CS 271 Project 6

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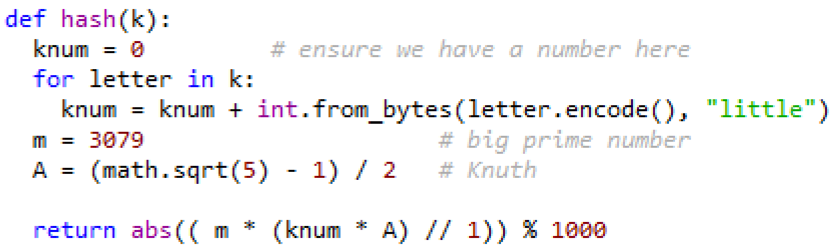
Figure 1 shows our code for the hash function.

We used a multiplication method hash function, in which m is a large prime number (we chose 3079) and A is an irrational number (we chose Knuth's example discussed in class). We then returned $m(k(A))$ floor divided by 1 to make it an integer, then modulo 1000 to hash it into a number between 1 and 1000 (our range for the histogram) (note: k in this case is the integer value we computed of all the letters added up in whichever word we were looking at). This hash function provides the following hashing distribution showed in Figure 2 (histogram produced using pyplot).

The minimum index hashed was 2, and the maximum index hashed was 996. This is pretty promising, as both ends of the spectrum were at least accounted for in some way by our hash function. However, the standard deviation was about 288.42, which is smaller than we may have liked, because 68 percent of your data lies within one standard deviation and 95 percent lies within two. So, by that logic, 95 percent of the values we hashed using this function fell within just shy of 580 slots, leaving the remaining 420 slots to only hold 5 percent of the values we hashed. This, of course, is pretty far from uniform, and not ideal. We tried many combinations of primes and irrational numbers, but settled with this one for our analysis. So, to conclude, while our hash table does a good job of covering the full range of our slots/indices, it can definitely do better in doing so uniformly.

function code.PNG



```
def hash(k):
  knum = 0         # ensure we have a number here
  for letter in k:
    knum = knum + int.from_bytes(letter.encode(), "little")
  m = 3079                     # big prime number
  A = (math.sqrt(5) - 1) / 2   # Knuth

  return abs(( m * (knum * A) // 1)) % 1000
```

Figure 1: The code

func histogram.PNG

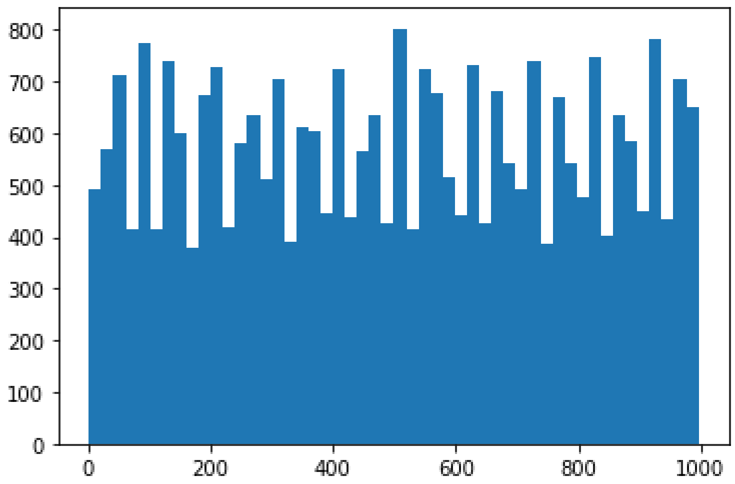


Figure 2: The histogram