

hasil_itb

July 26, 2021

```
[1]: %load_ext autoreload
      %autoreload 2
      %%matplotlib notebook

      from jupyterthemes import jtplot
      jtplot.style(theme='grade3')

[2]: import numpy as np

      from matplotlib import cm
      import matplotlib.pyplot as plt
      import matplotlib.ticker as mticker
      from mpl_toolkits.mplot3d import Axes3D

      from tabulate import tabulate

      np.set_printoptions(suppress=True)

[3]: # Measurement
      Ukur_Freq = np.array([250, 500, 1000, 2000, 4000, 8000])
      Ukur_OutUp = np.array([1, 2, 3, 4, 5, 6, 7, 8, 9])
      Ukur_OutDown = np.array([9, 8, 7, 6, 5, 4, 3, 2, 1])

[4]: def PlotSPLEachFreq(array_in, judul='grafik'):
      fig, axs = plt.subplots(3,2,figsize=(12,6))
      axs[0, 0].plot(Ukur_OutUp, array_in[0,:])
      axs[0, 0].set_title("250 Hz")
      axs[1, 0].plot(Ukur_OutUp, array_in[1,:])
      axs[1, 0].set_title("500 Hz")
      axs[2, 0].plot(Ukur_OutUp, array_in[2,:])
      axs[2, 0].set_title("1000 Hz")
      axs[0, 1].plot(Ukur_OutUp, array_in[3,:])
      axs[0, 1].set_title("2000 Hz")
      axs[1, 1].plot(Ukur_OutUp, array_in[4,:])
      axs[1, 1].set_title("4000 Hz")
      axs[2, 1].plot(Ukur_OutUp, array_in[5,:])
      axs[2, 1].set_title("8000 Hz")
      fig.tight_layout()
```

```
plt.show()
```

```
[5]: def FreqEstim(array_in):  
    c0 = np.polyfit(Ukur_OutUp, array_in[0,:], deg=3)  
    print(250,np.around(c0,2))  
    c1 = np.polyfit(Ukur_OutUp, array_in[1,:], deg=3)  
    print(500,np.around(c1,2))  
    c2 = np.polyfit(Ukur_OutUp, array_in[2,:], deg=3)  
    print(1000,np.around(c2,2))  
    c3 = np.polyfit(Ukur_OutUp, array_in[3,:], deg=3)  
    print(2000,np.around(c3,2))  
    c4 = np.polyfit(Ukur_OutUp, array_in[4,:], deg=3)  
    print(4000,np.around(c4,2))  
    c5 = np.polyfit(Ukur_OutUp, array_in[5,:], deg=3)  
    print(8000,np.around(c5,2))  
  
    model = np.around(np.array([c0,c1,c2,c3,c4,c5]),2)  
  
    return model
```

```
[6]: def TexTable(array_in, header_in):  
    print(tabulate(array_in, header_in, tablefmt="latex"))
```

```
[7]: freq = np.array([250,500,1000,2000,4000,8000])  
    lev1 = np.array([9,8,7,6,5,4,3,2,1])
```

```
[8]: bose_1 = np.array([  
    [75.0,68.9,62.8,56.8,50.7,45.1,40.2,35.4,32.5],  
    [74.5,68.4,62.4,56.3,50.3,44.5,39.4,35.1,31.5],  
    [81.2,75.2,69.2,63.1,57.1,51.2,45.5,40.8,37.2],  
    [78.0,71.9,65.9,59.8,53.8,48.2,42.7,38.2,35.2],  
    [82.9,76.9,70.9,64.8,58.8,53.0,47.8,43.8,41.0],  
    [79.1,73.0,67.0,60.9,55.2,49.6,45.4,42.8,42.0]  
])  
  
bose_2 = np.array([  
    [76.1,70.1,64.1,58.0,52.1,46.3,41.2,37.6,36.2],  
    [75.1,69.1,63.0,56.9,50.1,45.3,41.0,36.5,33.6],  
    [80.8,74.8,68.8,62.7,56.6,50.8,45.5,41.1,38.1],  
    [76.9,70.8,64.8,58.7,52.7,47.1,42.2,39.0,37.4],  
    [83.2,77.2,71.2,65.1,59.2,53.4,48.1,43.9,41.2],  
    [77.4,71.5,65.4,59.4,53.7,48.5,44.4,42.3,41.5]  
])
```

```
[9]: miniso_1 = np.array([  
    [73.7,67.7,61.7,55.7,49.9,44.1,38.7,33.7,30.5],  
    [74.8,68.8,62.9,56.9,51.0,45.2,39.8,34.9,31.1],
```

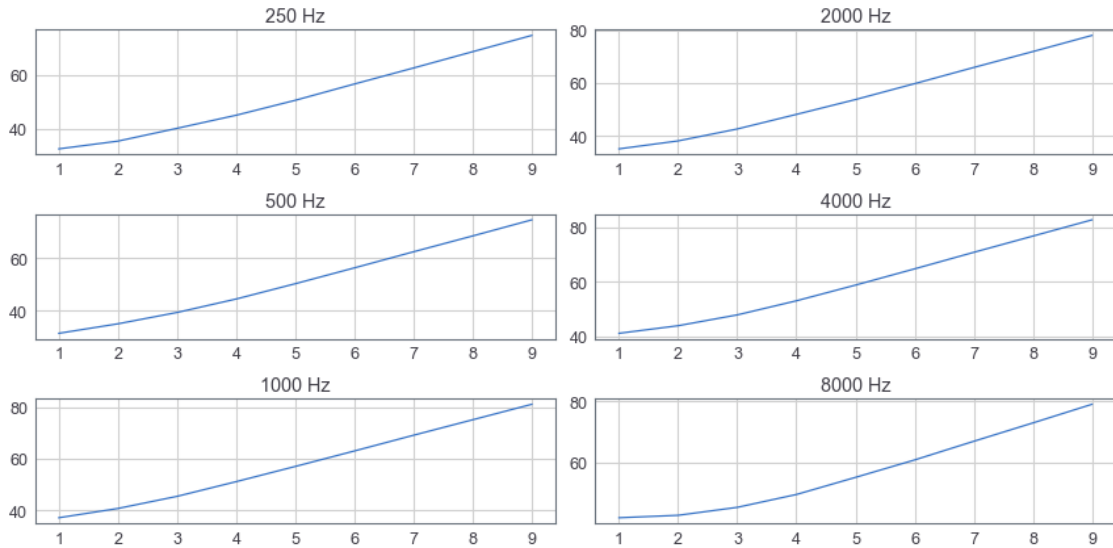
```

[78.0,72.0,66.0,60.1,54.2,48.4,43.0,38.0,34.3],
[68.7,62.6,56.7,50.7,44.9,39.1,34.0,29.9,27.2],
[62.2,56.2,50.2,44.3,38.7,33.6,29.6,27.7,27.0],
[65.0,59.0,53.0,47.2,41.5,36.3,32.7,30.4,29.6]
])

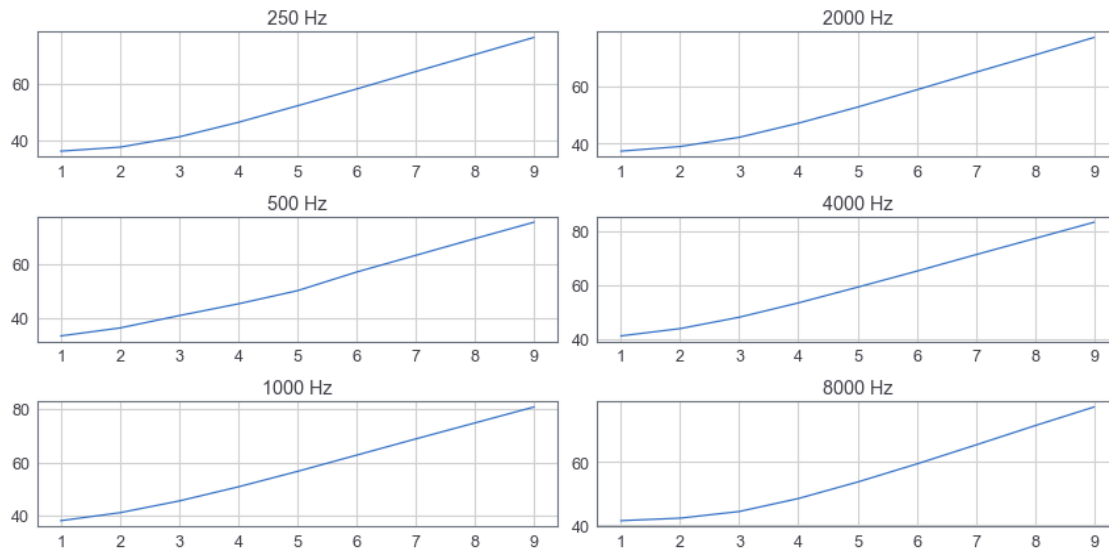
miniso_2 = np.array([
    [85.2,79.2,73.2,67.2,61.2,55.3,49.7,45.3,41.6],
    [86.4,80.4,74.4,68.4,62.4,56.5,51.1,46.1,42.3],
    [89.7,83.7,77.7,71.7,65.8,59.9,54.3,49.3,45.5],
    [80.1,74.0,68.0,62.0,56.0,50.2,45.1,41.0,38.7],
    [73.7,67.7,61.7,55.7,49.9,44.8,41.0,39.0,38.4],
    [76.0,70.1,64.1,58.1,52.4,47.3,43.9,42.0,41.5]
])

```

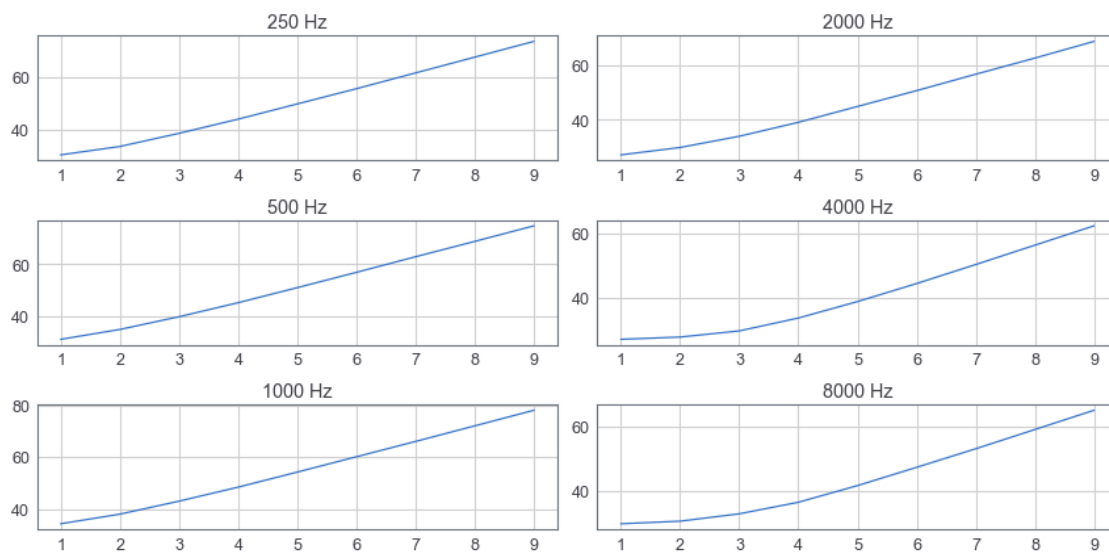
```
[10]: PlotSPLEachFreq(bose_1[:,::-1], "Prototype A with Bose")
```



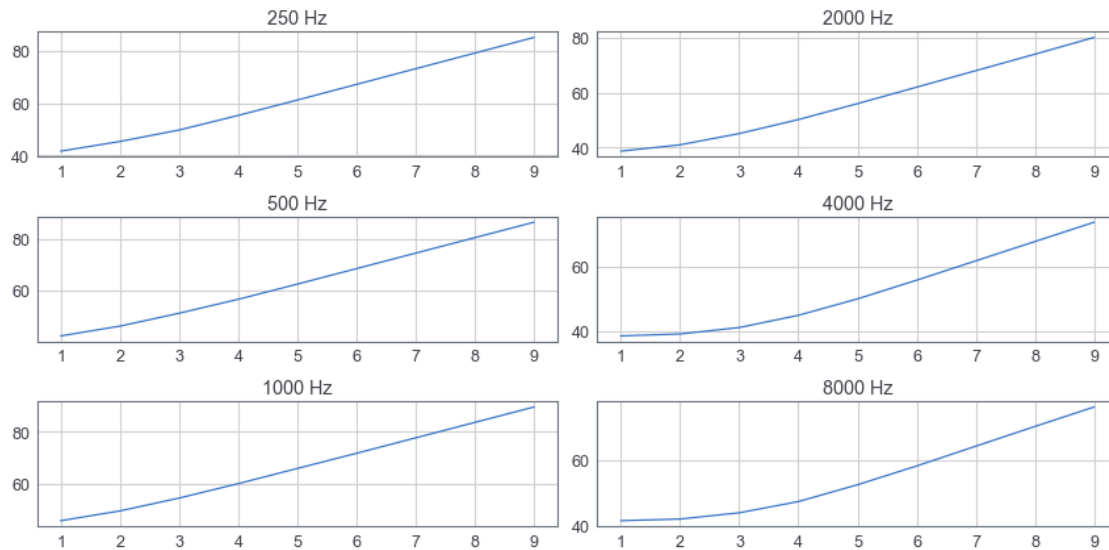
```
[11]: PlotSPLEachFreq(bose_2[:,::-1], "Prototype B with Bose")
```



```
[12]: PlotSPLEachFreq(miniso_1[:,::-1], "Prototype A with Miniso")
```



```
[13]: PlotSPLEachFreq(miniso_2[:,::-1], "Prototype B with Miniso")
```



```
[14]: avg_bose = np.around((bose_1+bose_2)/2,1)
      print(avg_bose)

[[75.6 69.5 63.4 57.4 51.4 45.7 40.7 36.5 34.4]
 [74.8 68.8 62.7 56.6 50.2 44.9 40.2 35.8 32.6]
 [81.  75.  69.  62.9 56.8 51.  45.5 41.  37.7]
 [77.4 71.4 65.4 59.2 53.2 47.7 42.4 38.6 36.3]
 [83.1 77.1 71.1 64.9 59.  53.2 48.  43.8 41.1]
 [78.2 72.2 66.2 60.2 54.4 49.  44.9 42.6 41.8]]
```

```
[15]: model_bose = FreqEstim(avg_bose)

250 [ 0.05 -0.46 -4.7  80.58]
500 [ 0.03 -0.28 -5.41 80.48]
1000 [ 0.04 -0.4  -4.8  86.06]
2000 [ 0.05 -0.49 -4.59 82.33]
4000 [ 0.04 -0.44 -4.72 88.12]
8000 [ 0.06 -0.59 -4.37 83.  ]
```

```
[16]: avg_miniso = np.around((miniso_1+miniso_2)/2,1)
      print(avg_miniso)

[[79.4 73.4 67.4 61.4 55.6 49.7 44.2 39.5 36. ]
 [80.6 74.6 68.6 62.6 56.7 50.8 45.4 40.5 36.7]
 [83.8 77.8 71.8 65.9 60.  54.2 48.6 43.6 39.9]
 [74.4 68.3 62.4 56.4 50.4 44.7 39.6 35.4 33. ]
 [68.  62.  56.  50.  44.3 39.2 35.3 33.4 32.7]
 [70.5 64.6 58.6 52.6 47.  41.8 38.3 36.2 35.6]]
```

```
[17]: model_miniso = FreqEstim(avg_miniso)
```

```

250 [ 0.03 -0.32 -4.99 84.58]
500 [ 0.03 -0.28 -5.16 85.93]
1000 [ 0.03 -0.28 -5.09 89.04]
2000 [ 0.04 -0.46 -4.63 79.29]
4000 [ 0.06 -0.53 -4.64 73.05]
8000 [ 0.06 -0.51 -4.67 75.59]

```

```
[18]: TexTable(avg_bose[:,::-1],['1','2','3','4','5','6','7','8','9'])
```

```

\begin{tabular}{rrrrrrrrrr}
\hline
1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & \\
\hline
34.4 & 36.5 & 40.7 & 45.7 & 51.4 & 57.4 & 63.4 & 69.5 & 75.6 & \\
32.6 & 35.8 & 40.2 & 44.9 & 50.2 & 56.6 & 62.7 & 68.8 & 74.8 & \\
37.7 & 41 & 45.5 & 51 & 56.8 & 62.9 & 69 & 75 & 81 & \\
36.3 & 38.6 & 42.4 & 47.7 & 53.2 & 59.2 & 65.4 & 71.4 & 77.4 & \\
41.1 & 43.8 & 48 & 53.2 & 59 & 64.9 & 71.1 & 77.1 & 83.1 & \\
41.8 & 42.6 & 44.9 & 49 & 54.4 & 60.2 & 66.2 & 72.2 & 78.2 & \\
\hline
\end{tabular}

```

```
[19]: TexTable(avg_miniso[:,::-1],['1','2','3','4','5','6','7','8','9'])
```

```

\begin{tabular}{rrrrrrrrrr}
\hline
1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & \\
\hline
36 & 39.5 & 44.2 & 49.7 & 55.6 & 61.4 & 67.4 & 73.4 & 79.4 & \\
36.7 & 40.5 & 45.4 & 50.8 & 56.7 & 62.6 & 68.6 & 74.6 & 80.6 & \\
39.9 & 43.6 & 48.6 & 54.2 & 60 & 65.9 & 71.8 & 77.8 & 83.8 & \\
33 & 35.4 & 39.6 & 44.7 & 50.4 & 56.4 & 62.4 & 68.3 & 74.4 & \\
32.7 & 33.4 & 35.3 & 39.2 & 44.3 & 50 & 56 & 62 & 68 & \\
35.6 & 36.2 & 38.3 & 41.8 & 47 & 52.6 & 58.6 & 64.6 & 70.5 & \\
\hline
\end{tabular}

```

```
[ ]:
```