

Masterpraktikum Scientific Computing – High Performance Computing

Gaurav Kukreja, Evangelos Drossos

Exercise Sheet 1

Exercise 2

2.a.

Please see `vector_changes.txt` enclosed here, for the comments on each function.

2.b.

The reports provided by the compiler as follows

Before changes

```
lu26xum@mac-login-intel:~/code_01_vanilla> icc -std=c99 -restrict -ip -ip_no_inlining  
-vec_report3 -opt_report_filevector.opt -opt_report_phaseall vector.c
```

vector.c(64): (col. 5) remark: LOOP WAS VECTORIZED.

vector.c(71): (col. 5) remark: LOOP WAS VECTORIZED.

vector.c(77): (col. 5) remark: LOOP WAS VECTORIZED.

vector.c(103): (col. 5) remark: LOOP WAS VECTORIZED.

vector.c(109): (col. 5) remark: LOOP WAS VECTORIZED.

vector.c(117): (col. 5) remark: LOOP WAS VECTORIZED.

vector.c(123): (col. 5) remark: LOOP WAS VECTORIZED.

vector.c(132): (col. 5) remark: LOOP WAS VECTORIZED.

vector.c(141): (col. 5) remark: LOOP WAS VECTORIZED.

vector.c(154): (col. 10) remark: LOOP WAS VECTORIZED.

vector.c(150): (col. 5) remark: loop was not vectorized: not inner loop.

vector.c(165): (col. 10) remark: LOOP WAS VECTORIZED.

vector.c(161): (col. 5) remark: loop was not vectorized: not inner loop.

vector.c(174): (col. 5) remark: LOOP WAS VECTORIZED.

vector.c(226): (col. 3) remark: LOOP WAS VECTORIZED.

vector.c(226): (col. 3) remark: loop was not vectorized: not inner loop.

vector.c(239): (col. 3) remark: LOOP WAS VECTORIZED.

vector.c(239): (col. 3) remark: loop was not vectorized: not inner loop.

vector.c(251): (col. 3) remark: LOOP WAS VECTORIZED.

vector.c(263): (col. 3) remark: PARTIAL LOOP WAS VECTORIZED.

vector.c(263): (col. 3) remark: PARTIAL LOOP WAS VECTORIZED.

vector.c(290): (col. 3) remark: LOOP WAS VECTORIZED.

vector.c(290): (col. 3) remark: LOOP WAS VECTORIZED.

vector.c(304): (col. 3) remark: loop was not vectorized: existence of vector dependence.

vector.c(307): (col. 6) remark: vector dependence: assumed FLOW dependence between y line 307 and y line 305.

vector.c(305): (col. 6) remark: vector dependence: assumed ANTI dependence between y line 305 and y line 307.

vector.c(307): (col. 6) remark: vector dependence: assumed FLOW dependence between y line 307 and y line 306.

vector.c(306): (col. 6) remark: vector dependence: assumed ANTI dependence between y line 306 and y line 307.

vector.c(306): (col. 6) remark: vector dependence: assumed ANTI dependence between y line 306 and y line 307.

vector.c(307): (col. 6) remark: vector dependence: assumed FLOW dependence between y line 307 and y line 306.

vector.c(305): (col. 6) remark: vector dependence: assumed ANTI dependence between y line 305 and y line 307.

vector.c(307): (col. 6) remark: vector dependence: assumed FLOW dependence between y line 307 and y line 305.

vector.c(341): (col. 6) remark: LOOP WAS VECTORIZED.

vector.c(339): (col. 3) remark: loop was not vectorized: not inner loop.

vector.c(362): (col. 6) remark: PERMUTED LOOP WAS VECTORIZED.

vector.c(381): (col. 6) remark: LOOP WAS VECTORIZED.

vector.c(384): (col. 6) remark: LOOP WAS VECTORIZED.

vector.c(378): (col. 3) remark: loop was not vectorized: not inner loop.

vector.c(402): (col. 6) remark: LOOP WAS VECTORIZED.

vector.c(405): (col. 6) remark: LOOP WAS VECTORIZED.

vector.c(399): (col. 3) remark: loop was not vectorized: not inner loop.

vector.c(428): (col. 6) remark: PERMUTED LOOP WAS VECTORIZED.

vector.c(445): (col. 3) remark: loop was not vectorized: existence of vector dependence.

vector.c(447): (col. 6) remark: vector dependence: assumed OUTPUT dependence between x line 447 and x line 446.

vector.c(446): (col. 6) remark: vector dependence: assumed OUTPUT dependence between x line 446 and x line 447.

vector.c(446): (col. 6) remark: vector dependence: assumed OUTPUT dependence between x line 446 and x line 447.

vector.c(447): (col. 6) remark: vector dependence: assumed OUTPUT dependence between x line 447 and x line 446.

vector.c(461): (col. 3) remark: LOOP WAS VECTORIZED.

vector.c(473): (col. 3) remark: loop was not vectorized: nonstandard loop is not a vectorization candidate.

vector.c(485): (col. 3) remark: loop was not vectorized: nonstandard loop is not a vectorization candidate.

After Changes

```
lu26xum@mac-login-intel:~/workspace> icc -std=c99 -restrict -ip -ip_no_inlining -vec_report3
```

```
-opt_report_filevector.opt -opt_report_phaseall vector.c
```

```
vector.c(64): (col. 5) remark: LOOP WAS VECTORIZED.
```

```
vector.c(71): (col. 5) remark: LOOP WAS VECTORIZED.
```

```
vector.c(77): (col. 5) remark: LOOP WAS VECTORIZED.
```

```
vector.c(103): (col. 5) remark: LOOP WAS VECTORIZED.
```

```
vector.c(109): (col. 5) remark: LOOP WAS VECTORIZED.
```

```
vector.c(117): (col. 5) remark: LOOP WAS VECTORIZED.
```

```
vector.c(123): (col. 5) remark: LOOP WAS VECTORIZED.
```

```
vector.c(132): (col. 5) remark: LOOP WAS VECTORIZED.
```

```
vector.c(141): (col. 5) remark: LOOP WAS VECTORIZED.
```

```
vector.c(154): (col. 10) remark: LOOP WAS VECTORIZED.
```

```
vector.c(150): (col. 5) remark: loop was not vectorized: not inner loop.
```

```
vector.c(165): (col. 10) remark: LOOP WAS VECTORIZED.
```

```
vector.c(161): (col. 5) remark: loop was not vectorized: not inner loop.
```

```
vector.c(174): (col. 5) remark: LOOP WAS VECTORIZED.
```

```
vector.c(190): (col. 3) remark: LOOP WAS VECTORIZED.
```

```
vector.c(218): (col. 2) remark: LOOP WAS VECTORIZED.
```

```
vector.c(233): (col. 3) remark: LOOP WAS VECTORIZED.
```

```
vector.c(233): (col. 3) remark: loop was not vectorized: not inner loop.
```

```
vector.c(246): (col. 3) remark: LOOP WAS VECTORIZED.
```

```
vector.c(246): (col. 3) remark: loop was not vectorized: not inner loop.
```

```
vector.c(258): (col. 3) remark: LOOP WAS VECTORIZED.
```

```
vector.c(271): (col. 3) remark: LOOP WAS VECTORIZED.
```

```
vector.c(285): (col. 3) remark: LOOP WAS VECTORIZED.
```

```
vector.c(300): (col. 3) remark: LOOP WAS VECTORIZED.
```

```
vector.c(300): (col. 3) remark: LOOP WAS VECTORIZED.
```

```
vector.c(315): (col. 3) remark: LOOP WAS VECTORIZED.
```

```
vector.c(321): (col. 3) remark: LOOP WAS VECTORIZED.
```

```
vector.c(334): (col. 3) remark: LOOP WAS VECTORIZED.
```

```
vector.c(357): (col. 6) remark: LOOP WAS VECTORIZED.
```

```
vector.c(355): (col. 3) remark: loop was not vectorized: not inner loop.
```

```
vector.c(378): (col. 6) remark: PERMUTED LOOP WAS VECTORIZED.
```

```
vector.c(397): (col. 6) remark: LOOP WAS VECTORIZED.
```

```
vector.c(400): (col. 6) remark: LOOP WAS VECTORIZED.
```

```
vector.c(394): (col. 3) remark: loop was not vectorized: not inner loop.
```

```
vector.c(418): (col. 6) remark: LOOP WAS VECTORIZED.
```

```
vector.c(421): (col. 6) remark: LOOP WAS VECTORIZED.
```

```
vector.c(415): (col. 3) remark: loop was not vectorized: not inner loop.
```

```
vector.c(444): (col. 6) remark: PERMUTED LOOP WAS VECTORIZED.
```

```
vector.c(461): (col. 3) remark: LOOP WAS VECTORIZED.
```

```
vector.c(466): (col. 3) remark: LOOP WAS VECTORIZED.
```

vector.c(481): (col. 3) remark: LOOP WAS VECTORIZED.

vector.c(493): (col. 3) remark: loop was not vectorized: nonstandard loop is not a vectorization candidate.

vector.c(505): (col. 3) remark: loop was not vectorized: nonstandard loop is not a vectorization candidate.

2.c

Please find vector.c in code_01_changed to see the rewritten loops to vectorize additional loops.

vector_changes.txt, also talks about these changes in detail.

2.d.

Isn't this the same as 2.2?