$	0 61 55 11 9 31 49 36 43 30 17 49 37 47 23 34 31	63 61 0 26 60 62 68 78 36 49 43 53 63 35 49 39 65 50 68	$\begin{array}{c} 58\\ 55\\ 55\\ 26\\ 0\\ 54\\ 56\\ 63\\ 74\\ 26\\ 42\\ 35\\ 46\\ 42\\ 35\\ 46\\ 42\\ 35\\ 58\\ 25\\ 41\\ 29\\ 60\\ 43\\ 63\\ \end{array}$	$\begin{array}{c} 21\\ 11\\ 60\\ 54\\ 0\\ 15\\ 33\\ 50\\ 47\\ 34\\ 42\\ 28\\ 20\\ 48\\ 35\\ 46\\ 25\\ 32\\ 33\\ \end{array}$	15 9 62 56 15 0 29 48 50 37 44 32 14 50 38 48 20 36 30	25 31 68 63 33 29 0 38 58 47 53 43 26 58 48 56 21 46 4	$\begin{array}{r} 46\\ 49\\ 78\\ 74\\ 50\\ 48\\ 38\\ 0\\ 69\\ 61\\ 65\\ 58\\ 46\\ 70\\ 61\\ 68\\ 43\\ 60\\ 38\end{array}$	52 49 36 26 47 50 58 69 0 33 23 38 52 8 32 13 54 35 58	40 36 49 42 34 37 47 61 33 0 24 19 39 34 8 31 42 10 47	47 43 43 35 42 44 53 65 23 24 0 31 46 24 23 19 49 26 53	35 30 53 46 28 32 43 58 38 19 31 0 35 39 21 36 38 16 43	7 17 63 58 20 14 26 46 52 39 46 35 0 52 40 50 15 38 26	53 49 35 25 48 50 58 70 8 34 24 39 52 0 33 16 54 36 58	41 37 49 41 35 38 48 61 32 8 23 21 40 33 0 29 43 13 48	$50 \\ 47 \\ 39 \\ 29 \\ 46 \\ 48 \\ 56 \\ 68 \\ 13 \\ 31 \\ 19 \\ 36 \\ 50 \\ 16 \\ 29 \\ 0 \\ 52 \\ 32 \\ 56 \\ $	$\begin{array}{c} 14\\ 23\\ 65\\ 60\\ 25\\ 20\\ 21\\ 43\\ 54\\ 42\\ 49\\ 38\\ 15\\ 54\\ 43\\ 52\\ 0\\ 41\\ 22\\ \end{array}$	39 34 50 43 32 36 46 60 35 10 26 16 38 36 13 32 41 0 46	$\begin{array}{c} 26\\ 31\\ 68\\ 63\\ 33\\ 30\\ 4\\ 38\\ 58\\ 47\\ 53\\ 43\\ 26\\ 58\\ 48\\ 56\\ 22\\ 46\\ 0\\ \end{array}$	$ \begin{array}{r} 10\\20\\64\\59\\23\\18\\23\\44\\53\\41\\48\\37\\12\\54\\42\\51\\10\\40\\24\end{array} $	51 47 38 28 46 48 57 68 11 31 20 37 50 14 30 7 53 33 57	27 32 69 64 34 31 8 37 58 48 54 44 27 59 49 57 23 47 7	61 58 18 18 57 59 66 76 32 46 39 50 60 31 45 34 62 47 66	39 43 75 70 45 42 30 23 65 56 61 53 40 66 57 64 37 55 30
$\begin{array}{c} D_{3} \\ D_{4} \\ D_{5} \\ D_{6} \\ D_{7} \\ D_{8} \\ D_{9} \\ D_{10} \\ D_{11} \\ D_{12} \\ D_{13} \\ D_{15} \\ D_{16} \\ D_{17} \\ D_{18} \\ D_{19} \\ D_{20} \\ D_{21} \end{array}$	$\begin{array}{c} 18 \\ 63 \\ 58 \\ 21 \\ 15 \\ 25 \\ 46 \\ 52 \\ 40 \\ 47 \\ 35 \\ 7 \\ 53 \\ 41 \\ 50 \\ 14 \\ 39 \\ 26 \\ 10 \end{array}$	0 61 55 11 9 31 49 49 36 43 30 17 49 37 47 23 34 31 20	63 61 0 26 60 62 68 78 36 49 43 53 63 35 49 39 65 50 68 64	$\begin{array}{c} 58\\ 55\\ 55\\ 26\\ 0\\ 54\\ 56\\ 63\\ 74\\ 26\\ 42\\ 35\\ 46\\ 42\\ 35\\ 46\\ 42\\ 35\\ 46\\ 42\\ 35\\ 46\\ 43\\ 63\\ 59\\ \end{array}$	$\begin{array}{c} 21\\ 11\\ 60\\ 54\\ 0\\ 15\\ 33\\ 50\\ 47\\ 34\\ 42\\ 28\\ 20\\ 48\\ 35\\ 46\\ 25\\ 32\\ 33\\ 23\\ \end{array}$	$\begin{array}{c} 15\\ 9\\ 62\\ 56\\ 15\\ 0\\ 29\\ 48\\ 50\\ 37\\ 44\\ 32\\ 14\\ 50\\ 38\\ 48\\ 20\\ 36\\ 30\\ 18 \end{array}$	25 31 68 63 33 29 0 38 58 47 53 43 26 58 47 53 43 26 58 48 56 21 46 4 23	$\begin{array}{c} 46\\ 49\\ 78\\ 74\\ 50\\ 48\\ 38\\ 0\\ 69\\ 61\\ 65\\ 58\\ 46\\ 70\\ 61\\ 68\\ 43\\ 60\\ 38\\ 44\\ \end{array}$	52 49 36 26 47 50 58 69 0 33 23 38 52 8 32 13 54 35 58 53	$\begin{array}{c} 40\\ 36\\ 49\\ 42\\ 34\\ 37\\ 47\\ 61\\ 33\\ 0\\ 24\\ 19\\ 39\\ 34\\ 8\\ 31\\ 42\\ 10\\ 47\\ 41\\ \end{array}$	$\begin{array}{r} 47\\ 43\\ 35\\ 42\\ 44\\ 53\\ 65\\ 23\\ 24\\ 0\\ 31\\ 46\\ 23\\ 19\\ 49\\ 26\\ 53\\ 48\\ \end{array}$	35 30 53 46 28 32 43 58 38 19 31 0 35 39 21 36 38 16 43 37	$\begin{array}{c} 7 \\ 17 \\ 63 \\ 58 \\ 20 \\ 14 \\ 26 \\ 46 \\ 52 \\ 39 \\ 46 \\ 35 \\ 0 \\ 52 \\ 40 \\ 50 \\ 15 \\ 38 \\ 26 \\ 12 \end{array}$	53 49 35 25 48 50 58 70 8 34 24 39 52 0 33 16 54 36 58 54	$\begin{array}{c} 41\\ 37\\ 49\\ 41\\ 35\\ 38\\ 48\\ 61\\ 32\\ 8\\ 23\\ 21\\ 40\\ 33\\ 0\\ 29\\ 43\\ 13\\ 48\\ 42\\ \end{array}$	$\begin{array}{c} 50\\ 47\\ 39\\ 29\\ 46\\ 48\\ 56\\ 68\\ 13\\ 31\\ 19\\ 36\\ 50\\ 16\\ 29\\ 0\\ 52\\ 32\\ 56\\ 51\\ \end{array}$	$\begin{array}{c} 14\\ 23\\ 65\\ 60\\ 25\\ 20\\ 21\\ 43\\ 54\\ 42\\ 9\\ 38\\ 15\\ 54\\ 43\\ 55\\ 44\\ 43\\ 52\\ 0\\ 41\\ 22\\ 10\\ \end{array}$	$\begin{array}{c} 39\\ 34\\ 50\\ 43\\ 32\\ 36\\ 46\\ 60\\ 35\\ 10\\ 26\\ 60\\ 38\\ 36\\ 13\\ 32\\ 41\\ 0\\ 46\\ 40\\ \end{array}$	$\begin{array}{c} 26\\ 31\\ 68\\ 63\\ 33\\ 30\\ 4\\ 38\\ 58\\ 47\\ 53\\ 43\\ 26\\ 58\\ 48\\ 56\\ 22\\ 46\\ 0\\ 24 \end{array}$	$\begin{array}{c} 10\\ 20\\ 64\\ 59\\ 23\\ 18\\ 23\\ 44\\ 53\\ 41\\ 48\\ 37\\ 12\\ 54\\ 42\\ 51\\ 10\\ 40\\ 24\\ 0\\ \end{array}$	51 47 38 28 46 48 57 68 11 31 20 50 14 30 7 53 33 57 52	27 32 69 64 34 31 8 37 58 48 54 427 59 49 57 23 47 7 25	$\begin{array}{c} 61 \\ 58 \\ 18 \\ 18 \\ 57 \\ 59 \\ 66 \\ 76 \\ 32 \\ 46 \\ 39 \\ 50 \\ 60 \\ 31 \\ 45 \\ 34 \\ 62 \\ 47 \\ 66 \\ 62 \end{array}$	39 43 75 70 45 42 30 23 65 56 61 53 40 66 57 64 37 55 30 38
$\begin{array}{c} D_3 \\ D_4 \\ D_5 \\ D_6 \\ D_7 \\ D_8 \\ D_9 \\ D_{10} \\ D_{11} \\ D_{12} \\ D_{13} \\ D_{15} \\ D_{16} \\ D_{17} \\ D_{18} \\ D_{19} \\ D_{20} \\ D_{21} \\ D_{22} \end{array}$	$\begin{array}{c} 18 \\ 63 \\ 58 \\ 21 \\ 15 \\ 25 \\ 46 \\ 52 \\ 40 \\ 47 \\ 35 \\ 7 \\ 53 \\ 41 \\ 50 \\ 14 \\ 39 \\ 26 \\ 10 \\ 51 \end{array}$	$\begin{array}{c} 0 \\ 61 \\ 55 \\ 11 \\ 9 \\ 31 \\ 49 \\ 49 \\ 36 \\ 43 \\ 30 \\ 17 \\ 49 \\ 37 \\ 47 \\ 23 \\ 34 \\ 31 \\ 20 \\ 47 \end{array}$	63 61 0 26 60 62 68 78 36 49 43 53 63 35 53 63 35 50 68 64 38	58 55 26 0 54 56 63 74 26 63 74 26 42 35 54 42 35 58 58 25 41 29 60 43 63 59 28	$\begin{array}{c} 21\\ 11\\ 60\\ 54\\ 0\\ 15\\ 33\\ 50\\ 47\\ 34\\ 42\\ 28\\ 200\\ 48\\ 35\\ 6\\ 46\\ 25\\ 32\\ 33\\ 23\\ 46\\ \end{array}$	$\begin{array}{c} 15\\ 9\\ 62\\ 56\\ 15\\ 0\\ 29\\ 48\\ 50\\ 37\\ 44\\ 32\\ 14\\ 50\\ 38\\ 48\\ 20\\ 36\\ 30\\ 18\\ 48\\ \end{array}$	25 31 68 63 33 29 0 38 58 47 53 43 26 58 47 53 43 26 58 43 26 58 44 21 46 4 23 57	$\begin{array}{c} 46\\ 49\\ 78\\ 74\\ 50\\ 48\\ 38\\ 0\\ 69\\ 61\\ 65\\ 58\\ 46\\ 61\\ 68\\ 43\\ 60\\ 38\\ 44\\ 68\end{array}$	52 49 36 26 47 50 58 69 0 33 23 38 52 8 32 13 54 35 58 53 11	$\begin{array}{c} 40\\ 36\\ 49\\ 42\\ 34\\ 37\\ 47\\ 61\\ 33\\ 0\\ 24\\ 19\\ 39\\ 34\\ 8\\ 31\\ 42\\ 10\\ 47\\ 41\\ 31\\ \end{array}$	$\begin{array}{r} 47\\ 43\\ 43\\ 35\\ 42\\ 44\\ 53\\ 65\\ 23\\ 24\\ 44\\ 53\\ 24\\ 0\\ 31\\ 46\\ 23\\ 19\\ 49\\ 26\\ 53\\ 48\\ 20\\ \end{array}$	35 30 53 46 28 32 43 8 8 38 19 31 0 35 39 21 36 38 16 43 37 37	$\begin{array}{c} 7 \\ 17 \\ 63 \\ 58 \\ 20 \\ 14 \\ 26 \\ 46 \\ 52 \\ 39 \\ 46 \\ 35 \\ 0 \\ 52 \\ 40 \\ 50 \\ 15 \\ 38 \\ 26 \\ 12 \\ 50 \end{array}$	53 49 35 25 48 50 58 70 8 34 24 39 52 0 33 16 54 36 54 14	$\begin{array}{c} 41\\ 37\\ 49\\ 41\\ 35\\ 38\\ 61\\ 32\\ 23\\ 21\\ 40\\ 33\\ 0\\ 29\\ 43\\ 13\\ 48\\ 42\\ 30\\ \end{array}$	$\begin{array}{c} 50\\ 47\\ 39\\ 29\\ 46\\ 48\\ 56\\ 68\\ 13\\ 19\\ 36\\ 50\\ 16\\ 29\\ 0\\ 52\\ 32\\ 56\\ 51\\ 7\end{array}$	$\begin{array}{c} 14\\ 23\\ 65\\ 60\\ 25\\ 20\\ 21\\ 43\\ 54\\ 42\\ 49\\ 38\\ 15\\ 54\\ 43\\ 55\\ 44\\ 38\\ 55\\ 44\\ 15\\ 52\\ 0\\ 41\\ 22\\ 10\\ 53\\ \end{array}$	39 34 50 43 32 36 46 60 35 10 26 16 13 32 36 44 0 46 40 33	$\begin{array}{c} 26\\ 31\\ 68\\ 63\\ 33\\ 30\\ 4\\ 38\\ 58\\ 47\\ 53\\ 43\\ 26\\ 58\\ 48\\ 56\\ 22\\ 46\\ 0\\ 24\\ 57\\ \end{array}$	$\begin{array}{c} 10\\ 20\\ 64\\ 59\\ 23\\ 18\\ 23\\ 44\\ 53\\ 44\\ 53\\ 44\\ 48\\ 37\\ 12\\ 54\\ 42\\ 51\\ 10\\ 40\\ 24\\ 0\\ 52\\ \end{array}$	$\begin{array}{c} 51\\ 47\\ 38\\ 28\\ 46\\ 48\\ 57\\ 68\\ 11\\ 20\\ 37\\ 50\\ 14\\ 30\\ 7\\ 53\\ 33\\ 57\\ 52\\ 0\\ \end{array}$	27 32 69 64 34 31 8 37 58 48 54 427 59 49 57 23 47 7 25 57	$\begin{array}{c} 61 \\ 58 \\ 18 \\ 18 \\ 57 \\ 59 \\ 66 \\ 76 \\ 32 \\ 46 \\ 39 \\ 50 \\ 60 \\ 31 \\ 45 \\ 34 \\ 62 \\ 47 \\ 66 \\ 62 \\ 34 \end{array}$	$\begin{array}{c} 39\\ 43\\ 75\\ 70\\ 45\\ 42\\ 30\\ 65\\ 56\\ 61\\ 53\\ 40\\ 66\\ 57\\ 64\\ 37\\ 55\\ 30\\ 38\\ 64\\ \end{array}$
$\begin{array}{c} D_3 \\ D_4 \\ D_5 \\ D_6 \\ D_7 \\ D_8 \\ D_9 \\ D_{10} \\ D_{11} \\ D_{12} \\ D_{13} \\ D_{15} \\ D_{16} \\ D_{17} \\ D_{18} \\ D_{19} \\ D_{20} \\ D_{21} \\ D_{22} \\ D_{23} \end{array}$	$\begin{array}{c} 18\\ 63\\ 58\\ 21\\ 15\\ 25\\ 46\\ 52\\ 40\\ 47\\ 53\\ 41\\ 50\\ 14\\ 39\\ 26\\ 10\\ 51\\ 27\\ \end{array}$	$\begin{array}{c} 0 \\ 61 \\ 55 \\ 11 \\ 9 \\ 31 \\ 49 \\ 49 \\ 36 \\ 43 \\ 30 \\ 17 \\ 49 \\ 37 \\ 47 \\ 23 \\ 34 \\ 31 \\ 20 \\ 47 \\ 32 \end{array}$	63 61 0 26 60 62 68 78 36 49 43 53 63 35 53 63 35 9 9 9 9 50 68 64 38 69	58 55 26 0 54 56 63 74 26 63 74 26 42 35 58 25 41 29 60 43 63 59 28 64	$\begin{array}{c} 21\\ 11\\ 60\\ 54\\ 0\\ 15\\ 33\\ 50\\ 47\\ 34\\ 42\\ 28\\ 20\\ 48\\ 35\\ 46\\ 25\\ 32\\ 33\\ 23\\ 46\\ 34\\ \end{array}$	15 9 62 56 15 0 29 48 50 37 44 32 14 50 38 48 20 36 30 18 48 31	25 31 68 63 33 29 0 38 58 47 53 43 26 58 48 56 21 46 42 357 8	$\begin{array}{c} 46\\ 49\\ 78\\ 74\\ 50\\ 48\\ 38\\ 0\\ 69\\ 61\\ 65\\ 58\\ 46\\ 60\\ 38\\ 44\\ 68\\ 37\\ \end{array}$	52 49 36 26 47 50 58 69 0 33 23 38 52 8 32 13 54 35 58 53 11 58	$\begin{array}{c} 40\\ 36\\ 49\\ 42\\ 34\\ 37\\ 47\\ 61\\ 33\\ 0\\ 24\\ 19\\ 39\\ 34\\ 8\\ 31\\ 42\\ 10\\ 47\\ 41\\ 31\\ 48\end{array}$	$\begin{array}{r} 47\\ 43\\ 43\\ 35\\ 42\\ 44\\ 53\\ 65\\ 23\\ 24\\ 44\\ 53\\ 24\\ 0\\ 31\\ 46\\ 23\\ 19\\ 49\\ 26\\ 53\\ 48\\ 20\\ 54\\ \end{array}$	35 30 53 46 28 32 43 58 38 19 31 0 35 39 21 36 38 16 43 37 37 44	$\begin{array}{c} 7\\ 17\\ 63\\ 58\\ 20\\ 14\\ 26\\ 46\\ 52\\ 39\\ 46\\ 35\\ 0\\ 52\\ 40\\ 50\\ 15\\ 38\\ 26\\ 12\\ 50\\ 27\\ \end{array}$	53 49 35 25 48 50 8 34 24 39 52 0 33 16 54 36 55 8 54 14 59	$\begin{array}{c} 41\\ 37\\ 49\\ 41\\ 35\\ 38\\ 48\\ 61\\ 32\\ 23\\ 21\\ 40\\ 33\\ 0\\ 29\\ 43\\ 13\\ 48\\ 42\\ 30\\ 49\\ \end{array}$	$\begin{array}{c} 50\\ 47\\ 39\\ 29\\ 46\\ 48\\ 56\\ 68\\ 13\\ 31\\ 19\\ 36\\ 50\\ 16\\ 29\\ 0\\ 52\\ 32\\ 56\\ 51\\ 7\\ 57\\ \end{array}$	$\begin{array}{c} 14\\ 23\\ 65\\ 60\\ 25\\ 20\\ 21\\ 43\\ 54\\ 42\\ 49\\ 38\\ 15\\ 54\\ 43\\ 52\\ 0\\ 41\\ 22\\ 10\\ 53\\ 23\\ \end{array}$	$\begin{array}{c} 39\\ 34\\ 50\\ 43\\ 32\\ 36\\ 46\\ 60\\ 35\\ 10\\ 26\\ 16\\ 38\\ 36\\ 13\\ 32\\ 41\\ 0\\ 46\\ 40\\ 33\\ 47\\ \end{array}$	$\begin{array}{c} 26\\ 31\\ 68\\ 63\\ 33\\ 30\\ 4\\ 38\\ 58\\ 43\\ 26\\ 58\\ 43\\ 26\\ 58\\ 48\\ 56\\ 22\\ 46\\ 0\\ 24\\ 57\\ 7\end{array}$	$\begin{array}{c} 10\\ 20\\ 64\\ 59\\ 23\\ 18\\ 23\\ 44\\ 53\\ 44\\ 48\\ 37\\ 12\\ 54\\ 42\\ 51\\ 10\\ 40\\ 24\\ 0\\ 52\\ 25\\ \end{array}$	$\begin{array}{c} 51\\ 47\\ 38\\ 28\\ 46\\ 48\\ 57\\ 68\\ 11\\ 20\\ 37\\ 50\\ 14\\ 30\\ 7\\ 53\\ 33\\ 57\\ 55\\ 0\\ 57\\ 0\\ 57\\ \end{array}$	27 32 69 64 34 31 8 37 58 48 54 44 27 59 49 57 23 47 7 25 57 0	$\begin{array}{c} 61\\ 58\\ 18\\ 18\\ 57\\ 59\\ 66\\ 76\\ 32\\ 46\\ 39\\ 50\\ 60\\ 31\\ 45\\ 34\\ 62\\ 47\\ 66\\ 62\\ 34\\ 66\\ \end{array}$	$\begin{array}{c} 39\\ 43\\ 75\\ 70\\ 45\\ 42\\ 30\\ 65\\ 56\\ 61\\ 53\\ 40\\ 66\\ 57\\ 64\\ 37\\ 55\\ 30\\ 38\\ 64\\ 29 \end{array}$
$\begin{array}{c} D_3 \\ D_4 \\ D_5 \\ D_6 \\ D_7 \\ D_8 \\ D_9 \\ D_{10} \\ D_{11} \\ D_{12} \\ D_{13} \\ D_{15} \\ D_{16} \\ D_{17} \\ D_{18} \\ D_{19} \\ D_{20} \\ D_{21} \\ D_{22} \end{array}$	$\begin{array}{c} 18 \\ 63 \\ 58 \\ 21 \\ 15 \\ 25 \\ 46 \\ 52 \\ 40 \\ 47 \\ 35 \\ 7 \\ 53 \\ 41 \\ 50 \\ 14 \\ 39 \\ 26 \\ 10 \\ 51 \end{array}$	$\begin{array}{c} 0 \\ 61 \\ 55 \\ 11 \\ 9 \\ 31 \\ 49 \\ 49 \\ 36 \\ 43 \\ 30 \\ 17 \\ 49 \\ 37 \\ 47 \\ 23 \\ 34 \\ 31 \\ 20 \\ 47 \end{array}$	63 61 0 26 60 62 68 78 36 49 43 53 63 35 53 63 35 50 68 64 38	58 55 26 0 54 56 63 74 26 63 74 26 42 35 54 42 35 58 58 25 41 29 60 43 63 59 28	$\begin{array}{c} 21\\ 11\\ 60\\ 54\\ 0\\ 15\\ 33\\ 50\\ 47\\ 34\\ 42\\ 28\\ 20\\ 48\\ 35\\ 46\\ 25\\ 32\\ 3\\ 34\\ 6\\ 34\\ 57\\ \end{array}$	$\begin{array}{c} 15\\ 9\\ 62\\ 56\\ 15\\ 0\\ 29\\ 48\\ 50\\ 37\\ 44\\ 32\\ 14\\ 50\\ 38\\ 48\\ 20\\ 36\\ 30\\ 18\\ 48\\ \end{array}$	25 31 68 63 33 29 0 38 58 47 53 43 26 58 47 53 43 26 58 43 26 58 44 21 46 4 23 57	$\begin{array}{c} 46\\ 49\\ 78\\ 74\\ 50\\ 48\\ 38\\ 0\\ 69\\ 61\\ 65\\ 58\\ 46\\ 61\\ 68\\ 43\\ 60\\ 38\\ 44\\ 68\end{array}$	52 49 36 26 47 50 58 69 0 33 23 38 52 8 32 13 54 35 58 53 11	$\begin{array}{c} 40\\ 36\\ 49\\ 42\\ 34\\ 37\\ 47\\ 61\\ 33\\ 0\\ 24\\ 19\\ 39\\ 34\\ 8\\ 31\\ 42\\ 10\\ 47\\ 41\\ 31\\ \end{array}$	$\begin{array}{r} 47\\ 43\\ 35\\ 42\\ 44\\ 53\\ 65\\ 23\\ 24\\ 44\\ 53\\ 24\\ 0\\ 31\\ 46\\ 23\\ 19\\ 49\\ 26\\ 53\\ 48\\ 20\\ \end{array}$	35 30 53 46 28 32 43 8 8 38 19 31 0 35 39 21 36 38 16 43 37 37	$\begin{array}{c} 7 \\ 17 \\ 63 \\ 58 \\ 20 \\ 14 \\ 26 \\ 46 \\ 52 \\ 39 \\ 46 \\ 35 \\ 0 \\ 52 \\ 40 \\ 50 \\ 15 \\ 38 \\ 26 \\ 12 \\ 50 \end{array}$	53 49 35 25 48 50 58 70 8 34 24 39 52 0 33 16 54 36 54 14	$\begin{array}{c} 41\\ 37\\ 49\\ 41\\ 35\\ 38\\ 61\\ 32\\ 23\\ 21\\ 40\\ 33\\ 0\\ 29\\ 43\\ 13\\ 48\\ 42\\ 30\\ \end{array}$	$\begin{array}{c} 50\\ 47\\ 39\\ 29\\ 46\\ 48\\ 56\\ 68\\ 13\\ 19\\ 36\\ 50\\ 16\\ 29\\ 0\\ 52\\ 32\\ 56\\ 51\\ 7\end{array}$	$\begin{array}{c} 14\\ 23\\ 65\\ 60\\ 25\\ 20\\ 21\\ 43\\ 54\\ 42\\ 49\\ 38\\ 15\\ 54\\ 43\\ 55\\ 44\\ 38\\ 55\\ 44\\ 15\\ 52\\ 0\\ 41\\ 22\\ 10\\ 53\\ \end{array}$	39 34 50 43 32 36 46 60 35 10 26 16 13 32 36 44 0 46 40 33	$\begin{array}{c} 26\\ 31\\ 68\\ 63\\ 33\\ 30\\ 4\\ 38\\ 58\\ 47\\ 53\\ 43\\ 26\\ 58\\ 48\\ 56\\ 22\\ 46\\ 0\\ 24\\ 57\\ \end{array}$	$\begin{array}{c} 10\\ 20\\ 64\\ 59\\ 23\\ 18\\ 23\\ 44\\ 53\\ 44\\ 53\\ 44\\ 48\\ 37\\ 12\\ 54\\ 42\\ 51\\ 10\\ 40\\ 24\\ 0\\ 52\\ \end{array}$	$\begin{array}{c} 51\\ 47\\ 38\\ 28\\ 46\\ 48\\ 57\\ 68\\ 11\\ 20\\ 37\\ 50\\ 14\\ 30\\ 7\\ 53\\ 33\\ 57\\ 52\\ 0\\ \end{array}$	27 32 69 64 34 31 8 37 58 48 54 427 59 49 57 23 47 7 25 57	$\begin{array}{c} 61 \\ 58 \\ 18 \\ 18 \\ 57 \\ 59 \\ 66 \\ 76 \\ 32 \\ 46 \\ 39 \\ 50 \\ 60 \\ 31 \\ 45 \\ 34 \\ 62 \\ 47 \\ 66 \\ 62 \\ 34 \end{array}$	$\begin{array}{c} 39\\ 43\\ 75\\ 70\\ 45\\ 42\\ 30\\ 65\\ 56\\ 61\\ 53\\ 40\\ 66\\ 57\\ 64\\ 37\\ 55\\ 30\\ 38\\ 64\\ \end{array}$

Table 5: Distance among the textures based on	mber of skeleton points using	g MHD Wavelet Transform
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When lag value is 30 the classes resulted based on least number of skeleton primitive points for the three nonlinear wavelets are shown in Table 7. In the same way, when the lag value is 50 the resultant classes are shown in Table 8.

If we assume MB wavelet transform as standard one then the classification rates are evaluated for each class with other nonlinear wavelets and they are listed in Table 9 and Table 10 for lag value 30 and 50 respectively. The classification rates are evaluated by the following formula: Percentage of classification rate = Number of common textures of W_x with respect to W_y for class Ci/ Number of textures in Wy for class Ci that means if W_y has got 'l' textures in class C_i and W_x has got 'l+m' textures then by the above formula shows 100% of correct classification for class C_i. However this effects for another class because of extra 'm' textures. By this the above formula guarantees that overall texture classification rate does not change and comparison rate is not going to be effected.

Wavelet	Class	Textures
MHEWT	C_1	$\{D_1, D_2, D_5, D_6, D_7, D_{12}, D_{13}, D_{18}, D_{25}\}$
	C_2	$\{D_3, D_4, D_{11}, D_{24}\}$
	C_3	$\{ D_8, D_{20}, D_{21} \}$
	C_4	$\{ D_9, D_{10}, D_{15}, D_{19}, D_{22} \}$
	C_5	$\{ D_{16}, D_{17} \}$
	C_6	$\{ D_{23} \}$
MHDWT	C_1	$\{ D_1, D_2, D_5, D_6, D_{13}, D_{20} \}$
	C_2	$\{ D_3, D_4, D_{24} \}$
	C_3	$\{ D_7, D_{23} \}$
	C_4	$\{ D_8, D_{25} \}$
	C_5	$\{ D_9, D_{10}, D_{15}, D_{17}, D_{21}, D_{22} \}$
	C_6	$\{ D_{11}, D_{12}, D_{16}, D_{19} \}$
	C_7	$\{ D_{18} \}$
MBWT	C_1	$\{ D_1, D_2, D_5, D_6, D_{13}, D_{18}, D_{21} \}$
	C_2	$\{ D_3, D_4, D_{24} \}$
	C_3	$\{ D_7, D_{20}, D_{23}, D_{25} \}$
	C_4	$\{ D_8 \}$
	C_5	$\{ D_9, D_{11}, D_{15}, D_{17}, D_{22} \}$
	C ₆	$\{ D_{10}, D_{12}, D_{16}, D_{19} \}$

Table 7: Classes of textures for the three nonlinear wavelets when the lag value is 30

Table 8: Classes of textures for the three nonlinear wavelets when the lag value is 50

Wavelet	Class	Textures
MHEWT	C1	$\{D_1, D_2, D_5, D_6, D_7, D_8, D_{12}, D_{13}, D_{18}, D_{20}, D_{21}, D_{23}, D_{25}\}$
	C_2	$\{D_3, D_4, D_9, D_{10}, D_{11}, D_{15}, D_{16}, D_{17}, D_{19}, D_{22}, D_{24}\}$
MHDWT	C_1	$\{D_1, D_2, D_5, D_6, D_7, D_{13}, D_{18}, D_{20}, D_{23}\}$
	C_2	$\{D_3, D_4, D_9, D_{10}, D_{11}, D_{12}, D_{15}, D_{16}, D_{17}, D_{19}, D_{21}, D_{22}, D_{24}\}$
	C ₃	$\{D_8, D_{25}\}$
MBWT	C_1	$\{D_1, D_2, D_5, D_6, D_7, D_8, D_{13}, D_{18}, D_{20}, D_{21}, D_{23}, D_{25}\}$
	C_2	$\{D_3, D_4, D_9, D_{10}, D_{11}, D_{15}, D_{16}, D_{17}, D_{19}, D_{22}, D_{24}\}$
	C ₃	$\{D_{12}\}$

Table 9: Classification rates of MHEWT and MHDWT with respect to MBWT when lag value = 30

Class	MHEWT	MHDWT	
1	85.71	71.43	
2	100.00	100.00	
3	25.00	50.00	
4	0.00	100.00	
5	20.00	80.00	
6	0.00	75.00	
Average	38.45	79.41	

Table 10: Classification rates of MHEWT and MHDWT with respect to MBWT when lag value = 50

Class	MHEWT	MHDWT	
1	100.00	75.00	
2	100.00	100.00	
3	0.00	0.00	
Average	66.67	58.33	

CONCLUSION

The present study investigated extraction of skeleton primitives by using skeleton subset. Though it is a tedious process of applying 2^8 possibilities, it is applied and it has given a clear and accurate dominant skeleton subset. If one wants classification mainly based on skeleton subset combination, then first method

of classification is more appropriate. Since all textures considered have the same dimension second method of classification is also adopted based on least skeleton points. This classification may be appropriate for shape primitive classification. By increasing lag value, number of classes will be decreased and more number of textures will be added into each class. The present method of comparison of classification rates between different nonlinear wavelets by assuming one of them as standard one is also suited for other type of texture comparison based on different classification methods. The same method can be extended to 5×5 , $7 \times 7... N \times N$ masks also.

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