Abstract

To run this program, firstly, you need to setup the dataset path like this:

If this is the dataset stored path:

```
C:\Users\Aspen\Desktop\Btraining_normal\Training B Normal\*.wav
```

Then you must download the dataset to use the function dirr.m (Copyright (c) 2009, Maximilien Chaumon, all rights reserved):

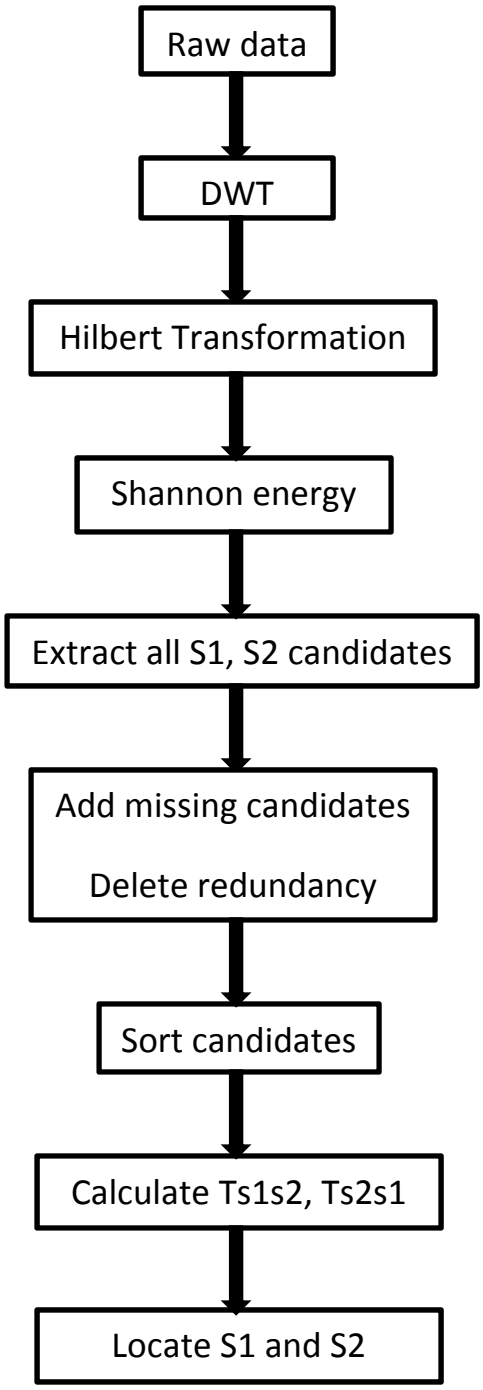
```
dirr('C:\Users\Aspen\Desktop\Btraining_normal\Training B Normal\*.wav', 'isdir', '0');
```

To deal every data, we construct a loop, then for every loop, we decompose the dataset into 7level (4level in B_dataset) wavelet transformation and reconstruct the frequency component, respectively. Because the heart sound is low frequency and the most energy is concentrated below 195Hz, so we just did analysis in A7 or (A4 in B_dataset) the approximate frequency component.

The following, we normalize the A7or A4 and do Hilbert transformation, then calculate its Shannon energy. The function peakfinder.m (Copyright (c) 2009, Nathanael C. Yoder, all rights reserved.) is used to find every possible S1 and S2.

When we get the candidates of S1 and S2, we check these candidates in order to delete the redundancy and add the missing points in the first detecting. Then we sort all the location and evaluate the point is S1 or S2 through the length of time interval. (The time interval of S1 to S2 is shorter than this of S2 to the next S1), the frame in Figure1.

Figure1. The design step frame



The result of A_dataset in Figure2:

Figure2 A_dataset evaluation

	Total of Heartbeat	Average Error	Total Error
201101070538.aif	11	41308.81818	1243640.66
201101151127.aif	11	166513.3636	
201102081152.aif	9.5	179655.2105	
201102201230.aif	11.5	17465	
201102270940.aif	2.5	488124.4	
201103101140.aif	9	53111.27778	
201103140135.aif	9.5	63606.73684	
201103170121.aif	10	2522.7	
201104122156.aif	11.5	186624.5217	
201106151236.aif	9.5	44708.63158	

The result of B_dataset in Figure3:

Figure3 B_dataset evaluation

	Total of Heartbeat	Average Error	Total Error
103_1305031931979_B.aiff	12.5	1968.8	76444.35766
103_1305031931979_D2.aiff	10.5	1010.714286	
106_1306776721273_B1.aiff	4	38.5	
106_1306776721273_C2.aiff	3	31.66666667	
106_1306776721273_D1.aiff	3.5	130.2857143	
106_1306776721273_D2.aiff	8	6616.9375	
107_1305654946865_C1.aiff	7.5	1539.666667	
126_1306777102824_B.aiff	5	24079	
126_1306777102824_C.aiff	3	13825.5	
133_1306759619127_A.aiff	4	96.375	
134_1306428161797_C2.aiff	2.5	66.4	

137_1306764999211_C.aiff	15	37.4
140_1306519735121_B.aiff	11	56.72727273
146_1306778707532_B.aiff	18	4082.638889
146_1306778707532_D3.aiff	3	36.16666667
147_1306523973811_A.aiff	4	258.125
148_1306768801551_D2.aiff	5.5	6285.818182
151_1306779785624_D.aiff	4.5	33.44444444
154_1306935608852_B1.aiff	4.5	2060.888889
159_1307018640315_B1.aiff	6	43.66666667
159_1307018640315_B2.aiff	3	51.83333333
167_1307111318050_A.aiff	13	89.80769231
167_1307111318050_C.aiff	5	3890.4
172_1307971284351_B1.aiff	3.5	44.71428571
175_1307987962616_B1.aiff	2.5	68.8
175_1307987962616_D.aiff	7	2531.642857
179_1307990076841_B.aiff	16.5	2540.909091
181_1308052613891_D.aiff	3	54.16666667
184_1308073010307_D.aiff	26	1113.634615
190_1308076920011_D.aiff	5.5	3759.727273