

Neighbor-Aware Data-Driven Relaxation of Stitch Mesh Models for Knits

SUPPLEMENTAL MATERIAL

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1 PATTERNS

We created a small set of building blocks that were systematically repeated to create patterns to be used in validation tests. Each measurement was done over a 40×48 out of 100×120 patch. The following Figure 1 and Table 1 show the visual representation and the number of each kernel type used within the patch.

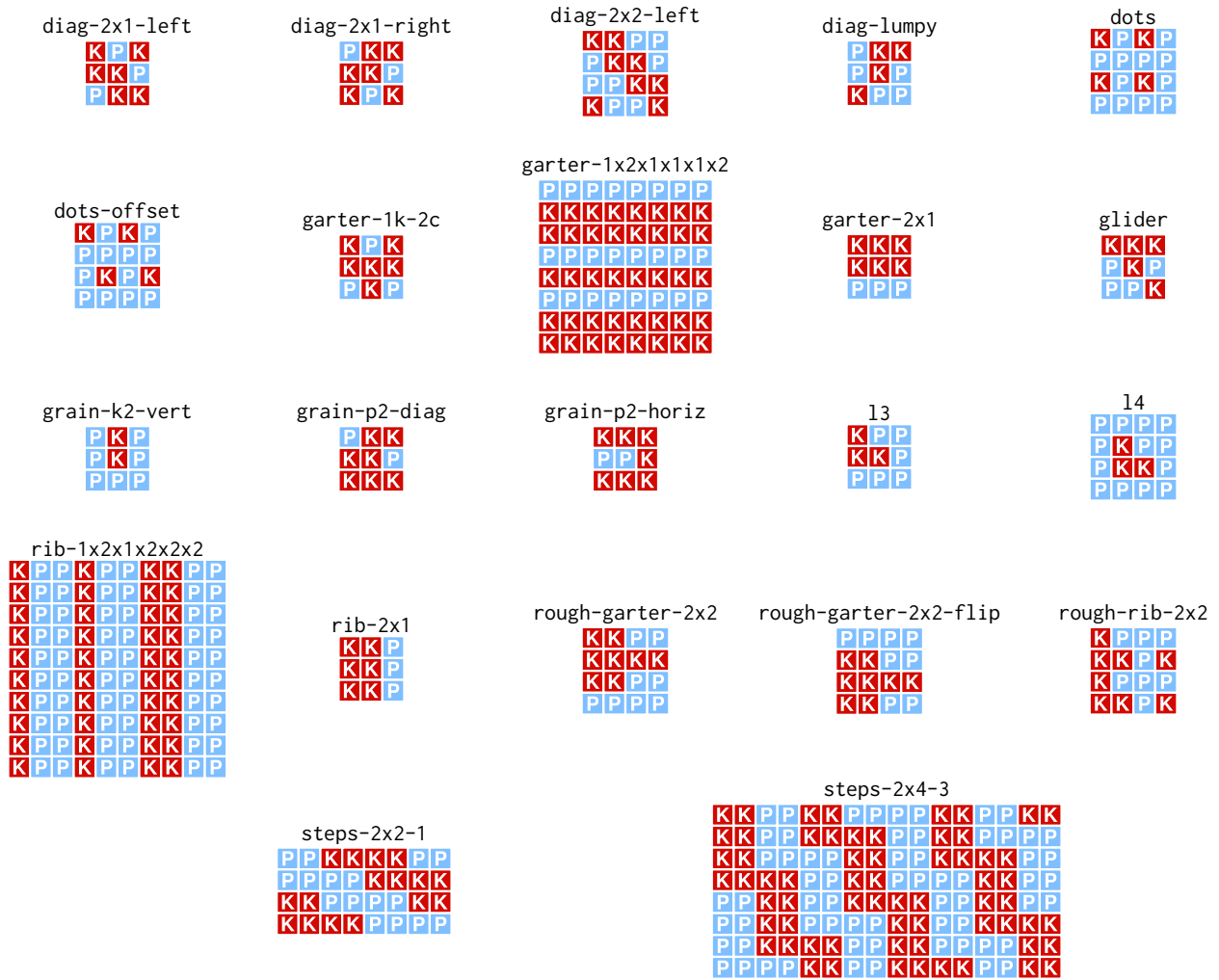


Fig. 1. A set of blocks used to create a variety of heterogeneous patterns.

Pattern	Kernel											
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
diag-2x1-left	0	0	0	640	0	0	640	640	0	0	0	0
diag-2x1-right	0	0	0	640	0	0	640	640	0	0	0	0
diag-2x2-left	0	0	0	0	0	0	960	960	0	0	0	0
diag-lumpy	0	0	0	224	0	416	432	416	0	0	224	208
garter-1k-2c	0	0	0	208	0	432	0	432	208	432	0	208
garter-1x1	0	0	1920	0	0	0	0	0	0	0	0	0
garter-1x2x1x1x1x2	0	0	960	0	0	0	0	0	480	480	0	0
garter-2x1	0	0	640	0	0	0	0	0	640	640	0	0
garter-2x2	0	0	0	0	0	0	0	0	960	960	0	0
glider	0	0	224	0	0	416	224	224	208	208	208	208
grain-k2-vert	432	0	208	0	864	0	0	0	0	0	208	208
grain-p2-diag	208	0	0	432	416	0	208	224	208	224	0	0
grain-p2-horiz	416	208	0	0	0	432	0	0	432	432	0	0
grid-1x1	0	0	0	1920	0	0	0	0	0	0	0	0
grid-1x2	0	0	0	0	0	0	0	0	0	0	960	960
grid-2x1	0	0	0	0	0	1920	0	0	0	0	0	0
grid-2x2	0	0	0	0	0	0	960	960	0	0	0	0
l3	208	208	224	0	208	208	432	0	208	0	224	0
l4	720	0	0	0	360	120	240	0	240	120	120	0
near-garter-2x2	0	0	0	0	0	0	0	480	480	720	0	240
near-garter-2x2-flip	0	0	0	0	0	0	480	0	720	480	240	0
rib-1x1	0	1920	0	0	0	0	0	0	0	0	0	0
rib-1x2x1x2x2x2	0	384	0	0	1536	0	0	0	0	0	0	0
rib-2x1	0	624	0	0	1296	0	0	0	0	0	0	0
rib-2x2	0	0	0	0	1920	0	0	0	0	0	0	0
rough-garter-2x2	480	0	480	0	0	0	480	480	0	0	0	0
rough-garter-2x2-flip	480	0	480	0	0	0	480	480	0	0	0	0
rough-rib-2x2	480	480	0	0	0	960	0	0	0	0	0	0
steps-2x2-1	0	0	0	0	0	0	480	480	480	480	0	0
steps-2x4-3	0	0	0	0	960	0	240	240	240	240	0	0
stockinette	1920	0	0	0	0	0	0	0	0	0	0	0
dots	480	480	480	480	0	0	0	0	0	0	0	0
dots-offset	0	480	0	480	0	0	0	0	480	480	0	0

Table 1. The kernel distributions of each pattern.

2 PATTERN VALIDATION DATA

We present the complete data in the [Table 2](#): A ground truth measurement collected from the patterns knitted by a knitting machine; simulation measurement acquired from mesh-based relaxation; linear estimate measurement that was estimated using our kernels; and percent error in linear estimate and simulation, respectively. This includes every pattern that we knit and measured in the course of this project. The results are also graphically portrayed in [Figure 2](#)

Pattern	Ground Truth (mm)		Linear Estimate (mm)		Simulation (mm)		Linear Estimate Error (%)		Simulation Error (%)	
	course	wale	course	wale	course	wale	course	wale	course	wale
garter-1x1	67.79	41.75	67.80	41.76	67.80	41.76	0.02%	0.01%	0.02%	0.01%
grid-2x1	71.83	48.44	71.84	48.43	71.84	48.43	0.02%	-0.02%	0.02%	-0.02%
stockinette	61.77	59.41	61.76	59.42	61.76	59.42	-0.02%	0.02%	-0.02%	0.02%
rib-2x2	40.23	66.66	40.24	66.67	40.24	66.67	0.02%	0.01%	0.02%	0.01%
rib-1x1	45.63	73.00	45.64	73.01	45.64	73.01	0.03%	0.01%	0.03%	0.01%
grid-1x1	80.23	57.39	80.24	57.41	80.24	57.41	0.02%	0.03%	0.02%	0.03%
grid-1x2	66.89	72.05	67.24	71.81	67.23	71.81	0.53%	-0.34%	0.52%	-0.34%
steps-2x2-1	68.59	46.29	69.17	45.85	69.11	45.87	0.84%	-0.95%	0.75%	-0.91%
grid-2x2	69.84	55.02	70.54	54.53	70.55	54.53	1.01%	-0.89%	1.02%	-0.89%
dots	64.02	57.28	63.86	57.90	63.98	58.13	-0.25%	1.07%	-0.06%	1.48%
near-garter-2x2-flip	69.15	46.48	67.75	47.44	67.70	47.45	-2.03%	2.07%	-2.10%	2.10%
diag-2x1-right	72.24	56.48	73.77	55.49	73.76	55.70	2.13%	-1.76%	2.11%	-1.39%
near-garter-2x2	70.49	43.28	69.08	44.24	68.97	44.27	-2.00%	2.22%	-2.16%	2.28%
grain-k2-vert	53.34	61.64	53.92	63.46	54.40	63.19	1.09%	2.95%	1.99%	2.52%
diag-2x2-left	69.80	52.98	70.54	54.53	70.54	54.53	1.07%	2.93%	1.07%	2.93%
l4	62.28	57.91	60.60	56.89	60.38	57.14	-2.71%	-1.76%	-3.05%	-1.33%
garter-2x2	66.04	38.40	67.80	37.18	67.80	37.18	2.67%	-3.19%	2.66%	-3.19%
diag-2x1-left	71.45	56.36	73.77	55.49	73.75	55.70	3.26%	-1.54%	3.22%	-1.17%
grain-p2-diag	67.19	57.20	64.61	54.38	65.03	55.16	-3.83%	-4.93%	-3.21%	-3.56%
rough-garter-2x2-flip	64.71	51.39	67.66	52.56	67.58	52.55	4.56%	2.28%	4.44%	2.26%
garter-1x2x1x1x1x2	65.75	41.49	67.80	39.47	67.79	39.48	3.12%	-4.88%	3.11%	-4.86%
rib-1x2x1x2x2x2	42.14	64.57	41.32	67.94	41.32	67.88	-1.95%	5.22%	-1.96%	5.13%
rough-garter-2x2	63.75	50.69	67.66	52.56	67.58	52.59	6.13%	3.70%	6.01%	3.75%
l3	58.56	57.29	62.15	57.80	62.18	57.68	6.12%	0.90%	6.17%	0.69%
glider	65.18	54.62	69.19	51.70	69.19	52.35	6.16%	-5.34%	6.16%	-4.15%
diag-lumpy	66.18	58.60	71.19	57.48	71.03	57.47	7.57%	-1.90%	7.33%	-1.93%
garter-1k-2c	70.90	52.21	71.21	48.12	71.34	48.46	0.44%	-7.84%	0.61%	-7.18%
grain-p2-horiz	64.44	53.26	65.00	48.41	64.93	48.43	0.87%	-9.10%	0.76%	-9.07%
garter-2x1	68.35	44.07	67.80	38.70	67.81	38.78	-0.80%	-12.17%	-0.79%	-12.00%
steps-2x4-3	62.48	58.02	54.71	56.26	54.08	57.19	-12.45%	-3.04%	-13.45%	-1.45%
dots-offset	70.68	59.56	65.37	51.19	65.43	51.03	-7.52%	-14.06%	-7.43%	-14.33%
rib-2x1	50.72	67.23	42.00	68.73	42.00	68.83	-17.20%	2.24%	-17.20%	2.39%
rough-rib-2x2	51.51	58.47	62.77	57.32	62.64	57.31	21.86%	-1.95%	21.62%	-1.97%

Table 2. Linear estimate and simulation dimensions for all tilable patterns, sorted by maximum simulation error between course and wale.

3 HETEROGENEOUS PATTERN ALIGNMENT

In order to quantitatively evaluate the errors of heterogeneous patterns, we start by creating target masks, which are generated from a scanned swatch. From our relaxed mesh, we generate input masks.

We present the visual representations of our mask matching results in Figure 3. Each mask is portrayed as two regions; the red mask represents the relaxed mesh, and the green mask is an aligned ground truth. The intersection of the two masks is rendered as yellow. With the exception of Figure 3e, which exhibited a large amount of out-of-plane curling, our model showed effectiveness in capturing complex shapes and heterogeneous patterns.

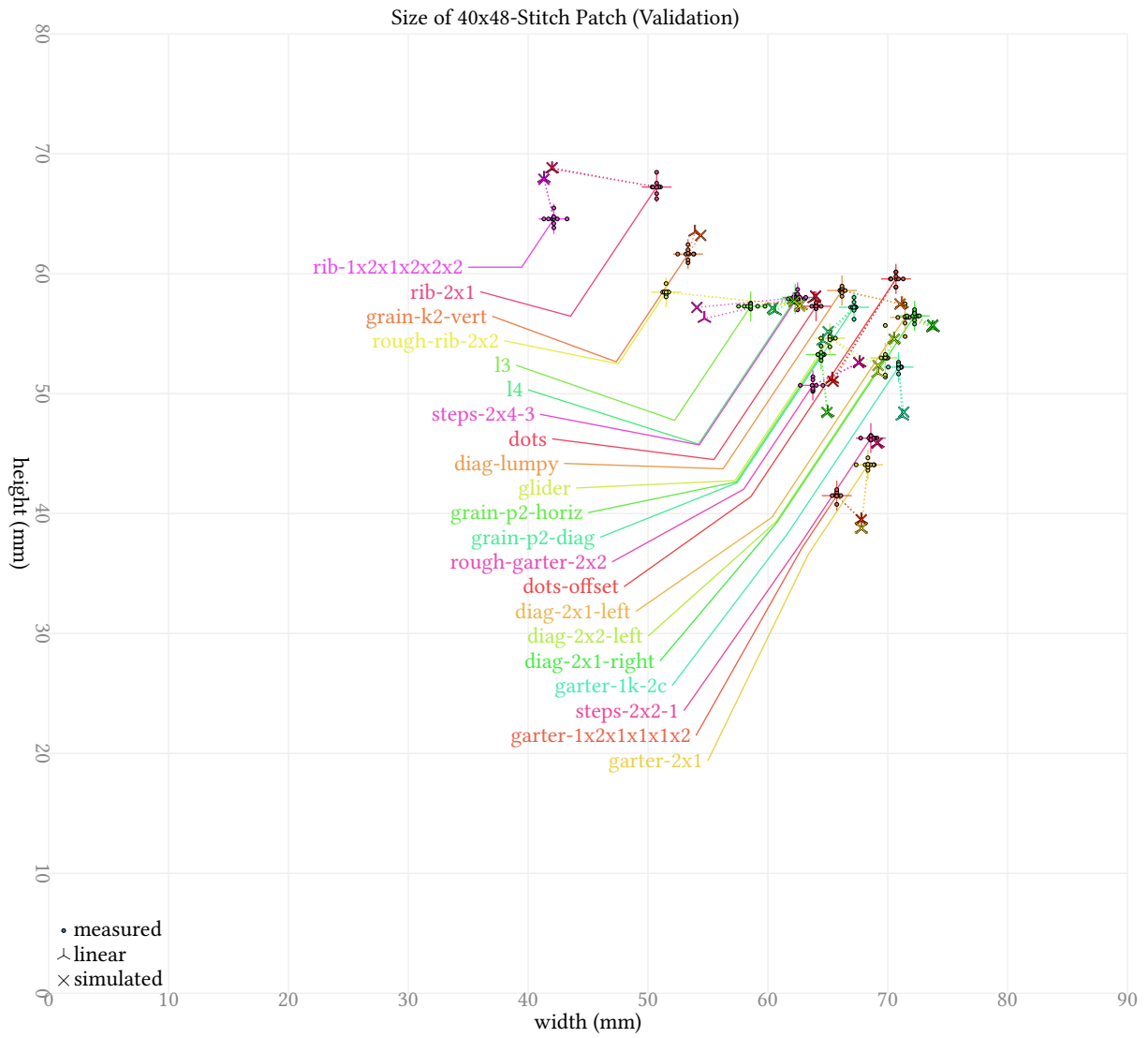
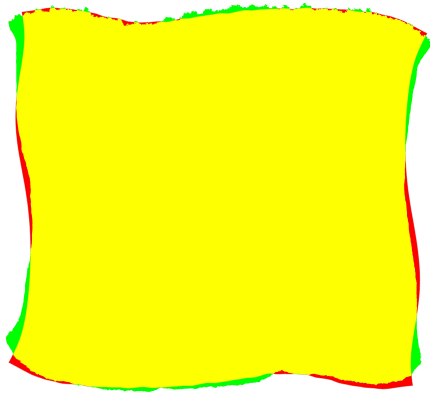
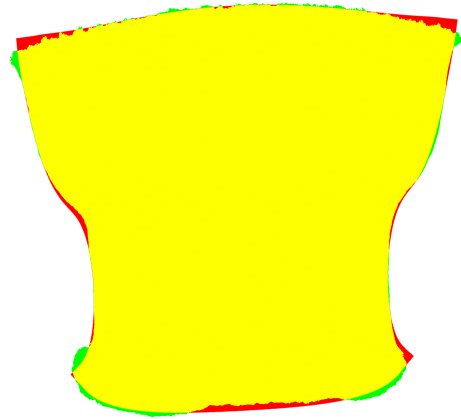


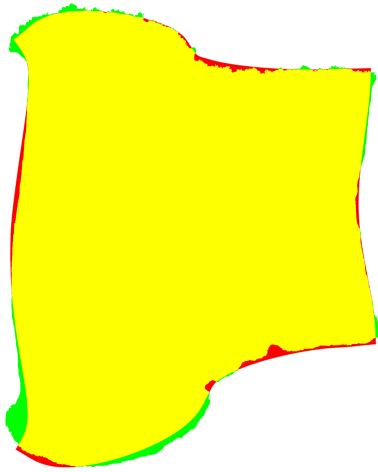
Fig. 2. Measured data for all patterns not used in fitting kernel sizes. Deviation is generally within about 10% of the total swatch dimensions, comparable to variation in measurement owing to hysteresis in our tests.



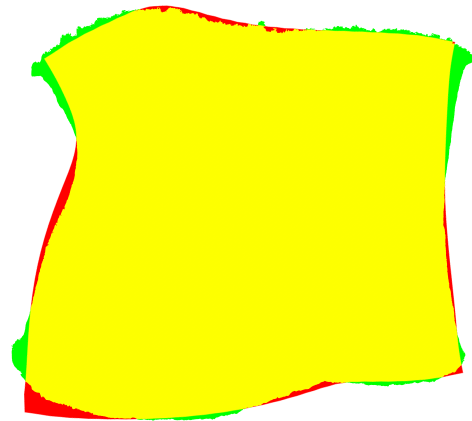
(a) Diagonal



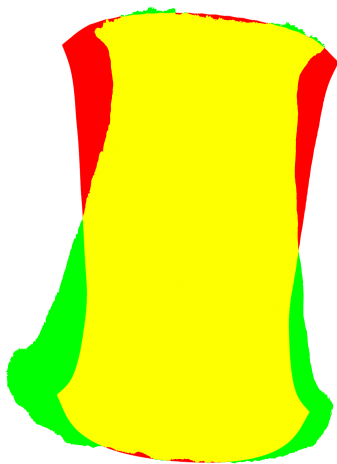
(b) Garter-rib



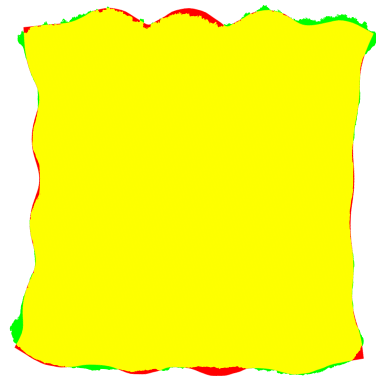
(c) Garter-rib-4



(d) Rib-garter-circles



(e) Ribs



(f) Tiles

Fig. 3. Mask alignment of heterogenous patterns.