

# Kripke - Scattering Kernel

```
for(int nm = 0; nm < num_moments; ++nm)
  for(int g = 0; g < num_groups; ++g)
    for(int gp = 0; gp < num_groups; ++gp)
      for(int zone = 0; zone < num_zones; ++zone)
        for(int mix = z_mixed[z]; mix < z_mixed[z]+num_mixed[z]; ++mix) {
          int material = mixed_material[mix];
          double fraction = mixed_fraction[mix];
          int n = moment_to_coeff[nm];

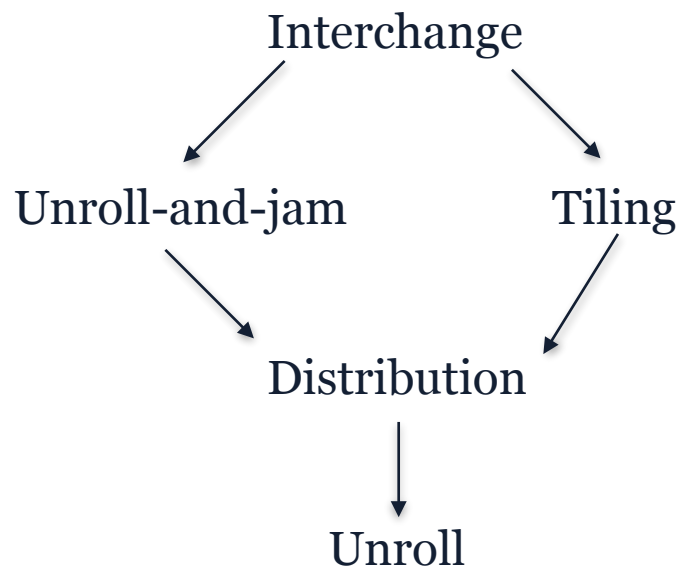
          #####
          # Address calculation to be inc
          #####

          *phi_out += *sigs * *phi * frac
        }
}
```

```
datalayout=enum("DZG", "DGZ", "GDZ", "GZD", "ZDG", "ZGD");
CodeReg Scattering {
  if (datalayout == "DGZ") {
    omploop="0.0.0.0";
  } elif (datalayout == "GDZ") {
    looporder=[1,2,0,3,4];
    omploop="0.0.0.0";
  } elif (datalayout == "GZD") {
    looporder=[1,2,3,4,0];
    omploop="0.0.0";
  } elif (datalayout == "ZGD") {
    looporder=[3,4,1,2,0];
    omploop="0";
  } elif (datalayout == "ZDG") {
    looporder=[3,4,0,1,2];
    omploop="0";
  } elif (datalayout == "DZG") {
    looporder=[0,3,4,1,2];
    omploop="0.0";
  }
  sourcepath="scatter_"+datalayout+".txt";
  BuiltIn.AltDesc(stmt="0.0.0.0.0.3", source=sourcepath);
  RoseLocus.Interchange(order=looporder);
RoseLocus.LICM();
RoseLocus.ScalarRepl();
Pragma.OMPFor(loop=omplloop);
}
```

# Optimization of Arbitrary Loop Nests

- Generic Locus program to optimize source codes unknown beforehand
- Goal: reproduce Gong Zhangxiaowen et al.<sup>1</sup> work using Locus
- Selected 856 loops from 16 benchmarks
- Transformed loops with all subsets of two sequences:



Benchmark	# of loop nests	Variants assessed
ALPBench [23]	13	39
ASC Sequoia [24]	1	3
Cortextsuite [25]	47	1,297
FreeBench [26]	30	431
Parallel Research Kernels [27]	37	1,055
Livermore Loops [28]	11	121
MediaBench [29]	39	159
Netlib [30]	18	260
NAS Parallel Benchmarks [31]	208	23,384
Polybench [32]	93	7,582
Scimark2 [33]	4	83
SPEC2000 [34]	71	2,228
SPEC2006 [35]	50	216
Extended TSVC [36]	156	6,943
Libraries [37]–[40]	61	1,966
Neural Network Kernels [41]	17	132
Total	856	45,899