Table 1: Verification results for the experiments of HaliVer from Chapter 4.

			Base			Unique			
Name	**V**	**Result**	**#**	**T_t**	**T_v**	**#**	**T_t**	**T_v**	**Speedup$_v$**
blur	0	✓	5	31	8	5	30	7	1.14
	1	✓	5	32	9	5	30	8	1.12
	2	✓	5	36	11	5	33	9	1.22
	3	✓	5	35	11	5	33	9	1.22
hist	0	✓	4	42	16	5	37	11	1.45
		×	0			1	101	76	
	1	✓	5	48	21	5	39	13	1.62
	2	✓	5	72	45	5	44	17	2.65
	3	✓	4	103	74	4	46	19	3.89
		×	1	100	74	1	146	120	
conv_layer	0	✓	5	118	86	5	70	40	2.15
	1	✓	5	134	101	5	72	42	2.4
	2	✓	5	196	159	5	75	44	3.61
	3	✓	4	174	138	5	75	44	3.14
		×	0			1	130	96	
gemm	0	✓	5	59	32	5	40	15	2.13
	1	✓	5	94	62	5	51	23	2.7
	2	✓	5	133	98	5	70	40	2.45
	3	×	5	59	26	5	119	80	
auto_viz	0	✓	5	46	15	5	41	12	1.25
	1	✓	5	97	68	5	50	21	3.24
	2	✓	5	98	67	5	52	22	3.05
	3	✓	5	73	39	5	54	22	1.77
bilateral_grid		✓	5	77	41	5	63	28	1.46
camera_pipe		✓	0			2	304	264	
		×	3	435	397	4	3084	3044	
		T.O.	0	-	-	1	-	-	
depthwise_ separable_conv		✓	5	214	165	5	139	96	1.72
Total		✓		1912	1266		1144	542	2.34

Table 2: Verification results for the experiments of HaliVer from Chapter 4.

			Base			Unique			
Name	**V**	**Result**	**#**	**T_t**	**T_v**	**#**	**T_t**	**T_v**	**Speedup$_v$**
blur	0	✓	5	33	10	5	33	8	1.25
	1	✓	5	33	10	5	32	8	1.25
	2	✓	5	43	14	5	42	14	1.0
	3	✓	5	42	15	5	56	29	0.52
hist	0	✓	4	46	18	5	38	12	1.5
		×	0			1	287	260	
	1	✓	5	54	25	5	41	14	1.79
	2	✓	5	81	53	5	45	18	2.94
	3	✓	4	108	78	4	52	23	3.39
		×	1	106	77	1	170	136	
conv_layer	0	✓	5	127	91	5	70	41	2.22
	1	✓	5	142	106	5	74	44	2.41
	2	✓	4	222	182	5	78	46	3.96
		×	0			1	134	97	
	3	✓	5	186	148	5	78	46	3.22
gemm	0	✓	5	63	35	5	41	16	2.19
	1	✓	5	118	82	5	69	38	2.16
	2	✓	5	266	225	4	187	151	1.49
		×	1	112	76	0			
	3	×	5	55	15	5	73	27	
auto_viz	0	✓	5	104	72	5	89	59	1.22
	1	✓	5	172	141	5	76	44	3.2
	2	✓	5	174	139	5	75	42	3.31
	3	✓	5	104	66	5	71	35	1.89
Total		✓		2118	1510		1247	688	2.19

Table 3: Verification results for `step`, `sub_direction`, `solve_direction`, and `perform_iteration` produced by HaliVer. We use abbreviations for versions with concrete bounds (**CB**), nonconcrete bounds (**NCB**), **unique** and const type qualifiers, and no type qualifiers (**Normal**).

(a) `step`

		Base			Unique			
Version	**Result**	**#**	$\mathbf{T}_t$	$\mathbf{T}_v$	**#**	$\mathbf{T}_t$	$\mathbf{T}_v$	$\mathbf{Speedup}_v$
CB	✓	5	73	41	5	65	34	1.21
NCB	✓	5	75	41	5	64	34	1.21

(b) `sub_direction`

		Base			Unique			
Version	**Result**	**#**	$\mathbf{T}_t$	$\mathbf{T}_v$	**#**	$\mathbf{T}_t$	$\mathbf{T}_v$	$\mathbf{Speedup}_v$
CB	✓	5	270	229	5	165	127	1.8
NCB	✓	0			5	165	128	
	×	0			4	702	660	
	T.O.	0	-	-	1	-	-	

(c) `solve_direction`

		Base			Unique			
Version	**Result**	**#**	$\mathbf{T}_t$	$\mathbf{T}_v$	**#**	$\mathbf{T}_t$	$\mathbf{T}_v$	$\mathbf{Speedup}_v$
CB	✓	0			5	1022	805	
	×	0			5	1555	1343	
NCB	×	3	3072	2792	5	925	631	
	T.O.	2	-	-	0	-	-	

(d) `perform_iteration`

		Base			Unique			
Version	**Result**	**#**	$\mathbf{T}_t$	$\mathbf{T}_v$	**#**	$\mathbf{T}_t$	$\mathbf{T}_v$	$\mathbf{Speedup}_v$
CB	✓	0			5	1198	1033	
	×	0			4	2008	1846	
	T.O.	0	-	-	1	-	-	
NCB	×	4	3062	2861	5	2265	2049	
	T.O.	1	-	-	0	-	-	