Leo Schultz
10/1/2014
Parallel Programming HW #1

```cpp
// C++ Implementation

#include <stdio.h>
#include <stdlib.h>
#include <sys/time.h>
#include <pthread.h>
#include <iostream>
#include <fstream>
#include <string>
#define numThreads 8

using namespace std;
std::ifstream ifs ("Human_MtDNA.txt");
std::string str ("GAAAAT");
std::string line;
int totalCount = 0;

pthread_mutex_t lock;
pthread_t threads[numThreads];

int countSubstring(const std::string& str, const std::string& sub)
{
    if (sub.length() == 0) return 0;
    int count = 0;
    for (size_t offset = str.find(sub); offset != std::string::npos;
    offset = str.find(sub, offset + sub.length()))
    {
        ++count;
    }
    return count;
}

int matchCount()
{
    int lineno = 0;
    pthread_mutex_lock(&lock);
    while(std::getline(ifs, line)){
    lineno++;
    totalCount = countSubstring(line, str) + totalCount;
        if(countSubstring(line, str)>0){
            std::cout << countSubstring(line, str) << " GAAAAT's were found in line " << lineno <<
endl;
        }
    }
    pthread_mutex_unlock(&lock);
```

```cpp
    return totalCount;
}

int main ()
{
    struct timeval tim;
    gettimeofday(&tim, NULL);
    double start_time=tim.tv_sec+(tim.tv_usec/1000000.0);
    matchCount();
    pthread_mutex_init(&lock,NULL);
    for(int i=0;i<numThreads;i++){
        pthread_create(&(threads[i]), NULL, matchCount, NULL);
    }
    for(int t=0;t<numThreads;t++){
        pthread_join(threads[t], NULL);
    }
    pthread_mutex_destroy(&lock);
    gettimeofday(&tim, NULL);
    double end_time=tim.tv_sec+(tim.tv_usec/1000000.0);
    double runtime = end_time - start_time;
    cout << totalCount << " GAAAAT's were found in the file in " << runtime << " seconds!!!" <<
endl;
    return 0;
}
```

```
6 GAAAAT's were found in line 56
6 GAAAAT's were found in line 59
6 GAAAAT's were found in line 62
6 GAAAAT's were found in line 65
6 GAAAAT's were found in line 68
6 GAAAAT's were found in line 71
6 GAAAAT's were found in line 74
6 GAAAAT's were found in line 77
6 GAAAAT's were found in line 80
6 GAAAAT's were found in line 83
6 GAAAAT's were found in line 86
6 GAAAAT's were found in line 89
6 GAAAAT's were found in line 92
6 GAAAAT's were found in line 95
6 GAAAAT's were found in line 98
6 GAAAAT's were found in line 101
6 GAAAAT's were found in line 104
6 GAAAAT's were found in line 107
6 GAAAAT's were found in line 110
6 GAAAAT's were found in line 113
6 GAAAAT's were found in line 116
6 GAAAAT's were found in line 119
6 GAAAAT's were found in line 122
6 GAAAAT's were found in line 125
6 GAAAAT's were found in line 128
8 GAAAAT's were found in line 131
1 GAAAAT's were found in line 175
1 GAAAAT's were found in line 184
1 GAAAAT's were found in line 191
6 GAAAAT's were found in line 198
6 GAAAAT's were found in line 201
6 GAAAAT's were found in line 204
6 GAAAAT's were found in line 207
6 GAAAAT's were found in line 210
6 GAAAAT's were found in line 213
6 GAAAAT's were found in line 216
6 GAAAAT's were found in line 219
6 GAAAAT's were found in line 222
6 GAAAAT's were found in line 225
6 GAAAAT's were found in line 228
6 GAAAAT's were found in line 231
5 GAAAAT's were found in line 234
6 GAAAAT's were found in line 237
6 GAAAAT's were found in line 240
6 GAAAAT's were found in line 243
6 GAAAAT's were found in line 246
6 GAAAAT's were found in line 249
6 GAAAAT's were found in line 252
6 GAAAAT's were found in line 255
6 GAAAAT's were found in line 258
6 GAAAAT's were found in line 261
6 GAAAAT's were found in line 264
6 GAAAAT's were found in line 267
6 GAAAAT's were found in line 270
6 GAAAAT's were found in line 273
6 GAAAAT's were found in line 276
6 GAAAAT's were found in line 279
6 GAAAAT's were found in line 282
6 GAAAAT's were found in line 285
6 GAAAAT's were found in line 288
6 GAAAAT's were found in line 291
6 GAAAAT's were found in line 294
6 GAAAAT's were found in line 297
6 GAAAAT's were found in line 300
6 GAAAAT's were found in line 303
6 GAAAAT's were found in line 306
6 GAAAAT's were found in line 309
6 GAAAAT's were found in line 312
6 GAAAAT's were found in line 315
6 GAAAAT's were found in line 318
8 GAAAAT's were found in line 321
509 GAAAAT's were found in the file in 0.0410249 seconds!!!
Leos-iMac:program_1 leo$ 
```