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file use: guitarDry.wav, ir1.wav
git is used as a vision control
==========
baseline – a4.cpp

runtime >1hours, I dont know if will ever get to the result, but I terminated the program at 1hour

```
69
70  }
71
72  //convolve from prof
73  void convolve(vector<float> &x, int N, vector<float> &h, int M, vector<float> &y, int P)
74  {
75      cout<< "convolve..." << endl;
76    int n, m;
77
78    /*  Make sure the output buffer is the right size: P = N + M - 1  */
79    if (P != (N + M - 1)) {
80      printf("Output signal vector is the wrong size\n");
81      printf("It is %-d, but should be %-d\n", P, (N + M - 1));
82      printf("Aborting convolution\n");
83      return;
84    }
85
86    /*  Clear the output buffer y[] to all zero values  */
87    for (n = 0; n < P; n++)
88      y[n] = 0.0;
89
90    /*  Do the convolution  */
91    /*  Outer loop:  process each input value x[n] in turn  */
92    for (n = 0; n < N; n++) {
93      /*  Inner loop:  process x[n] with each sample of h[]  */
94      for (m = 0; m < M; m++)
95
96        y[n+m] += x[n] * h[m];
97    }
98  }
```

I included the prof output, as well.

- from the profiler, it appear that the program spend most time on my toFloat and toInt functions.
- I think its spending sometime with copying vector as well

algorithm – fft.cpp

runtime – I dont know, because I cant get four 1 to work with c++ vector. And I have no idea how array in C works

```
120
121 void four1(vector<double> &data, int nn, int isign)
122 {
123     unsigned long n, mmax, m, j, istep, i;
124     double wtemp, wr, wpr, wpi, wi, theta;
125     double tempr, tempi;
126
127     n = nn << 1;
128     j = 1;
129
130     for (i = 0; i < n; i += 2) {
131         if (j > i) {
132             SWAP(data[j], data[i]);
133             SWAP(data[j+1], data[i+1]);
134         }
135         m = nn;
136         while (m >= 2 && j > m) {
137             j -= m;
138             m >>= 1;
139         }
140         j += m;
141     }
142
143     mmax = 2;
144     while (n > mmax) {
145         istep = mmax << 1;
146         theta = isign * (6.28318530717959 / mmax);
147         wtemp = sin(0.5 * theta);
148         wpr = -2.0 * wtemp * wtemp;
149         wpi = sin(theta);
150         wr = 1.0;
151         wi = 0.0;
152         for (m = 1; m < mmax; m += 2) {
153             for (i = m; i <= n; i += istep) {
154             j = i + mmax;
155             tempr = wr * data[j] - wi * data[j+1];
156             tempi = wr * data[j+1] + wi * data[j];
157             data[j] = data[i] - tempr;
158             data[j+1] = data[i+1] - tempi;
159             data[i] += tempr;
160             data[i+1] += tempi;
161             }
162             wr = (wtemp = wr) * wpr - wi * wpi + wr;
163             wi = wi * wpr + wtemp * wpi + wi;
164         }
165         mmax = istep;
166     }
167 }
```

Gprof is included for this program too.
Since it never get pass to four1, it makes sense that it use most of its runtime on zeropadding functions