
ParVec Profiling Information for Intel Processors

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Profiling of the applications will be performed on an Ivy Bridge 3770 using AMD's CodeAnalyst profiling tool. We used a time-based profile (PERF) in intervals of one millisecond for the whole duration of each of the analyzed benchmarks. Profiling information will allow us to locate those functions that cover most of the application runtime and focus our vectorization efforts.

Profiling summary of the blackscholes benchmark (Profile 1):

Original	SSE	AVX
<ul style="list-style-type: none">▪ libc (12.92%)<ul style="list-style-type: none">▪ strtold (4.04%)▪ _IO_vfscanf (3.74%)▪ sigset (1.71%)▪ <i>*printf*</i> (2.2%)▪ blackscholes (24.88%)<ul style="list-style-type: none">▪ CNDF (16.49%)▪ BlkS...Div (6.93%)▪ bs_thread (1.10%)▪ libm (61.85%)<ul style="list-style-type: none">▪ _signbitl (50.38%)▪ _logf_finite (8.88%)▪ exp (2.00%)	<ul style="list-style-type: none">▪ libc (40.51%)<ul style="list-style-type: none">▪ strtold (13.12%)▪ _IO_vfscanf (11.91%)▪ sigset (5.34%)▪ <i>*printf*</i> (7.2%)▪ blackscholes (58.79%)<ul style="list-style-type: none">▪ BlkS...Div (56.27%)<ul style="list-style-type: none">▪ CNDF_SIMD (37.00%)▪ log_ps (5.30%)▪ exp_ps (3.00%)▪ <i>*SIMD_Arith</i> (11.10%)▪ bs_thread (2.25%)	<ul style="list-style-type: none">▪ libc (54.24%)<ul style="list-style-type: none">▪ strtold (17.41%)▪ _IO_vfscanf (15.92%)▪ sigset (7.28%)▪ <i>*printf*</i> (9.5%)▪ blackscholes (44.91%)<ul style="list-style-type: none">▪ BlkS...Div (42.40%)<ul style="list-style-type: none">▪ CNDF_SIMD (23.50%)▪ log256_ps (6.8%)▪ exp256_ps (3.00%)▪ <i>*SIMD256_Arith</i> (9.1%)▪ bs_thread (2.1%)

Profile 1. Blackscholes benchmark profile.

Profiling summary of the canneal kernel (Profile 2-3):

Original	SSE	AVX
<ul style="list-style-type: none"> ▪ libc (3.55%) ▪ libstdc (1.08%) ▪ canneal (94.76%) <ul style="list-style-type: none"> ▪ swap_cost (75.42%) ▪ _Rb_tree (7.99%) ▪ calc...cost (5.34%) ▪ accept_move (1.72%) ▪ routi...loc (1.55%) 	<ul style="list-style-type: none"> ▪ libc (3.92%) ▪ libstdc (1.23%) ▪ canneal (93.68%) <ul style="list-style-type: none"> ▪ swap_cost (68.60%) ▪ _Rb_tree (8.52%) ▪ calc...cost (10.39%) ▪ accept_move (1.56%) ▪ routi...loc (1.77%) 	Non-clustered AVX version of canneal not implemented due to low speedup of SSE version.

Profile 2. Canneal benchmark profile.

Non-Vectorized	SSE	AVX
<ul style="list-style-type: none"> ▪ libc (7.35%) ▪ libstdc (2.28%) ▪ canneal (90.03%) <ul style="list-style-type: none"> ▪ swap_cost (65.21%) ▪ _Rb_tree (14.70%) ▪ calc...cost (2.46%) ▪ routi...loc (2.96%) 	<ul style="list-style-type: none"> ▪ libc (13.89%) ▪ libstdc (3.43%) ▪ canneal (81.92%) <ul style="list-style-type: none"> ▪ swap_cost (44.82%) ▪ _Rb_tree (21.84%) ▪ calc...cost (2.00%) ▪ routi...loc (4.42%) ▪ netlist (2.28%) ▪ update..elements (2.08%) 	<ul style="list-style-type: none"> ▪ libc (12.33%) ▪ libstdc (3.66%) ▪ canneal (83.60%) <ul style="list-style-type: none"> ▪ swap_cost (44.87%) ▪ _Rb_tree (23.80%) ▪ calc...cost (2.04%) ▪ routi...loc (4.81%) ▪ netlist (2.53%) ▪ update..elements (2.29%)

Profile 3. Canneal-clustered benchmark profile.

Profiling summary of the fluidanimate benchmark (Profile 4):

Original	SSE	AVX
<ul style="list-style-type: none"> ▪ fluidanimate (99.67%) <ul style="list-style-type: none"> ▪ ComputeForcesMT (49.87%) ▪ Compute..itiesMT (40.21%) ▪ RebuildGridMT (2.72%) ▪ Init...List (1.72%) ▪ AdvanceParticlesMT (1.55%) 	<ul style="list-style-type: none"> ▪ fluidanimate (99.64%) <ul style="list-style-type: none"> ▪ ComputeForcesMT (52.67%) ▪ Compute..itiesMT (33.31%) ▪ RebuildGridMT (3.99%) ▪ Init...List (2.43%) ▪ AdvanceParticlesMT (2.16%) 	<ul style="list-style-type: none"> ▪ fluidanimate (99.69%) <ul style="list-style-type: none"> ▪ ComputeForcesMT (52.16%) ▪ Compute..itiesMT (36.26%) ▪ RebuildGridMT (3.27%) ▪ Init...List (2.15%) ▪ AdvanceParticlesMT (1.76%)

Profile 4. Fluidanimate benchmark profile.

Profiling summary of the raytrace benchmark (Profile 5):

Original	SSE	AVX
<ul style="list-style-type: none"> ▪ libc (1.60%) ▪ rtview (97.64%) <ul style="list-style-type: none"> ▪ TraverseBVH (79.34%) ▪ renderFrame (11.36%) ▪ recur...Fast (4.69%) 	<ul style="list-style-type: none"> ▪ libc (19.98%) ▪ libstdc (7.83%) ▪ rtview (71.50%) <ul style="list-style-type: none"> ▪ TraverseBVH (60.37%) ▪ recur...Fast (5.75%) ▪ renderFrame (3.25%) 	<ul style="list-style-type: none"> ▪ Not implemented, check text for details.

Profile 5. Raytrace benchmark profile.

Profiling summary of the streamcluster kernel (Profile 6):

Original	SSE	AVX
<ul style="list-style-type: none"> ▪ libc (0.55%) ▪ streamcluster (98.94%) <ul style="list-style-type: none"> ▪ pgain (97.95%) <ul style="list-style-type: none"> ▪ dist (95.00%) ▪ pspeedy (1.64%) 	<ul style="list-style-type: none"> ▪ libc (0.55%) ▪ streamcluster (98.94%) <ul style="list-style-type: none"> ▪ pgain (6.50%) ▪ pspeedy (0.09%) ▪ dist (92.00%) <ul style="list-style-type: none"> ▪ _mm_add_ps (88.16%) ▪ _mm_cvtss_f32 (0.85%) 	<ul style="list-style-type: none"> ▪ libc (0.53%) ▪ streamcluster (99.01%) <ul style="list-style-type: none"> ▪ pgain (6.89%) ▪ pspeedy (0.10%) ▪ dist (91.61%) <ul style="list-style-type: none"> ▪ _mm256_add_ps (87.09%) ▪ _mm256_ext....ps (1.03%) ▪ _mm_cvtss_f32 (0.86%)

Profile 6. Streamcluster benchmark profile.

Profiling summary of the swaptions benchmark (Profile 7):

Original	SSE	AVX
<ul style="list-style-type: none"> ▪ libc (2.20%) ▪ libm (40.00%) <ul style="list-style-type: none"> ▪ signbitl (38.57%) ▪ exp (0.73%) ▪ log (0.40%) ▪ swaptions (57.66%) <ul style="list-style-type: none"> ▪ HJM..Blocking (25.27%) ▪ SerialB (14.02%) <ul style="list-style-type: none"> ▪ CumNormalInv (13.16%) ▪ RanUnif (10.28%) ▪ Discount..Blocking (6.24%) 	<ul style="list-style-type: none"> ▪ libc (1.06%) ▪ libm (21.05%) <ul style="list-style-type: none"> ▪ signbitl (19.84%) ▪ exp (0.92%) ▪ log (0.29%) ▪ swaptions (77.21%) <ul style="list-style-type: none"> ▪ HJM..Blocking (23.55%) ▪ SerialB (16.00%) <ul style="list-style-type: none"> ▪ Cu..nv_SIMD (15.71%) ▪ RanUnif (12.44%) ▪ Discount..Blocking (7.03%) ▪ log_pd (16.03%) 	<ul style="list-style-type: none"> ▪ libc (2.02%) ▪ libm (22.95%) <ul style="list-style-type: none"> ▪ signbitl (21.50%) ▪ exp (1.10%) ▪ log (0.35%) ▪ swaptions (74.58%) <ul style="list-style-type: none"> ▪ HJM..Blocking (19.12%) ▪ SerialB (15.00%) <ul style="list-style-type: none"> ▪ Cu..nv_SIMD (14.95%) ▪ RanUnif (15.46%) ▪ Discount..Blocking (8.23%) ▪ log256_pd (14.57%)

Profile 7. Swaptions benchmark profile.

Profiling summary of the vips benchmark (Profile 8):

Original	SSE	AVX
<ul style="list-style-type: none"> ▪ libc (0.80%) ▪ vips (98.20%) <ul style="list-style-type: none"> ▪ vips..erpolate (18.87%) ▪ convgen (13.16%) ▪ imb_XYZLab (11.59%) ▪ lintran_gen (9.71%) 	<ul style="list-style-type: none"> ▪ libc (0.61%) ▪ vips (98.95%) <ul style="list-style-type: none"> ▪ vips..erpolate (13.67%) ▪ convgen (17.67%) ▪ imb_XYZLab (13.42%) ▪ lintran_gen (4.85%) 	<ul style="list-style-type: none"> ▪ libc (0.74%) ▪ vips (98.95%) <ul style="list-style-type: none"> ▪ vips..erpolate (13.67%) ▪ convgen (18.43%) ▪ imb_XYZLab (13.72%) ▪ lintran_gen (2.88%)

Profile 8. Vips benchmark profile.

The profiling summary of the x264 benchmark (Profile 9) is performed using version 0.133.x (latest stable by June 2013). Profiling shows an equally distributed load among the different functions, some of them implemented using AVX technology and other using older specific SSE versions.

-disable-asm	SSE	AVX
	Included in AVX.	
▪ libc (0.42%)		▪ libc (0.22%)
▪ x264 (99.48%)		▪ x264 (99.58%)
▪ _pixel_sad.. (40.00%)		▪ _pixel_sad.. (11.82%)
▪ _me_sear.. (2.60%)		▪ _me_sear.. (9.38%)
▪ _pixel_sat.. (8.7%)		▪ _pixel_sat.. (6.92%)
▪		▪ _pixel_avg2.. (4.44%)
		▪

Profile 9. x264 version 0.133.x benchmark profile.