

Data Analysis

After writing the retrieved values to a database (table from mysql) for 60 minutes, I made some observations about the data. The factor value is increasing per minute. At minute 0, the factor value starts at 1 and increases for every minute after. For the pi values, there appears to be a sort of alternating pattern between each minute with the values increasing, and then decreasing. At minute 0, the pi value is 4. As minutes pass and factor numbers increase, the pi values seem to be getting closer and closer to the actual value of pi: 3.14159265359... The last ten or so pi values, for reference, were very close to 3.14159. I did some research on alternating series involving pi and found the Leibniz formula for pi, an alternating series, which states:

$$1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \dots = \frac{\pi}{4}$$

Based on my research, Leibniz's formula converges to the actual value of pi extremely slowly. For example, calculating pi to 10 correct decimal places using direct summation of the series requires about five billion terms. Because of this knowledge, I figured that the factor number was the number of terms. Since it was too difficult to calculate pi using the high factor numbers, I found a list of 1000 pi values calculated from the Leibniz formula that I was going to look at for the factor values between 1-1000 from my table to see if they matched the values from the list. I had 10 factor values below 1000 from the api data which pi values were as follows:

| Factor | Pi |
|--------|---------|
| 1 | 4 |
| 8 | 3.01707 |
| 27 | 3.17862 |
| 64 | 3.12597 |
| 125 | 3.14959 |
| 216 | 3.13696 |
| 343 | 3.14451 |
| 512 | 3.13964 |
| 729 | 3.14296 |
| 1000 | 3.14059 |

Using the list of 1000 pi values, I looked at the corresponding factor values below 1000 from my table to see if their pi values matched the list pi values. I discovered that the values did match, proving that this api is calculating pi using the Leibniz formula.

Sources:

https://en.wikipedia.org/wiki/Leibniz_formula_for_pi

<http://www.eveandersson.com/pi/gregory-leibniz>