A graph with blue lines

Description automatically generated

Figure 1. Clear signal (2,5, and 22Hz)

A graph with blue lines

Description automatically generated

Figure 2. Signal with white noise

A graph with blue lines

Description automatically generated

Figure 3. Filtered signal by Wiener filter.

A graph of a graph

Description automatically generated

Figure 5. Filtered signal by Median filter.

A graph with blue lines

Description automatically generated

Figure 7. Filtered signal by Average filter.

Table 1. PSNR summary

|  |  |
| --- | --- |
| Compared to a clear signal | PSNR |
| Noisy signal | -0.0082 |
| The sum of 5 IMF | -4.2639 |
| Filtered signal with Wiener filter | 2.8972 |
| The filtered residual with the Wiener filter | -2.6658 |
| Filtered signal with Median filter | 3.4673 |
| The filtered residual with the Median filter | -3.1441 |
| Filtered signal with Average filter | 6.9875 |
| The filtered residual with the Average filter | -3.8055 |

Survey with K = 6



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **No-filter** | **Wiener** | **Mean** | **Median** |
| **Noisy signal** | 0.017931 | 2.89151 | 6.972775 | 3.511527 |
| **1/6 IMF** | 10.80683 | 5.332989 | 7.057435 | 3.461672 |
| **2/6 IMF** | 6.135901 | 3.752324 | 4.760916 | 2.503336 |
| **3/6 IMF** | 3.300035 | 2.432038 | 2.927765 | 1.361761 |
| **4/6 IMF** | 2.190311 | 1.692811 | 1.984921 | 0.749356 |
| **5/6 IMF** | 1.38759 | 1.103501 | 1.233484 | 0.326964 |
| **6/6 IMF** | 0.319661 | 0.287527 | 0.274418 | -0.55811 |



Survey with k=10

A graph of different colored bars

Description automatically generated

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **No-filter** | **Wiener** | **Mean** | **Median** |
| **Noisy signal** | 0.017931 | 2.89151 | 6.972775 | 3.511527 |
| **1/10 IMF** | 15.80713 | 6.191366 | 6.991755 | 3.50947 |
| **2/10 IMF** | 9.960359 | 5.307051 | 6.909527 | 3.486803 |
| **3/10 IMF** | 7.339386 | 4.456443 | 6.426504 | 3.405059 |
| **4/10 IMF** | 5.386286 | 3.580901 | 5.257355 | 3.200646 |
| **5/10 IMF** | 4.012864 | 2.793135 | 3.957636 | 2.809807 |
| **6/10 IMF** | 2.922539 | 2.09542 | 2.870418 | 2.251542 |
| **7/10 IMF** | 1.981748 | 1.462532 | 2.017265 | 1.589824 |
| **8/10 IMF** | 1.192561 | 0.921364 | 1.285275 | 0.931173 |
| **9/10 IMF** | 0.469479 | 0.431651 | 0.551332 | 0.341724 |
| **10/10 IMF** | -0.24674 | -0.06629 | -0.15674 | -0.20203 |

