Hexahedral Mesh Structure Visualization and Evaluation – *Supplemental Materials*

Kaoji Xu and Guoning Chen *Member, IEEE*

In this document, we provide the pseudo-code for the proposed main sheet extraction algorithm, additional results and some verification of the correctness of the proposed methods.

1 Pseudo-code of the Main Sheet Extraction Algorithm

The following Algorithms 1-4 provide the pseudo-code for our main sheets extraction process.

Algorithm 1: Extract Main Sheets

```
Input: base complex and all its sheets
Output: main sheets
Construct the sheet connectivity graph CG Build a table between each base complex component and a list of base
    complex sheets that contain it;
Build a table between each base complex face and a list of base complex sheets that neighboring with it;
foreach sheet do
    Starting from it and get a set of candidate main sheets using DFS and BFS methods described in Algorithms 2
        and 3;
end
Remove redundant subsets using Algorithm 4;
foreach candidate subset of main sheets do
    Calculate the complexity using Equation 2;
end
Return the set that has the maximum average per-sheet complexity;
```

Algorithm 2: Extract Candidate Main Sheets using DFS

```
Input: one sheet, CG
Output: a set of candidate main sheets
Create a result set res;
Create a stack st;
Create a queue q;
Push the input sheet to q;
while not all base complex cells are visited do
    while q is not empty do
        foreach sheet in the current queue do
            Pop one, S_i;
            if S_i is visited or redundant then
                continue;
            Append S_i to res;
            foreach base complex cell in S_i do
                Set it as visited;
            end
            if all base complex cells are visited then
                break;
            Get all neighboring sheets of S_i N(S_i) on CG; Select the sheet has the minimum overlap with
                S_i, if multiple sheets have the same minimum overlap with S_i, select S_j that has more base
                complex cells. Push it to q;
            Remove S_j from N(S_i);
            if N(S_i) is not empty then
                Push (S_i, N(S_i)) to st;
        end
    end
    if not all base complex cells are visited then
        Get current sheet and its neighboring sheets, (S_i, N(S_i)), from top of st;
        Select the sheet has the minimum overlap with S_i from N(S_i), if multiple sheets have the same
            minimum overlap with S_i, select S_j that has more base complex cells. Push it to q;
        Remove S_j from N(S_i);
        if N(S_i) is empty then
            Pop the top from st;
end
Return res;
```

Algorithm 3: Extract Candidate Main Sheets using BFS

```
Input: one sheet, CG
Output: candidate main sheets
Create a result set res;
Create a stack st;
Create a queue q;
Push input sheet to q;
while not all base complex cells are visited do
    while q is not empty do
        foreach sheet in the current queue do
            Pop one, S_i;
            if S_i is visited or redundant then
                continue;
            Append S_i to res;
            foreach base complex cell in S_i do
                Set it as visited;
            end
            if all base complex cells are visited then
                break;
            Get neighboring sheets of S_i, N(S_i) on CG;
            Select all sheets that have the minimum overlap with S_i. Push them to the queue a except the
                ones that have been visited;
            Remove the selected sheets from N(S_i);
            if N(S_i) is not empty then
                Push the pair (S_i, N(S_i)) to st;
        end
    end
    if not all base complex cells are visited then
        Get current sheet and its neighboring sheets, (S_i, N(S_i)), from the top of st;
        Select the sheets that have the minimum overlap with S_i from N(S_i). Push them to q except the ones
            that have been visited;
        Remove the selected sheet from N(S_i);
        if N(S_i is empty then
            Pop the top from st;
end
Return res;
```

Algorithm 4: Remove Redundancy

```
Input: A list of subsets of candidate main sheets
Output: candidate main sheets
foreach set of sheets do
    Sort the sheets in descending order based on the number of base complex cells in the sheet;
    Create a counter of each base complex cell;
    foreach sheet in the current set do
        foreach base complex cell in a given sheet do
            Increase the counter of base complex cell by 1;
        end
    end
    while true do
        Initialize a local flag, sheetsChanged, to false;
        foreach sheet in the sorted list do
            if all base complex cells in the sheet are visited then
                foreach base complex cell in the sheet do
                    Decrease the counter of base complex cell by 1;
                end
                Remove the sheet from the sorted list;
                Set sheetsChanged to true;
        end
        if sheetsChanged is false then
            break;
    end
    if representative sheets are duplicated then
        Remove the representative sheet;
    else
        Recover sorted list to its original order;
end
```

2 Additional Results

Tables 1 provides the complexity values of the extracted main sheets using the proposed method for a number of hex-meshes generated by the $l1-$polycube [2], closed-form polycube [1], and the frame-field [3]

• *Kaoji Xu and Guoning Chen are with the University of Houston. E-mails: cotrikxu@gmail.com, gchen16@uh.edu*

Manuscript received xx xxx. 201x; accepted xx xxx. 201x. Date of Publication xx xxx. 201x; date of current version xx xxx. 201x. For information on obtaining reprints of this article, please send e-mail to: reprints@ieee.org. Digital Object Identifier: xx.xxxx/TVCG.201x.xxxxxxx

Table 1. Structure complexity

Model	main sheets #sheets	main sheets $\|\|M\|\|_F$	all sheets #sheets	all sheets $\|\|M\|\|_F$	effectiveness
anc101 [2]	20	18.26	79	59.91	30.45%
angel_1 [2]	9	9.46	41	31.19	30.33%
bunny [2]	9	7.63	23	16.55	46.11%
bumpy_torus [2]	26	20.27	70	41.56	48.77%
buste [2]	13	9.78	32	19.36	50.52%
children [2]	37	34.58	105	59.67	57.96%
dragon [2]	40	25.02	111	47.56	52.61%
elephant [2]	29	20.01	80	40.13	49.86%
gargoyle [2]	34	20.85	99	56.96	36.60%
rockerarm1 [2]	6	7.95	36	25.05	31.74%
rockerarm2 [2]	9	9.63	34	25.71	37.46%
rod [2]	5	6.56	17	13.98	46.92%
carter [1]	9	25.76	44	43.71	58.93%
chinese-lion [1]	24	20.52	62	50.00	41.04%
dragon [1]	51	38.91	134	67.84	57.36%
fertility [1]	8	7.10	38	22.50	31.53%
grayloc [1]	23	22.18	73	44.66	49.66%
hollow-eight [1]	7	16.17	18	26.40	61.25%
joint [1]	4	4.57	15	11.65	39.23%
kitten [1]	10	13.69	16	17.05	80.29%
knot [1]	5	5.28	11	10.06	52.49%
pegasus [1]	27	26.73	120	60.71	44.03%
rockerarm [1]	15	14.35	41	30.55	50.25%
bone [3]	8	6.40	14	12.24	52.29%
bunny [3]	8	7.35	22	15.95	46.08%
ellipsoid-A [3]	3	5.83	6	8.78	66.40%
fandisk [3]	4	3.43	15	11.19	30.65%
fertility [3]	10	30.45	40	39.96	76.20%
hanger [3]	7	6.28	16	12.79	49.10%
impeller [3]	14	40.87	51	52.21	78.28%
joint [3]	5	4.83	17	12.85	37.59%
rockerarm [3]	7	8.57	27	23.06	25.46%
rod [3]	4	3.99	14	14.68	27.18%
sculpture-B [3]	2	4.24	20	15.35	27.62%

based approaches, respectively. We also measure the effectiveness (the last column of the table) of the extracted main sheets in representing their corresponding base complexes, as defined in the paper.

3 Verification

To verify whether our main sheet extraction algorithm identified a (near) optimal subset of main sheets or not, we use a fandisk hex-mesh as an example. Assume n is the number of sheets. First we compute all possible subsets from the combinations $C_n^i, i = \{1, 2, ..., n\}$, then we remove those subsets which cannot cover the space of the base complex. Next we remove redundant sheet in each set as described in the above Algorithm 3. Finally we obtain the following black and red candidate sets of main sheets (shown in the following list), where the sets in red color are returned by Algorithm 1; We use the set of candidate main sheets which has the biggest average per sheet complexity (0.856414) and the complexity of the structure is 3.425656. The complexity in the all sheets structure is 11.193765 (green). The complexity of the main sheets is 30.6% of the one in all sheets. The details are provided in the verbatim text, where we can see the results using the brute-force search (in black and red) and our algorithm (in red), respectively. The selected subset of main sheets using our algorithm is in the last red row, while the global optimal subset selected using the brute-force search is highlighted using underline. The optimal solution should satisfy: its number of of overlap components and number of sheets should be equal or smaller than those of the subset found by our algorithm, while its per-sheet complexity should be larger (the line with bold fonts). In this example, the subset selected using our algorithm is the global optimal solution. The last line shown in green is the information for all sheets. More examples can be found in Table 2. In this table, the first row of each mesh is our result, while the second row shows the global optimal result obtained using a brute-force search (i.e., searching all possible sub-graphs that can cover the space of the original base complex). Note that the optimal results typically have smaller number of main sheets with large per-sheet complexity, which we believe is important. Nonetheless, our results are sufficiently close to the optimal ones in most cases, and for many models, our algorithm indeed locates the optimal subsets of main sheets.

Table 2. ours vs brute-force. The first row of each mesh is our result, while the second row shows the global optimal result obtained using a brute-force search. Note that the optimal results typically have smaller number of main sheets with large per-sheet complexity. Nonetheless, our results are sufficiently close to the optimal ones in most cases, and for some models, our algorithm locates the optimal subsets.

Model	overlaps	avg $\|\|M\|\|_F$	$\|\|M\|\|_F$	#sheets
SRF - bone	59	0.799523	6.39618	8
brute-force	24	1.26133	2.52265	2
SRF - bunny	228	0.919342	7.35474	8
brute-force	228	0.919342	7.35474	8
SRF - ellipsoid-A	16	1.94475	5.83426	3
brute-force	16	1.94475	5.83426	3
SRF - fandisk	12	0.856414	3.42565	4
brute-force	12	0.856414	3.42565	4
SRF - hanger	29	0.896956	6.27869	7
brute-force	29	0.896956	6.27869	7
SRF - joint	24	0.965884	4.82942	5
brute-force	24	0.965884	4.82942	5
SRF - rod	12	0.998346	3.99338	4
brute-force	12	0.998346	3.99338	4
SRF - sculpture-B	9	2.12132	4.24264	2
brute-force	9	2.12132	4.24264	2
l1-polycube - angel_3	28	0.969791	2.90937	3
brute-force	28	0.969791	2.90937	3
l1-polycube - bunny	242	0.876539	7.88885	9
brute-force	227	0.906213	8.15591	9
l1-polycube - kitty	96	1.09203	6.5522	6
brute-force	86	1.19561	5.97807	5
l1-polycube - rod	66	1.31195	6.55977	5
brute-force	66	1.31195	6.55977	5
closed-form - joint	20	1.1417	4.5668	4
brute-force	20	1.1417	4.5668	4
closed-form - kitten	210	1.36929	13.6929	10
brute-force	182	1.42982	8.57893	6
closed-form - knot	23	1.05602	5.2801	5
brute-force	23	1.05602	5.2801	5
closed-form - eight	58	2.31062	16.1743	7
brute-force	58	2.31062	16.1743	7

Note that the above verification with a brute-force search can only be applied to a number of hex-meshes with small numbers of sheets, as the complexity of the brute-force search increases exponentially with the increase of the numbers of sheets (i.e., an NP-complete problem).

```
SRF - fandisk
avg/total compl./#sheets #overlaps sheetids
0.527425/3.69197/7     18      1 3 6 8 10 12 14
0.573645/4.01552/7     10      0 2 5 7 8 9 13
0.582797/2.33119/4     4       1 3 4 10
0.598571/4.18999/7     25      1 3 6 7 10 12 14
0.623981/4.99185/8     13      0 1 6 8 10 11 12 14
0.640699/4.48489/7     14      0 2 5 7 9 13 14
0.650924/3.90554/6     20      2 3 5 7 8 9
0.660034/5.94031/9     26      2 5 6 7 8 9 11 12 13
0.688528/4.81969/7     29      1 2 3 6 8 12 14
0.689862/5.5189/8      36      1 2 3 5 6 8 9 12
0.70529/4.93703/7      17      0 4 6 8 11 12 14
0.7128/5.7024/8        24      0 1 2 6 8 11 12 14
0.716371/5.73096/8     20      0 1 6 7 10 11 12 14
0.717903/6.46113/9     31      0 1 2 5 6 8 9 11 12
0.731117/4.3867/6      24      2 3 5 7 9 14
0.741485/6.67337/9     33      0 2 5 6 7 8 9 11 12
0.74408/5.95264/8      26      2 6 7 9 11 12 13 14
0.747263/2.98905/4     15      1 2 3 4
0.751146/6.76031/9     38      0 2 4 5 6 8 9 11 12
0.757181/5.30027/7     36      1 2 3 6 7 12 14
0.761768/5.33238/7     20      0 2 6 7 9 13 14
0.78156/3.9078/5       28      2 3 4 7 9
0.786358/5.50451/7     24      0 4 6 7 11 12 14
0.804098/6.43279/8     31      0 1 2 6 7 11 12 14
0.809031/4.85419/6     30      2 3 6 7 9 14
0.835543/6.68434/8     33      0 2 6 7 9 11 12 14
0.856414/3.42565/4     12      0 3 4 11
0.746251/11.1938/15    98      0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
```

SRF - joint

avg/total compl./#sheets	#overlaps	sheetids
0.389748/3.11798/8	10	2 3 5 7 10 11 14 16
0.452857/4.07571/9	21	2 3 5 6 7 11 13 14 16
0.471427/2.82856/6	6	0 6 8 10 13 15
0.474821/3.32375/7	7	0 3 6 8 13 15 16
0.518857/4.15086/8	24	2 3 5 7 10 11 14 15
0.526165/4.73549/9	26	1 3 5 7 10 11 12 14 16
0.555205/2.77602/5	8	1 2 4 9 12
0.559593/5.59593/10	37	1 3 5 6 7 11 12 13 14 16
0.56754/2.8377/5	8	1 4 9 11 12
0.575821/3.45493/6	10	0 6 8 10 14 15
0.590697/5.31627/9	37	0 2 5 7 8 10 11 14 16
0.607897/5.47107/9	40	1 3 5 7 10 11 12 14 15
0.626915/5.64223/9	47	0 2 5 7 8 10 11 13 15
0.655482/6.55482/10	53	0 1 5 7 8 10 11 12 14 16
0.664539/5.98085/9	51	0 2 5 7 8 10 11 14 15
0.675006/6.07506/9	50	2 4 5 7 8 10 11 14 16
0.682186/6.82186/10	63	0 1 5 7 8 10 11 12 13 15
0.704339/7.04339/10	66	1 4 5 7 8 10 11 12 14 16
0.710447/7.10447/10	67	0 1 5 7 8 10 11 12 14 15
0.713967/7.13967/10	68	2 3 4 6 7 8 11 13 15 16
0.724172/6.51755/9	60	2 4 5 7 8 10 11 13 15
0.732072/7.32072/10	60	2 3 4 5 6 7 9 13 14 16
0.736744/8.10419/11	84	1 3 4 6 7 8 11 12 13 15 16
0.740488/6.66439/9	64	2 4 5 7 8 10 11 14 15
0.742842/7.42842/10	76	1 4 5 7 8 10 11 12 13 15
0.742895/6.68606/9	49	2 3 4 5 7 9 10 14 16
0.755759/7.55759/10	80	1 4 5 7 8 10 11 12 14 15
0.769225/6.92303/9	67	2 4 6 7 8 10 11 13 15
0.778661/7.78661/10	83	1 4 6 7 8 10 11 12 13 15
0.784605/7.06145/9	71	2 4 6 7 8 10 11 14 15
0.784792/7.06313/9	62	2 4 5 7 8 9 10 14 16
0.787124/7.87123/10	80	2 3 4 6 7 8 9 13 15 16
0.787331/7.08598/9	63	2 3 4 5 7 9 10 14 15
0.788652/5.52056/7	59	0 4 6 8 9 12 15
0.790993/7.90993/10	87	1 4 6 7 8 10 11 12 14 15
0.812403/7.31163/9	72	2 4 5 7 8 9 10 13 15
0.826981/7.44282/9	76	2 4 5 7 8 9 10 14 15
0.838207/7.54386/9	79	2 4 6 7 8 9 10 13 15
0.852343/7.67109/9	83	2 4 6 7 8 9 10 14 15
0.965884/4.82942/5	**24**	**2 4 7 9 12**
0.755742/12.8476/17	166	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

closed-form - hollow-eight

avg/total compl./#sheets	#overlaps	sheetids
0.581917/6.40108/11	103	0 2 6 7 8 9 10 11 12 14 15
0.663143/5.96828/9	109	0 1 3 4 5 8 9 13 15
0.6911/5.5288/8	39	1 3 4 5 7 9 13 15
0.727582/8.73099/12	169	0 2 3 6 7 8 10 11 12 14 15 17
0.765666/9.18799/12	175	0 2 4 6 7 8 9 10 11 12 14 17
0.808131/9.69757/12	187	0 2 3 4 6 7 8 10 11 12 14 17
0.811198/6.48958/8	121	1 3 4 5 9 13 15 16
0.865361/10.3843/12	172	0 1 2 3 6 7 8 10 11 12 14 15
0.880291/8.80291/10	115	2 6 7 9 10 11 12 14 15 16
0.964303/6.75012/7	146	1 3 4 5 13 16 17
0.986071/11.8328/12	180	0 2 4 6 7 8 9 10 11 12 13 14
0.98992/6.92944/7	64	1 3 4 5 7 13 17
1.01663/8.133/8	116	2 7 10 11 12 14 16 17
1.04904/11.5394/11	184	1 2 3 6 7 10 11 12 14 15 16
1.1064/14.3832/13	249	0 1 2 3 4 6 7 8 10 11 12 13 14
1.12495/8.99956/8	73	1 3 4 5 7 9 12 13
1.1684/12.8524/11	192	2 4 6 7 9 10 11 12 13 14 16
1.23842/14.8611/12	261	1 2 3 4 6 7 10 11 12 13 14 16
1.26436/16.4367/13	255	0 1 2 5 6 8 9 10 11 12 13 14 15
1.45215/17.4258/12	267	1 2 5 6 9 10 11 12 13 14 15 16
1.56998/12.5598/8	103	1 3 4 5 7 11 12 13
1.59244/19.1093/12	238	0 1 3 6 7 8 10 11 12 14 15 16
1.60449/17.6494/11	169	0 6 7 8 9 10 11 12 14 15 16
1.6336/21.2368/13	315	0 1 3 4 6 7 8 10 11 12 13 14 16
1.66111/19.9333/12	246	0 4 6 7 8 9 10 11 12 13 14 16
1.68673/18.554/11	201	0 4 5 6 8 9 10 13 14 15 16
1.6917/20.3003/12	259	0 4 5 6 7 8 9 10 12 13 14 16
1.70224/17.0224/10	268	1 2 5 10 11 12 13 14 16 17
1.71429/13.7143/8	139	0 2 7 11 12 14 16 17
1.71429/13.7143/8	139	2 7 8 10 11 12 16 17
1.84741/18.4741/10	159	0 5 6 8 9 10 11 14 15 16
1.97579/17.7821/9	204	0 1 3 4 6 8 13 16 17
1.97992/19.7992/10	291	0 1 2 5 11 12 13 14 16 17
1.97992/19.7992/10	291	1 2 5 8 10 11 12 13 16 17
2.00579/18.0521/9	185	0 1 3 6 7 8 12 16 17
2.02944/18.2649/9	220	0 1 2 3 4 8 13 16 17
2.04529/18.4076/9	191	0 1 6 8 11 12 15 16 17
2.05865/18.5279/9	201	0 1 2 3 7 8 12 16 17
2.07805/18.7024/9	220	0 1 3 6 8 12 13 16 17
2.09715/18.8744/9	207	0 1 2 8 11 12 15 16 17
2.12449/16.9959/8	127	0 1 3 6 8 15 16 17
2.12483/16.9986/8	135	0 4 6 8 9 13 16 17
2.12911/19.162/9	236	0 1 2 3 8 12 13 16 17
2.13088/17.047/8	116	0 6 7 8 9 12 16 17
2.13825/17.106/8	146	0 6 7 8 11 12 16 17
2.18755/17.5004/8	143	0 1 2 3 8 15 16 17
2.18788/17.503/8	151	0 2 4 8 9 13 16 17
2.19376/17.55/8	132	0 2 7 8 9 12 16 17
2.20092/17.6074/8	162	0 2 7 8 11 12 16 17
2.20478/19.843/9	238	0 1 6 8 11 12 13 16 17
2.21687/17.735/8	151	0 6 8 9 12 13 16 17
2.25298/20.2768/9	254	0 1 2 8 11 12 13 16 17
2.27738/18.219/8	167	0 2 8 9 12 13 16 17
2.31062/16.1743/7	**58**	**0 6 8 9 15 16 17**
2.38624/16.7037/7	74	0 2 8 9 15 16 17
1.46689/26.4041/18	498	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

SRF - bone

avg/total compl./#sheets	#overlaps	sheetids
0.632125/7.58549/12	63	0 1 2 4 5 6 7 8 9 10 11 12
0.664908/6.64908/10	57	0 1 2 3 4 5 6 9 11 12
0.669853/6.69853/10	78	0 1 2 4 5 6 9 11 12 13
0.688559/5.50847/8	47	0 1 3 4 5 7 10 11
0.688559/5.50847/8	47	0 2 3 6 7 8 9 12
0.69177/5.53416/8	68	0 1 4 5 7 10 11 13
0.69177/5.53416/8	68	0 2 6 7 8 9 12 13
0.707071/6.36364/9	55	0 1 2 3 4 5 9 10 11
0.707071/6.36364/9	55	0 2 3 5 6 8 9 11 12
0.711472/6.40325/9	76	0 1 2 4 5 9 10 11 13
0.711472/6.40325/9	76	0 2 5 6 8 9 11 12 13
0.712361/5.69889/8	47	1 3 4 6 7 8 10 12
0.713708/5.70967/8	68	1 4 6 7 8 10 12 13
0.737523/5.90019/8	53	1 3 4 6 7 8 10 11
0.737523/5.90019/8	53	2 3 4 6 7 8 10 12
0.742663/5.9413/8	74	1 4 6 7 8 10 11 13
0.742663/5.9413/8	74	2 4 6 7 8 10 12 13
0.757197/6.05758/8	53	1 3 4 5 7 8 10 11
0.757197/6.05758/8	53	2 3 6 7 8 9 10 12
0.758096/6.06477/8	53	0 2 3 5 8 9 10 11
0.759641/6.07713/8	74	1 4 5 7 8 10 11 13
0.759641/6.07713/8	74	2 6 7 8 9 10 12 13
0.761711/6.09368/8	74	0 2 5 8 9 10 11 13
0.761855/6.09484/8	59	2 3 4 6 7 8 10 11
0.77053/6.16424/8	80	2 4 6 7 8 10 11 13
0.780916/6.24733/8	59	2 3 4 5 7 8 10 11
0.780916/6.24733/8	59	2 3 6 7 8 9 10 11
0.786907/6.29526/8	80	2 4 5 7 8 10 11 13
0.786907/6.29526/8	80	2 6 7 8 9 10 11 13
0.799523/6.39618/8	59	2 3 5 7 8 9 10 11
0.80295/6.4236/8	80	2 5 7 8 9 10 11 13
1.26133/2.52265/2	**24**	**3 13**
0.8031/11.2434/14	174	0 1 2 3 4 5 6 7 8 9 10 11 12 13

SRF - bunny

avg/total compl./#sheets	#overlaps	sheetids
0.565029/5.08526/9	108	1 4 5 8 13 15 17 18 21
0.577577/8.08607/14	143	0 1 3 4 5 8 9 10 11 13 15 16 17 18
0.582793/8.7419/15	155	1 2 4 5 6 7 8 12 13 14 15 17 18 19 20
0.611555/4.89244/8	116	2 6 7 12 14 19 20 21
0.621827/7.46192/12	195	0 1 3 4 8 10 13 15 16 17 18 21
0.654679/11.1295/17	237	0 1 2 3 4 6 7 8 10 12 13 14 15 16 17 18 20
0.656166/8.53016/13	151	0 2 3 6 7 9 10 11 12 14 16 19 20
0.665411/9.31575/14	183	0 1 2 3 4 5 8 9 10 11 13 15 16 18
0.673849/4.71694/7	104	0 3 9 10 11 16 21
0.677923/9.49092/14	182	1 2 3 4 5 6 7 8 12 13 14 15 17 18
0.682041/6.13837/9	148	1 2 4 5 8 13 15 18 21
0.682704/8.87515/13	171	1 2 4 5 6 7 8 11 12 14 15 19 20
0.696375/10.4456/15	226	0 1 3 4 5 6 7 8 9 10 11 13 16 17 18
0.700293/9.8041/14	197	1 2 3 4 5 6 7 8 10 13 14 15 17 18
0.708795/10.6319/15	229	0 1 3 4 5 6 8 9 10 11 14 15 16 17 18
0.71457/8.57484/12	235	0 1 2 3 4 8 10 13 15 16 18 21
0.716279/9.31163/13	189	1 2 4 5 6 7 8 9 11 12 14 19 20
0.724963/9.42452/13	195	0 2 4 5 6 7 8 9 11 12 14 19 20
0.725166/7.25166/10	191	1 4 5 6 7 8 13 17 18 21
0.734505/9.54856/13	185	0 2 3 5 6 7 9 10 11 12 14 16 19
0.736375/7.36375/10	194	1 4 5 6 8 14 15 17 18 21
0.745874/9.69637/13	197	0 2 3 4 6 7 9 10 11 12 14 16 20
0.747067/5.97653/8	162	2 4 6 7 12 14 20 21
0.747344/9.71547/13	278	0 1 3 4 6 7 8 10 13 16 17 18 21
0.748968/11.2345/15	253	0 1 2 3 4 6 7 8 10 11 12 14 15 16 20
0.752592/6.02074/8	150	2 5 6 7 12 14 19 21
0.754355/9.80662/13	281	0 1 3 4 6 8 10 14 15 16 17 18 21
0.758726/11.3809/15	263	0 1 3 4 5 6 7 8 9 10 11 14 16 17 18
0.765843/11.4876/15	266	0 1 2 3 4 5 6 7 8 9 10 11 13 16 18
0.772978/11.5947/15	269	0 1 2 3 4 5 6 8 9 10 11 14 15 16 18
0.775083/7.75083/10	211	0 1 3 4 8 10 11 15 16 21
0.78578/5.50046/7	124	1 4 5 8 11 15 21
0.79743/7.9743/10	228	1 4 5 6 7 8 14 17 18 21
0.801149/9.61379/12	198	1 2 3 4 5 6 7 8 11 12 14 15
0.811559/8.11559/10	231	1 2 4 5 6 7 8 13 18 21
0.812324/10.5602/13	315	0 1 3 4 6 7 8 10 14 16 17 18 21
0.812678/8.12678/10	234	1 2 4 5 6 8 14 15 18 21
0.815642/10.6033/13	231	0 2 3 4 5 6 7 9 10 11 12 14 16
0.820213/10.6628/13	318	0 1 2 3 4 6 7 8 10 13 16 18 21
0.821377/10.6779/13	321	0 1 2 3 4 6 8 10 14 15 16 18 21
0.826925/9.9231/12	213	1 2 3 4 5 6 7 8 10 11 14 15
0.829411/5.80587/7	143	2 3 6 7 12 14 21
0.834845/10.0181/12	216	1 2 3 4 5 6 7 8 9 11 12 14
0.84141/5.88987/7	142	1 4 5 8 9 11 21
0.843596/10.1231/12	222	0 2 3 4 5 6 7 8 9 11 12 14
0.859611/10.3153/12	231	1 2 3 4 5 6 7 8 9 10 11 14
0.866317/6.93053/8	196	2 4 5 6 7 12 14 21
0.868112/10.4173/12	237	0 2 3 4 5 6 7 8 9 10 11 14
0.87055/6.09385/7	148	0 4 5 8 9 11 21
0.883872/9.72259/11	294	0 1 3 4 6 7 8 10 11 16 21
0.904732/6.33313/7	158	2 3 6 7 10 14 21
0.90765/7.2612/8	207	1 4 5 6 7 8 11 21
0.919342/7.35474/8	**228**	**2 4 5 6 7 8 14 21**
0.724848/15.9467/22	518	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

SRF - ellipsoid-A

avg/total compl./#sheets	#overlaps	sheetids
1.16797/4.67188/4	34	0 1 2 3
1.16797/4.67188/4	34	0 1 2 4
1.16797/4.67188/4	34	0 1 3 5
1.16797/4.67188/4	34	0 1 4 5
1.20317/4.81267/4	30	0 2 3 5
1.20317/4.81267/4	30	0 2 4 5
1.38024/4.14071/3	18	1 2 5
1.58364/6.33456/4	38	1 2 3 4
1.58364/6.33456/4	38	1 3 4 5
1.64788/6.59152/4	34	2 3 4 5
1.94475/5.83426/3	**16**	**0 3 4**
1.46372/8.7823/6	68	0 1 2 3 4 5

SRF - hanger

avg/total compl./#sheets	#overlaps	sheetids
0.363875/2.18325/6	0	4 5 6 10 13 15
0.505637/3.03382/6	15	3 4 5 10 13 15
0.588401/3.5304/6	5	1 2 8 11 12 14
0.633463/3.16732/5	9	4 5 6 9 13
0.648542/3.89125/6	20	0 2 3 7 9 12
0.653912/3.92347/6	15	2 8 9 11 12 14
0.686774/4.12064/6	16	0 3 7 8 9 11
0.709289/4.25573/6	18	0 1 2 3 8 12
0.713494/4.28096/6	21	0 3 4 7 9 11
0.73185/3.65925/5	22	1 3 4 8 12
0.737662/4.42597/6	20	0 1 3 8 11 12
0.743908/4.46345/6	11	0 2 3 7 9 11
0.74906/4.49436/6	21	1 2 3 8 11 12
0.760773/3.80386/5	24	3 4 5 9 13

0.764511/4.58706/6	28	0 2 3 8 9 12
0.790569/3.16228/4	20	3 4 9 12
0.790905/4.74543/6	30	0 3 8 9 11 12
0.801547/4.80928/6	31	2 3 8 9 11 12
0.875201/8.75201/10	45	2 4 5 8 10 11 12 13 14 15
0.896956/6.27869/7	**29**	**1 4 5 6 8 12 13**
0.799065/12.785/16	100	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

SRF - rod

avg/total compl./#sheets	#overlaps	sheetids
0.393524/3.14819/8	9	0 3 4 8 9 10 11 13
0.53095/4.77855/9	21	0 3 4 5 8 9 10 11 12
0.557153/4.45722/8	21	0 1 4 8 9 10 11 13
0.575104/5.17593/9	33	0 1 4 5 8 9 10 11 12
0.663419/3.3171/5	9	2 5 9 10 12
0.785169/3.14068/4	9	2 5 12 13
0.799446/3.99723/5	22	1 4 5 6 7
0.815842/5.71089/7	45	0 1 2 4 8 12 13
0.888677/6.22074/7	48	0 1 2 4 8 11 13
0.892936/4.46468/5	18	1 3 5 6 7
0.894433/8.94433/10	53	0 3 5 6 7 8 9 10 11 12
0.912839/9.12839/10	59	0 3 5 6 7 8 9 10 11 13
0.963678/3.85471/4	12	0 1 4 7
0.998346/3.99338/4	**12**	**2 5 11 13**
1.01678/7.11748/7	33	0 2 3 4 8 12 13
1.0761/7.53272/7	36	0 2 3 4 8 11 13
1.20857/6.04287/5	43	1 2 4 6 7
1.28916/10.3133/8	65	0 2 3 6 7 8 12 13
1.30456/5.21826/4	42	1 2 5 7
1.32551/10.6041/8	68	0 2 3 6 7 8 11 13
1.60589/8.02943/5	39	1 2 3 6 7
1.04869/14.6816/14	132	0 1 2 3 4 5 6 7 8 9 10 11 12 13

SRF - sculpture-B

avg/total compl./#sheets	#overlaps	sheetids
0.719306/7.19306/10	35	0 2 5 6 7 8 10 11 17 19
0.719306/7.19306/10	35	0 2 6 8 9 10 11 15 17 19
0.719306/7.19306/10	35	0 3 4 5 7 12 13 14 16 18
0.719306/7.19306/10	35	0 3 4 9 12 13 14 15 16 18
0.719306/7.19306/10	35	1 2 5 6 8 9 10 11 17 19
0.719306/7.19306/10	35	1 3 4 5 9 12 13 14 16 18
0.752032/6.76829/9	38	0 1 2 6 8 9 10 15 19
0.752032/6.76829/9	38	1 2 5 6 7 8 9 11 17
0.752032/6.76829/9	38	1 3 4 5 9 12 14 15 18
0.800383/8.00383/10	44	0 1 2 5 6 7 8 10 11 17
0.800383/8.00383/10	44	0 1 3 4 9 12 13 14 15 18
0.800383/8.00383/10	44	0 2 7 8 9 10 11 15 17 19
0.800383/8.00383/10	44	0 4 5 7 12 13 14 15 16 18
0.800383/8.00383/10	44	1 2 5 6 8 9 10 11 15 19
0.800383/8.00383/10	44	1 3 4 5 7 9 13 14 16 18
0.809305/8.09305/10	36	0 2 5 6 8 9 10 11 17 19
0.809305/8.09305/10	36	0 3 4 5 9 12 13 14 16 18
0.847152/7.62436/9	47	0 1 2 5 7 10 11 15 17
0.847152/7.62436/9	47	0 1 2 7 8 9 10 15 19
0.847152/7.62436/9	47	0 1 4 5 7 13 15 16 18
0.847152/7.62436/9	47	0 1 4 7 9 12 13 14 15
0.847152/7.62436/9	47	1 2 5 6 7 8 9 11 15
0.847152/7.62436/9	47	1 3 4 5 7 9 14 15 18
0.974724/9.74724/10	30	0 1 5 7 8 9 10 13 15 18
0.974724/9.74724/10	30	0 1 5 7 9 10 11 13 14 15
0.974724/9.74724/10	30	0 1 5 7 8 9 10 13 14 15
0.974724/9.74724/10	30	0 1 5 7 8 9 10 14 15 18
0.974724/9.74724/10	30	0 1 5 7 8 9 11 13 14 15
0.974724/9.74724/10	30	0 1 5 7 8 9 11 13 15 18
0.974724/9.74724/10	30	0 1 5 7 8 9 11 14 15 18
0.974724/9.74724/10	30	0 1 5 7 9 10 11 13 15 18
0.974724/9.74724/10	30	0 1 5 7 9 10 11 14 15 18
1.02371/9.2134/9	57	0 1 2 5 7 8 9 10 15
1.02371/9.2134/9	57	0 1 2 5 7 8 9 11 15
1.02371/9.2134/9	57	0 1 2 5 7 9 10 11 15
1.02371/9.2134/9	57	0 1 4 5 7 9 13 14 15
1.02371/9.2134/9	57	0 1 4 5 7 9 13 15 18
1.02371/9.2134/9	57	0 1 4 5 7 9 14 15 18
2.12132/4.24264/2	**9**	**2 4**
0.767723/15.3545/20	138	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

11-polycube - angel_3

avg/total compl./#sheets	#overlaps	sheetids
0.565672/5.09104/9	34	1 2 3 4 5 7 8 9 11
0.604988/4.8399/8	48	1 3 4 5 7 9 11 13
0.613465/6.74811/11	50	0 1 3 4 5 6 7 9 10 11 12
0.731274/4.38765/6	30	0 2 6 8 10 12
0.7501/6.0008/8	50	0 2 3 5 7 8 9 11
0.750301/6.00241/8	50	0 2 3 5 7 9 10 11
0.754538/3.77269/5	44	0 6 10 12 13
0.801932/5.61353/7	64	0 3 5 7 9 11 13
0.837951/5.86566/7	51	0 2 3 7 8 11 12
0.838031/5.86621/7	51	0 2 3 7 10 11 12
0.846364/5.07818/6	40	0 2 3 6 8 12
0.84647/5.07882/6	40	0 2 3 6 10 12
0.914527/5.48716/6	65	0 3 7 11 12 13
0.917711/4.58855/5	54	0 3 6 12 13
0.969791/2.90937/3	**28**	**2 8 13**
1.07492/4.29969/4	54	0 2 10 13
1.12217/3.36652/3	38	2 3 13
0.790046/11.0606/14	156	0 1 2 3 4 5 6 7 8 9 10 11 12 13

11-polycube - bunny

avg/total compl./#sheets	#overlaps	sheetids
0.532494/5.32494/10	122	0 3 6 7 10 14 16 19 20 22
0.559376/8.95002/16	159	0 1 3 4 6 7 9 10 11 14 15 16 17 19 20 21
0.589569/4.71655/8	116	1 4 9 11 15 17 21 22
0.593143/8.89715/15	157	0 2 3 5 6 7 8 10 12 13 14 16 18 19 20
0.606465/6.06465/10	148	0 3 6 7 10 12 14 19 20 22
0.616979/9.87166/16	188	0 1 3 4 6 7 8 9 10 11 14 15 16 17 20 21
0.63954/10.8722/17	226	0 1 2 3 4 5 6 7 9 11 12 13 15 17 19 20 21
0.639553/9.59329/15	180	0 1 3 4 6 7 9 10 11 12 14 17 19 20 21
0.640507/6.40507/10	151	0 3 6 7 8 10 14 16 20 22
0.64598/8.39774/13	151	1 2 4 5 8 9 11 12 13 15 17 18 21
0.653185/6.53185/10	171	0 1 3 6 7 10 14 16 19 22
0.654881/9.82321/15	199	0 1 4 5 8 9 10 11 13 14 15 16 17 18 21
0.660211/9.90316/15	193	0 1 2 3 4 6 7 9 10 11 12 14 17 19 20
0.664823/10.6372/16	216	0 1 3 4 6 7 8 9 10 11 14 15 16 17 18 21
0.666712/4.66699/7	114	2 5 8 12 13 18 22
0.668549/7.35404/11	189	0 2 3 5 6 7 12 13 19 20 22
0.669464/10.042/15	206	0 1 2 3 5 6 7 8 10 12 13 14 16 18 19
0.672121/6.72121/10	172	0 3 6 7 10 11 14 19 20 22
0.680029/11.5605/17	254	0 1 2 3 4 5 6 7 9 10 11 12 13 17 19 20 21
0.684861/11.6426/17	255	0 1 2 3 4 5 6 7 8 9 11 12 13 15 17 20 21
0.685517/10.2828/15	207	0 2 3 5 6 7 8 10 11 12 13 14 18 19 20
0.695622/6.95622/10	179	0 3 6 7 8 10 14 16 18 22
0.697226/10.4584/15	209	0 1 3 4 6 7 8 9 10 11 12 14 17 20 21
0.697968/5.58374/8	144	1 4 9 10 11 17 21 22
0.699453/10.4918/15	227	0 1 3 4 5 6 7 8 10 11 14 15 16 18 21
0.702285/11.2366/16	253	0 1 4 5 6 7 8 10 11 13 14 15 16 17 18 21
0.703206/7.03206/10	177	0 3 6 7 8 10 12 14 20 22
0.710491/9.23638/13	179	1 2 4 5 8 9 10 11 12 13 17 18 21
0.711254/5.69003/8	142	1 4 9 11 12 17 21 22
0.712673/9.97743/14	205	1 2 4 5 6 7 8 11 12 13 15 17 18 21
0.716223/10.7433/15	222	0 1 2 3 4 6 7 8 9 10 11 12 14 17 20
0.722816/12.2879/17	283	0 1 2 3 4 5 6 7 8 9 10 11 12 13 17 20 21
0.728615/7.28615/10	197	0 1 3 6 7 10 12 14 19 22
0.728633/10.2009/14	215	1 2 3 4 5 6 7 8 11 12 13 15 18 21
0.730283/7.30283/10	200	0 1 3 6 7 8 10 14 16 22
0.732375/6.59138/9	170	1 4 6 7 11 15 17 21 22
0.734402/6.60962/9	162	0 5 8 10 13 14 16 18 22
0.742744/8.17018/11	218	0 2 3 5 6 7 8 12 13 20 22
0.743763/10.4127/14	220	0 1 4 5 8 9 10 11 12 13 14 17 18 21
0.745588/11.1838/15	237	0 1 3 4 6 7 8 9 10 11 12 14 17 18 21
0.750354/9.00425/12	258	0 1 5 6 7 10 13 14 16 18 19 22
0.750837/9.76088/13	197	1 2 4 5 8 9 10 11 12 13 14 17 18
0.752032/6.76829/9	180	1 3 4 6 7 11 15 21 22
0.75375/7.5375/10	205	0 3 6 7 8 10 12 14 18 22
0.756841/11.3526/15	256	0 1 2 3 5 6 7 8 10 11 12 13 14 18 19
0.759309/6.83378/9	178	1 4 6 8 11 15 17 21 22
0.760584/6.08467/8	155	1 2 4 9 11 12 17 22
0.761523/7.61523/10	201	0 3 6 7 8 10 11 14 20 22
0.763382/11.4507/15	250	0 1 2 3 4 6 7 8 9 10 11 12 14 17 18
0.763778/10.6929/14	233	1 2 4 5 6 7 8 10 11 12 13 17 18 21
0.765431/6.88888/9	203	1 4 5 8 11 15 18 21 22
0.766198/6.12958/8	162	1 4 9 10 11 14 17 22
0.773459/8.50805/11	238	0 1 2 3 5 6 7 12 13 19 22
0.77869/10.9017/14	243	1 2 3 4 5 6 7 8 10 11 12 13 18 21
0.780705/7.80705/10	221	0 1 3 6 7 10 11 14 19 22
0.783389/8.61728/11	246	0 1 2 5 6 7 12 13 18 19 22
0.783691/11.7554/15	274	0 1 4 5 6 7 8 10 11 12 13 14 17 18 21
0.788974/11.0456/14	248	0 1 3 4 5 6 7 8 10 11 12 14 18 21
0.796362/11.1491/14	251	1 2 4 5 6 7 8 10 11 12 13 14 17 18
0.796547/7.96547/10	231	1 4 5 6 7 11 15 18 21 22
0.797128/9.56554/12	284	0 1 5 6 7 10 12 13 14 18 19 22
0.798462/7.98462/10	226	0 1 3 6 7 8 10 12 14 22
0.79924/7.19316/9	188	1 3 4 6 8 11 15 21 22
0.802096/7.21887/9	188	0 5 8 10 12 13 14 18 22
0.804145/7.2373/9	198	1 4 6 7 10 11 17 21 22
0.808272/11.3158/14	261	0 1 2 3 4 5 6 7 8 10 11 12 14 18
0.810676/11.3495/14	261	1 2 3 4 5 6 7 8 10 11 12 13 14 18
0.813291/7.31962/9	196	1 4 6 7 11 12 17 21 22
0.821787/8.21787/10	229	0 3 6 7 8 10 11 14 18 22
0.822087/7.39878/9	208	1 3 4 6 7 10 11 21 22
0.828486/9.11335/11	267	0 1 2 3 5 6 7 8 12 13 22
0.828749/7.45874/9	206	1 4 6 8 10 11 17 21 22
0.831036/7.47933/9	206	1 3 4 6 7 11 12 21 22
0.837627/7.53864/9	204	1 4 6 8 11 12 17 21 22
0.84318/7.58862/9	229	1 4 5 8 11 12 18 21 22
0.847132/8.47132/10	250	0 1 3 6 7 8 10 11 14 22
0.847988/7.63189/9	209	1 2 4 6 7 11 12 17 22
0.848404/10.1808/12	308	0 1 5 6 7 10 11 13 14 18 19 22
0.849139/7.64225/9	231	1 4 5 8 10 11 18 21 22
0.851811/7.6663/9	216	1 4 6 7 10 11 14 17 22
0.857784/8.57784/10	257	1 4 5 6 7 11 12 18 21 22
0.862532/8.62532/10	259	1 4 5 6 7 10 11 18 21 22
0.865021/7.78519/9	219	1 2 3 4 6 7 11 12 22
0.865483/7.78934/9	216	1 3 4 6 8 10 11 21 22
0.867379/7.80641/9	212	0 5 8 10 11 13 14 18 22
0.86877/7.81893/9	226	1 3 4 6 7 10 11 14 22
0.871198/7.84078/9	217	1 2 4 6 8 11 12 17 22
0.873987/7.86589/9	214	1 3 4 6 8 11 12 21 22
0.875076/7.87569/9	224	1 4 6 8 10 11 14 17 22
0.876539/7.88885/9	242	1 2 4 5 8 11 12 18 22
0.88458/8.8458/10	270	1 2 4 5 6 7 11 12 18 22
0.906213/8.15591/9	**227**	**1 2 3 4 6 8 11 12 22**
0.909941/8.18947/9	234	1 3 4 6 8 10 11 14 22
0.911247/8.20122/9	249	1 4 5 8 10 11 14 18 22
0.912426/9.12426/10	277	1 4 5 6 7 10 11 14 18 22
0.719616/16.5512/23	546	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

11-polycube - kitty

avg/total compl./#sheets	#overlaps	sheetids
0.558297/6.14127/11	61	0 1 3 5 6 7 8 11 12 13 14
0.63622/4.45354/7	60	1 5 6 8 12 14 15
0.672757/6.05481/9	61	0 2 3 4 7 9 10 11 13
0.677463/6.77463/10	69	1 2 4 5 6 8 9 10 12 14
0.680568/4.08341/6	52	0 3 7 11 13 15
0.721779/5.05245/7	68	1 5 6 7 12 14 15
0.722973/7.22973/10	77	1 2 4 5 6 7 9 10 12 14
0.732983/7.32983/10	86	0 1 3 4 5 6 7 8 11 12
0.747007/6.72307/9	70	0 2 3 4 7 9 10 11 12
0.767359/6.90623/9	81	0 2 3 4 5 7 9 10 13
0.782212/7.82212/10	95	1 2 3 4 5 6 7 9 10 13
0.784586/7.06127/9	82	0 2 3 4 5 8 9 10 12
0.791962/5.54374/7	86	1 3 5 6 7 13 15
0.793285/4.75971/6	61	0 3 7 11 12 15
0.795656/5.56959/7	87	1 3 5 6 8 12 15
0.795934/7.95934/10	96	1 2 3 4 5 6 8 9 10 12
0.806869/7.26182/9	89	0 1 2 3 4 5 6 7 13
0.812287/4.87372/6	72	0 3 5 7 13 15
0.817185/4.90311/6	73	0 3 5 8 12 15
0.82327/7.40943/9	90	0 1 2 3 4 5 6 8 12
0.833221/7.49899/9	90	0 2 3 4 5 7 9 10 12
0.835011/8.35011/10	104	1 2 3 4 5 6 7 9 10 12
0.865597/6.05918/7	95	1 3 5 6 7 12 15
0.869745/7.82771/9	98	0 1 2 3 4 5 6 7 12
0.908812/5.45287/6	81	0 3 5 7 12 15
0.935515/6.54861/7	90	1 4 5 6 8 12 15
1.01609/5.08047/5	60	2 4 9 10 15
1.02398/6.14387/6	82	0 3 4 7 11 15
1.0603/6.3618/6	84	1 4 5 6 7 15
1.09203/6.5522/6	96	1 2 4 5 6 15

1.1217/6.73017/6	102	0 3 4 5 7 15
1.19561/5.97807/5	**86**	**0 2 3 4 15**
0.80258/12.8413/16	242	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

l1-polycube - rod

avg/total compl./#sheets	#overlaps	sheetids
0.493939/5.92727/12	56	0 1 2 3 5 7 9 10 11 12 13 14
0.542539/4.88285/9	64	0 3 5 9 10 12 13 14 16
0.595297/7.14356/12	72	0 3 4 5 6 8 9 10 12 13 14 15
0.608048/5.47243/9	74	0 1 5 9 10 12 13 14 16
0.608048/5.47243/9	74	0 2 3 5 10 12 13 14 16
0.608761/5.47885/9	74	0 1 2 10 11 12 13 14 16
0.624528/7.49433/12	84	0 1 2 3 4 5 7 9 11 12 13 14
0.624528/7.49433/12	84	0 1 2 3 5 6 7 9 10 11 13 14
0.630333/7.564/12	82	0 1 4 5 6 8 9 10 12 13 14 15
0.630333/7.564/12	82	0 2 3 4 5 6 8 10 12 13 14 15
0.630721/7.56865/12	82	0 1 2 4 6 8 10 11 12 13 14 15
0.663523/7.96227/12	92	0 1 2 4 5 6 8 10 12 13 14 15
0.667154/6.00439/9	84	0 1 2 5 10 12 13 14 16
0.703337/8.44005/12	106	0 1 2 3 4 5 6 7 9 11 13 15
0.732184/8.78621/12	112	0 1 2 3 4 5 6 7 9 11 13 14
0.734405/6.60964/9	69	0 3 4 5 6 7 8 9 15
0.738758/5.91006/8	58	1 2 4 6 7 8 11 15
0.78178/7.03602/9	92	0 3 4 5 9 12 13 14 16
0.78178/7.03602/9	92	0 3 5 6 9 10 13 14 16
0.782923/7.04631/9	75	0 3 4 5 6 7 8 9 14
0.784383/7.05944/9	79	0 1 4 5 6 7 8 9 15
0.784383/7.05944/9	79	0 2 3 4 5 6 7 8 15
0.799335/6.39468/8	64	1 2 4 6 7 8 11 14
0.800803/6.40642/8	68	1 2 4 5 6 7 8 15
0.829984/7.46986/9	85	0 1 4 5 6 7 8 9 14
0.829984/7.46986/9	85	0 2 3 4 5 6 7 8 14
0.833948/7.50553/9	102	0 1 4 5 9 12 13 14 16
0.833948/7.50553/9	102	0 1 5 6 9 10 13 14 16
0.833948/7.50553/9	102	0 2 3 4 5 12 13 14 16
0.833948/7.50553/9	102	0 2 3 5 6 10 13 14 16
0.834468/7.51022/9	102	0 1 2 4 11 12 13 14 16
0.834468/7.51022/9	102	0 1 2 6 10 11 13 14 16
0.857005/6.85604/8	74	1 2 4 5 6 7 8 14
0.883039/7.94735/9	112	0 1 2 4 5 12 13 14 16
0.883039/7.94735/9	112	0 1 2 5 6 10 13 14 16
0.902569/5.41542/6	61	0 3 5 7 9 16
0.929275/8.36347/9	114	0 3 4 5 6 9 13 15 16
0.963333/8.67/9	120	0 3 4 5 6 9 13 14 16
0.97814/8.80326/9	124	0 1 4 5 6 9 13 15 16
0.97814/8.80326/9	124	0 2 3 4 5 6 13 15 16
0.978583/8.80725/9	124	0 1 2 4 6 11 13 15 16
0.990667/4.95333/5	50	1 2 7 11 16
0.991584/5.94951/6	71	0 1 5 7 9 16
0.991584/5.94951/6	71	0 2 3 5 7 16
1.01055/9.09497/9	130	0 1 4 5 6 9 13 14 16
1.01055/9.09497/9	130	0 2 3 4 5 6 13 14 16
1.01098/9.09884/9	130	0 1 2 4 6 11 13 14 16
1.02468/9.22209/9	134	0 1 2 4 5 6 13 15 16
1.05566/9.50096/9	140	0 1 2 4 5 6 13 14 16
1.10581/5.52905/5	60	1 2 5 7 16
1.31195/6.55977/5	**66**	**4 6 8 15 16**
1.38927/6.94635/5	72	4 6 8 14 16
1.58991/7.94954/5	90	4 6 7 8 16
0.822323/13.9795/17	244	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

closed-form - joint

avg/total compl./#sheets	#overlaps	sheetids
0.623028/3.11514/5	7	0 3 4 11 12
0.637338/4.46137/7	24	0 4 6 7 8 11 13
0.66104/4.62728/7	31	0 3 5 6 7 11 13
0.743018/5.20113/7	38	0 3 4 6 7 11 13
0.764908/5.35435/7	36	2 4 6 7 8 11 13
0.789727/5.52809/7	52	0 2 3 9 11 12 14
0.810354/5.67248/7	43	2 3 5 6 7 11 13
0.832434/5.82704/7	44	2 3 5 6 11 12 13
0.854962/5.98473/7	50	2 3 4 6 7 11 13
0.864031/6.04821/7	35	2 4 7 8 9 10 13
0.875918/6.13143/7	51	2 3 4 6 11 12 13
0.917792/6.42454/7	48	2 4 7 8 9 11 13
0.922826/6.45979/7	49	2 3 4 7 9 10 13
0.931972/6.52381/7	56	2 3 5 9 11 12 13
0.934407/6.54085/7	55	2 3 5 7 9 11 13
0.971009/6.79706/7	63	2 3 4 9 11 12 13
0.973346/6.81342/7	62	2 3 4 7 9 11 13
1.1417/4.5668/4	**20**	**2 9 13 14**
0.776365/11.6455/15	118	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

closed-form - kitten

avg/total compl./#sheets	#overlaps	sheetids
0.589854/6.4884/11	100	0 1 3 5 6 8 9 11 12 13 14
0.700253/4.90177/7	104	1 6 9 11 13 14 15
0.748123/4.48874/6	76	1 3 5 8 12 15
0.780122/3.90061/5	108	2 4 7 10 15
0.793198/5.55238/7	134	0 5 6 9 11 13 15
0.800612/4.80367/6	102	0 3 5 12 13 15
0.857149/5.14289/6	122	0 3 5 11 13 15
0.866645/6.06652/7	146	1 5 6 9 11 13 15
0.898284/5.3897/6	114	1 3 5 12 13 15
0.94902/5.69412/6	134	1 3 5 11 13 15
0.984533/8.8608/9	116	1 2 3 4 5 7 8 10 12
1.1994/10.7946/9	142	0 2 3 4 5 7 10 12 13
1.21128/12.1128/10	144	1 2 4 6 7 9 10 11 13 14
1.24126/11.1713/9	154	1 2 3 4 5 7 10 12 13
1.25837/13.8421/11	206	0 1 2 3 5 6 9 10 11 13 14
1.2669/12.669/10	174	0 2 4 5 6 7 9 10 11 13
1.29916/12.9916/10	186	1 2 4 5 6 7 9 10 11 13
1.30187/11.7168/9	162	0 2 3 4 5 7 10 11 13
1.31254/7.87526/6	188	2 3 4 5 10 15
1.33873/13.3873/10	198	0 2 3 4 5 6 9 10 11 13
1.34053/12.0648/9	174	1 2 3 4 5 7 10 11 13
1.36929/13.6929/10	210	1 2 3 4 5 6 9 10 11 13
1.4041/11.2328/8	222	2 4 6 9 10 11 13 15
1.42982/8.57893/6	**182**	**1 2 3 5 10 15**
1.47329/10.313/7	216	0 2 3 5 10 13 15
1.06551/17.0481/16	416	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

closed-form - knot

avg/total compl./#sheets #overlaps sheetids

0.599705/4.79764/8	26	0 1 2 5 6 7 8 9
0.723453/4.34072/6	33	1 2 6 8 9 10
0.775683/5.42978/7	27	1 2 3 4 6 8 9
0.913459/3.65384/4	29	0 2 7 10
0.913459/3.65384/4	29	5 7 8 10
0.925472/2.77642/3	24	3 4 10
1.05602/5.2801/5	23	0 2 3 4 7
1.05602/5.2801/5	**23**	**3 4 5 7 8**
1.0991/4.39641/4	35	2 7 8 10
1.16426/5.82132/5	29	2 3 4 7 8
1.27767/6.38836/5	29	0 2 4 7 9
1.27767/6.38836/5	29	4 5 7 8 9
1.3685/6.84248/5	35	2 4 7 8 9
1.50292/4.50875/3	30	4 9 10
1.74444/5.23332/3	42	4 7 10
0.91427/10.057/11	100	0 1 2 3 4 5 6 7 8 9 10

polycut-aligned - rockerarm

avg/total compl./#sheets	#overlaps	sheetids
0.493272/8.8789/18	177	1 2 3 4 6 7 9 10 13 14 15 16 18 19 20 21 22 23
0.517002/5.17002/10	130	1 4 7 9 11 13 19 21 22 23
0.53311/6.39732/12	178	2 3 6 9 10 11 15 18 19 21 22 23
0.537763/5.37764/10	148	2 3 6 10 11 14 15 16 18 20
0.576999/6.92399/12	199	2 3 6 9 10 11 14 15 18 19 21 23
0.580905/5.80905/10	151	1 4 7 9 11 13 14 19 21 23
0.582242/6.98691/12	198	2 3 6 7 9 10 11 15 19 21 22 23
0.582813/6.99376/12	203	2 3 6 9 10 11 15 16 18 19 21 22
0.583736/10.5072/18	238	0 1 2 3 4 6 7 9 10 13 14 15 16 18 19 20 21 22
0.589204/5.89204/10	155	1 4 7 9 11 13 16 19 21 22
0.589454/7.07344/12	197	1 3 4 6 9 11 15 18 19 21 22 23
0.602989/6.63288/11	174	1 3 4 6 7 9 11 19 21 22 23
0.606662/6.06662/10	168	2 3 6 7 10 11 14 15 16 20
0.622678/7.47213/12	219	2 3 6 7 9 10 11 14 15 19 21 23
0.628069/7.53683/12	223	2 3 6 7 9 10 11 15 16 19 21 22
0.629426/7.55312/12	218	1 3 4 6 9 11 14 15 18 19 21 23
0.63476/7.61713/12	222	1 3 4 6 9 11 15 16 18 19 21 22
0.635487/6.99036/11	208	2 3 6 9 10 11 14 15 16 18 19
0.636464/6.36464/10	175	1 4 7 10 11 13 14 15 16 20
0.642116/7.06327/11	199	1 3 4 6 10 11 14 15 16 18 20
0.649291/7.1422/11	195	1 3 4 6 7 9 11 14 19 21 23
0.654222/5.888/9	160	1 4 7 9 11 13 14 16 19
0.655442/7.20986/11	199	1 3 4 6 7 9 11 16 19 21 22
0.664321/9.3005/14	187	0 1 4 5 7 8 9 12 13 17 19 21 22 23
0.682317/10.9171/16	235	0 2 3 5 6 8 9 10 12 15 17 18 19 21 22 23
0.68488/7.53368/11	228	2 3 6 7 9 10 11 14 15 16 19
0.690997/7.60097/11	219	1 3 4 6 7 10 11 14 15 16 20
0.692182/7.614/11	227	1 3 4 6 9 11 14 15 16 18 19
0.692681/8.31217/12	239	0 2 3 6 9 10 11 15 18 19 21 22
0.696614/11.1458/16	254	0 1 3 4 5 6 8 9 12 15 17 18 19 21 22 23
0.699856/10.4978/15	231	0 1 3 4 5 6 7 8 9 12 17 19 21 22 23
0.704814/9.8674/14	208	0 1 4 5 7 8 9 12 13 14 17 19 21 23
0.705025/11.2804/16	255	0 2 3 5 6 7 8 9 10 12 15 17 19 21 22 23
0.710342/12.0758/17	306	0 1 2 3 5 6 7 8 9 10 13 14 15 16 18 19 20
0.712744/11.4039/16	256	0 2 3 5 6 8 9 10 12 14 15 17 18 19 21 23
0.713411/7.13411/10	191	0 1 4 7 9 11 13 19 21 22
0.720656/7.20656/10	204	1 3 4 6 7 9 11 14 16 19
0.724209/10.1389/14	212	0 1 4 5 7 8 9 12 13 16 17 19 21 22
0.726442/11.6231/16	275	0 1 3 4 5 6 8 9 12 14 15 17 18 19 21 23
0.726971/8.72366/12	260	0 2 3 6 9 10 11 14 15 18 19 21
0.727477/11.6396/16	260	0 2 3 5 6 8 9 10 12 15 16 17 18 19 21 22
0.731168/8.77401/12	259	0 2 3 6 7 9 10 11 15 19 21 22
0.733548/11.0032/15	252	0 1 3 4 5 6 7 8 9 12 14 17 19 21 23
0.734478/10.2827/14	205	0 2 3 5 6 8 10 12 14 15 16 17 18 20
0.734511/11.7522/16	276	0 2 3 5 6 7 8 9 10 12 14 15 17 19 21 23
0.736923/8.84308/12	258	0 1 3 4 6 9 11 15 18 19 21 22
0.740881/13.3359/18	350	0 1 2 4 5 6 7 8 9 10 12 13 14 15 16 18 19 20
0.740903/11.8544/16	279	0 1 3 4 5 6 8 9 12 15 16 17 18 19 21 22
0.748817/11.9811/16	280	0 2 3 5 6 7 8 9 10 12 15 16 17 19 21 22
0.749824/11.2474/15	256	0 1 3 4 5 6 7 8 9 12 16 17 19 21 22
0.760957/7.60957/10	212	0 1 4 7 9 11 13 14 19 21
0.761477/8.37625/11	235	0 1 3 4 6 7 9 11 19 21 22
0.761954/10.6674/14	225	0 2 3 5 6 7 8 10 12 14 15 16 17 20
0.763732/9.16479/12	280	0 2 3 6 7 9 10 11 14 15 19 21
0.764014/11.4602/15	256	0 1 3 4 5 6 8 10 12 14 15 16 17 18 20
0.76828/10.7559/14	232	0 1 4 5 7 8 10 12 13 14 15 16 17 20
0.769244/9.23093/12	279	0 1 3 4 6 9 11 14 15 18 19 21
0.774625/11.6194/15	265	0 2 3 5 6 8 9 10 12 14 15 16 17 18 19
0.778127/10.1157/13	217	0 1 4 5 7 8 9 12 13 14 16 17 19
0.787105/11.8066/15	276	0 1 3 4 5 6 7 8 10 12 14 15 16 17 20
0.78897/11.8345/15	284	0 1 3 4 5 6 8 9 12 14 15 16 17 18 19
0.797425/11.9614/15	285	0 2 3 5 6 7 8 9 10 12 14 15 16 17 19
0.798613/8.78474/11	256	0 1 3 4 6 7 9 11 14 19 21
0.801885/11.2264/14	261	0 1 3 4 5 6 7 8 9 12 14 16 17 19
0.882766/11.476/13	360	0 1 3 5 6 8 10 11 14 15 16 18 20
0.909339/11.8214/13	380	0 1 3 5 6 7 8 10 11 14 15 16 20
0.914418/10.973/12	336	0 1 5 7 8 10 11 13 14 15 16 20
0.919222/11.9499/13	353	0 2 5 6 8 10 11 12 14 15 16 18 20
0.938324/12.1982/13	373	0 2 5 6 7 8 10 11 12 14 15 16 20
0.939999/12.22/13	373	0 1 5 6 8 10 11 12 14 15 16 18 20
0.958687/12.4629/13	393	0 1 5 6 7 8 10 11 12 14 15 16 20
0.976859/9.76859/10	269	0 2 3 5 6 8 9 11 15 18
1.00805/10.0805/10	289	0 1 3 5 6 8 9 11 15 18
1.01704/10.1704/10	289	0 2 3 5 6 7 8 9 11 15
1.01792/10.1792/10	303	0 1 3 5 6 7 8 9 11 19
1.02003/9.18024/9	259	0 1 5 7 8 9 11 13 19
1.04338/10.4338/10	282	0 2 5 6 8 9 11 12 15 18
1.04704/10.4704/10	309	0 1 3 5 6 7 8 9 11 15
1.05579/9.50215/9	265	0 1 5 7 8 9 11 13 15
1.06447/10.6447/10	316	0 1 5 6 7 8 9 11 12 19
1.06478/10.6478/10	302	0 1 5 6 8 9 11 12 15 18
1.07157/10.7157/10	302	0 2 5 6 7 8 9 11 12 15
1.09241/10.9241/10	322	0 1 5 6 7 8 9 11 12 15
1.32239/7.93434/6	**158**	**0 5 8 11 12 17**
0.788643/18.9274/24	670	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

polycut-simplified - rockerarm

0.59535/7.1442/12	80	0 1 2 3 4 5 6 7 10 12 14 15
0.595568/4.76454/8	78	0 2 4 5 8 10 12 15
0.641393/5.13114/8	88	0 2 3 4 5 8 10 12
0.662805/7.95367/12	106	0 2 3 4 5 6 7 9 10 12 14 15
0.673645/4.04187/6	64	1 3 6 7 8 14
0.695148/5.56118/8	92	0 2 4 6 8 10 12 15
0.72309/7.2309/10	82	0 2 4 5 9 10 11 12 13 15
0.728331/9.4683/13	139	0 1 3 4 5 6 7 9 10 12 13 14 15

0.735046/5.88036/8	102	0 2 3 4 6 8 10 12
0.739706/5.91765/8	95	0 1 6 7 8 10 14 15
0.740502/6.66451/9	109	0 1 2 5 8 10 12 14 15
0.747738/7.47738/10	92	0 2 3 4 5 9 10 11 12 13
0.749372/5.99498/8	68	1 3 6 7 9 11 13 14
0.770475/6.1638/8	102	0 1 2 3 5 8 12 14
0.780196/7.80196/10	96	0 2 4 6 9 10 11 12 13 15
0.788132/8.66945/11	113	0 1 2 5 9 10 11 12 13 14 15
0.796691/7.96691/10	99	0 1 6 7 9 10 11 13 14 15
0.800339/8.00339/10	106	0 1 2 3 5 9 11 12 13 14
0.803244/8.03244/10	106	0 2 3 4 6 9 10 11 12 13
0.806162/7.25546/9	123	0 1 2 6 8 10 12 14 15
0.831925/9.15117/11	127	0 1 2 6 9 10 11 12 13 14 15
0.832501/5.8275/7	92	1 2 3 6 8 12 14
0.833052/7.49747/9	96	1 2 3 6 9 11 12 13 14
0.867278/6.93822/8	114	0 2 3 4 5 8 9 12
0.872621/7.85359/9	135	0 2 5 8 9 10 12 14 15
0.920431/7.36345/8	121	0 6 7 8 9 10 14 15
0.928582/7.42866/8	128	0 2 3 5 8 9 12 14
0.930598/8.37538/9	149	0 2 6 8 9 10 12 14 15
0.940332/7.52266/8	128	0 2 3 4 6 8 9 12
0.958598/8.62738/9	137	0 4 5 8 9 10 12 13 15
0.992583/5.9555/6	90	3 6 7 8 9 14
1.00073/9.00654/9	151	0 4 6 8 9 10 12 13 15
1.0095/9.08551/9	151	0 5 8 9 10 12 13 14 15
1.02414/7.169/7	118	2 3 6 8 9 12 14
1.03366/8.26925/8	130	0 3 4 5 8 9 12 13
1.04959/9.44629/9	165	0 6 8 9 10 12 13 14 15
1.07516/8.60129/8	144	0 3 5 8 9 12 13 14
1.08289/8.66314/8	144	0 3 4 6 8 9 12 13
1.15909/8.1136/7	134	3 6 8 9 12 13 14
1.65601/6.62405/4	**66**	**8 9 11 13**
0.894972/14.3196/16	292	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

References

[1] X. Fang, W. Xu, H. Bao, and J. Huang. All-hex meshing using closed-form induced polycube. *ACM Trans. Graph.*, 35(4):124, 2016.

[2] J. Huang, T. Jiang, Z. Shi, Y. Tong, H. Bao, and M. Desbrun. 1-Based Construction of Polycube Maps from Complex Shapes. *ACM Trans. Graph.*, 33(3):25:1–25:11, 2014.

[3] Y. Li, Y. Liu, W. Xu, W. Wang, and B. Guo. All-hex meshing using singularity-restricted field. *ACM Trans. Graph.*, 31(6):177, 2012.