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The project conducted a performance comparison of two algorithms, one deterministic and the other randomized, for determining the primality of large numbers stored as BigInteger objects. The study evaluated the effectiveness and efficiency of these algorithms for determining whether a given integer is prime. The deterministic algorithm checks all numbers between two and the square root of the number being tested. The randomized algorithm is based on Fermat's Little Theorem and uses a random base to check the compositeness of a number.

The study found that the deterministic algorithm performs well for small values of n, but its performance degrades significantly as n increases. The randomized algorithm, on the other hand, is more effective for large values of n. The study showed that for the range of values tested, the randomized algorithm is faster than the deterministic algorithm for values greater than 100 million. The study also demonstrated that the number of iterations for the randomized algorithm significantly impacts the algorithm's effectiveness, with the number of iterations required to be larger for larger values of n. The algorithm becomes more accurate with the higher amount of iterations being done. Additionally in this experiment there were no false calculations, the deterministic and randomized algorithms answered the same for every number.

Here are some charts comparing the times to complete each algorithm, for iterations of 5 (Small Values) and for iterations of 500 (Large Values). Notice that the average time for each computation looks around 6,000 milliseconds for the Deterministic algorithm and looks to be around 15 milliseconds for the Randomized algorithm.
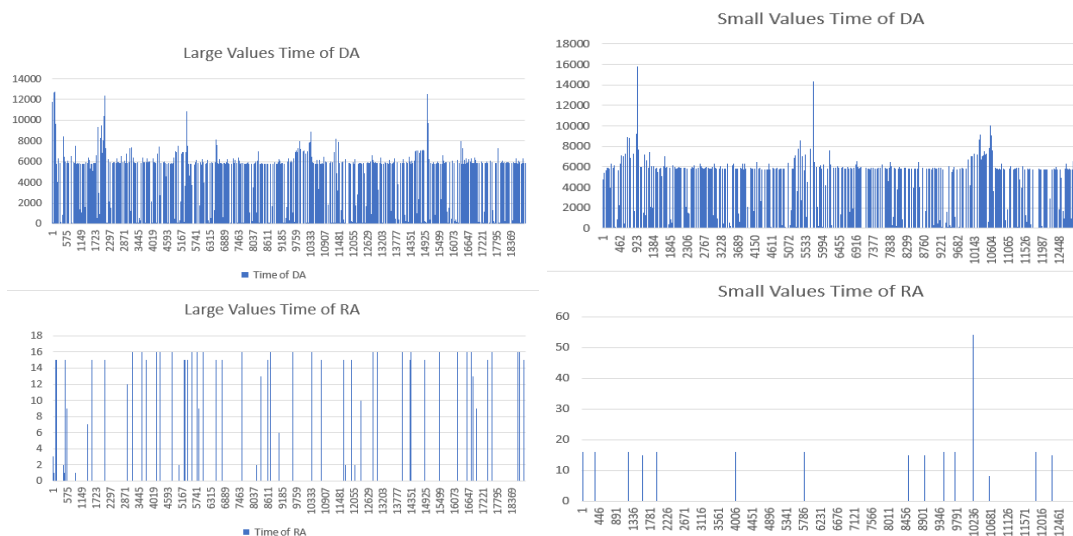
In conclusion, the study demonstrated that the choice of algorithm for determining the primality of large integers is dependent on the size of the value being tested. The study also showed that the randomized algorithm is a faster and more effective approach for large values of n. However, the choice of the algorithm is based on the level of accuracy required for the application being developed.