1012-11-13 **Fred B. Holt*** (`fbholt@u.washington.edu`), 4311 - 11th Ave NE, #500, Seattle, WA 98105.
Constellations of prime numbers.

We study the gaps between consecutive prime numbers directly through Eratosthenes sieve. For each stage of the sieve there is a corresponding cycle of gaps. For the sieve after multiples of the prime p_k have been removed, there is a cycle of Φ_k gaps which sum up to Π_k (here $\Pi_k = \prod_1^k p$ and $\Phi_k = \prod_1^k (p_i - 1)$). For example, the cycle of gaps for $p_k = 5$ is

$$G(5) = 64242462.$$

Using elementary methods, we identify a deterministic recursive relation for these gaps. This recursion consists of three steps:

1. Identify the next prime: $p_{k+1} = g_{k,1} + 1$.
2. Concatenate p_{k+1} copies of $G(p_k)$.
3. Add consecutive gaps as indicated by the element-wise product $p_{k+1} * G(p_k)$.

The third step in this recursion removes the remaining multiples of p_{k+1} from the list of possible primes. In the context of gaps, to remove a number is to add the gaps on either side of this number.

Using this recursion we can estimate the numbers not only of specific gaps but also of specific sequences of consecutive gaps, known as constellations. The Twin Prime Conjecture concerns the constellation of the single gap $g = 2$. Computational evidence supports this approach. (Received July 11, 2005)