

6.172 Project 1 Final Writeup

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The bitarray code has changed dramatically since the beta submission. For the beta, bitarray accessed bits individually and moved them to their proper spots. Although this was an improvement over the original implementation, the code ran in 1.350 ms. For the final, instead of moving bits individually, the code tried to move as much data through byte accesses. When the final code was tested and optimized, the final code finished in 0.179 ms, a 7.5 times improvement.

After the final was first finished and correct, the code ran in 0.279 ms, an only 5 times improvement. From there, we inlined a `shift_byte` function, which is called many times in our code. This inlining dropped the time down to 0.270 ms. Three loops were also optimized to increment a pointer directly,

instead of an extra index variable, which dropped the time to 0.210 ms. A function call was also removed to drop the running time to 0.191 ms. Two loops were combined, which resulted in a running time of 0.181 ms, then the code was cleaned up to remove unused functions and statements which finished with a running time of 0.179 ms.

Most of these code improvements came from various class and recitation ideas. Switching to modifying mostly on the byte-level instead of the bit-level was actually thought of right before the beta was due, but there wasn't any time to implement the new strategy.

Master Annirudda Bohra gave some good advice about the project. Although there weren't any explicit tips about speeding up the beta code, there were some more practical tips such as coding style and inlining. Some of the more useful tips included that the code should stay away from multiplication as much as possible, and to experiment with changing the code.