seaEchoTargetStrengthCalculator

Instructions

The seaEchoTargetStrengthCalculator (v0.1) is a CLI tool based on python 3.8 to determine Target Strength, particularly focused towards bubbles underwater, along with a portion used to determine target strength of solid elastic spheres.

Installation

1. Obtain the code.
    a. Clone repository to a suitable directory.
    git clone https://github.com/.../..../
    b. Download version0.1 and unzip to a suitable directory in the system.
2. Navigate to repository's root directory.

```
cd seaEchoTargetStrengthCalc/
```

3. Setup an isolated python environment using the following in terminal

```
python -m venv venv
```

4. Activate virtual environment.

```
source venv/bin/activate [For macOS/Linux]
.\env\Scripts\Activate.ps1 [For windows(powershell)]
```

5. Install dependencies for the code.

```
pip install -r requirements.txt
```

Operation

For bubble, workflow is as following,

1. Navigate your required directory. (Bubble/Sphere)

```
cd Bubble
```

2. Launch the CLI using following command.

```
python main.py
```

3. After executing the main.py file, available models are provided. User can input the numeric value provided to select their preferred models.

```
=== Target Strength Computation ===

Available Models:
1. Medwin_Clay
2. Breathing
3. Thuraisingham
4. Modal
5. Weston_Medwin
6. Anderson_Weston
7. Ainslie_Leighton
Select models (comma-separated numbers): 1, 4
```

4. Following this, user is prompted for frequency configuration.
    a. Single Frequency Analysis.

```
Frequency type? (single/range): single
Center frequency (kHz): 1000
```

    b. Custom Frequency Range

```
Frequency type? (single/range): range
Enter range (kHz) [min-max]: 1-1200
Number of steps: 1200
Additional discrete freqs (kHz, comma-separated): 1000
```

User can also input any additional discrete frequency to mark in the plot.

5. Following this you will be prompted to provide environmental parameters and bubble diameter.

```
Environmental Parameters:
Temperature (°C): 20
Salinity (psu): 0
Depth (m): 10
Bubble diameter (mm): 1
```

6. Results Output printed in the terminal.

```
=== Discrete Frequency Results ===

Frequency: 1000.0 kHz
  Medwin_Clay: -73.40 dB
  Modal: -71.56 dB
```

7. A graph of TS vs Frequency within the range of ±10KHz of the user input frequency (For single frequency analysis) or range of custom frequency selected will be generated automatically at the root directory as ts_vs_frequency_plot.png as shown in Figure 1 and Figure 2.

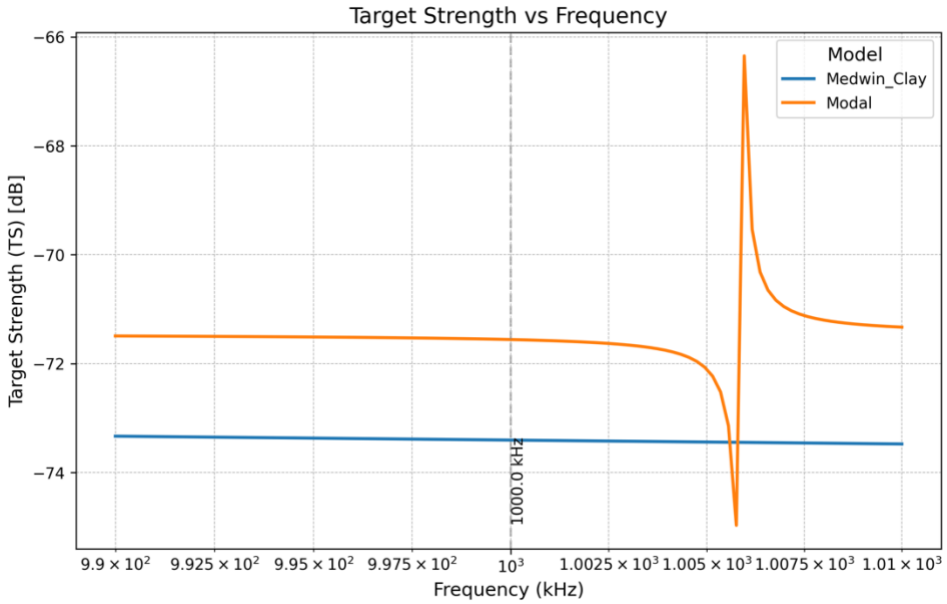

Figure 1: Output plot for single frequency.

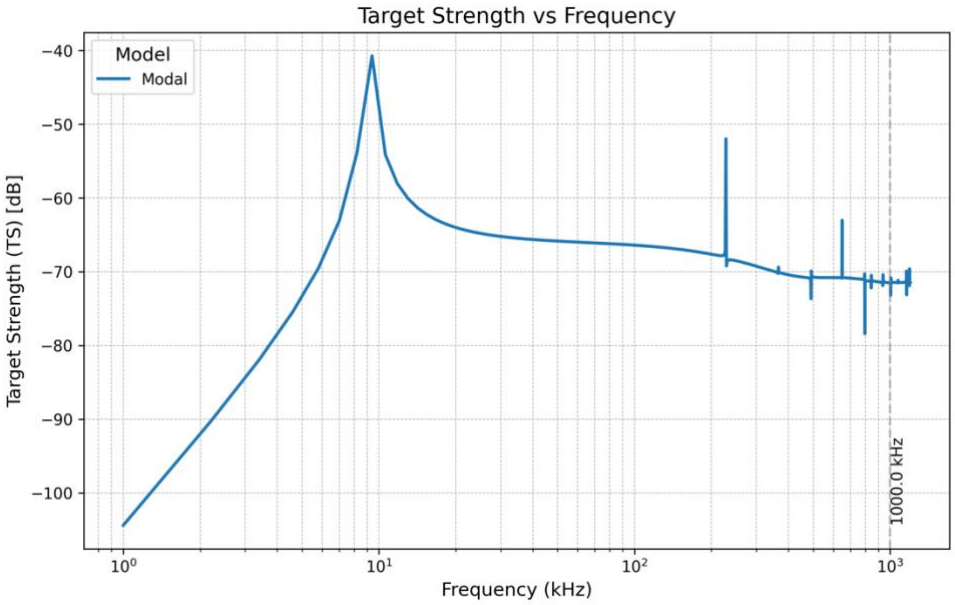

Figure 2: Output plot for range of frequency.

For sphere, workflow is as following,

1. Navigate your required directory. (Bubble/Sphere)

```
cd SolidSphere
```

2. Launch the CLI using following command.

```
python main.py
```

3. User will be prompted to provide the following input.

```
=== Solid Sphere Target Strength Computation ===
Enter frequency range (e.g., 10-50): 1-1350
Enter the number of steps between the range: 1000
Enter discrete frequencies (e.g., 30, 45): 38, 1000
Enter temperature (°C): 20
Enter salinity (psu): 0
Enter depth (m): 10
Enter sphere radius (mm): 5
```

4. Upon inputting and executing the script, following outputs will pop out.

```
=== Results for Discrete Frequencies ===
Frequency: 38.0 kHz -> TS: -54.65 dB
Frequency: 1000.0 kHz -> TS: -51.76 dB
```

5. A graph of TS vs Frequency will also be generated as shown in the figure 3.

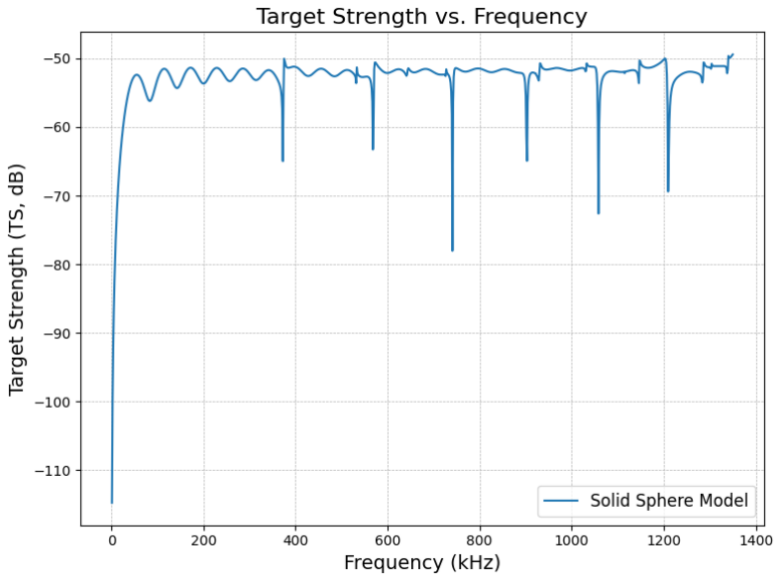

Figure 3: Output plot for a range of frequency for solid sphere.

N.B.: In v0.1, our solid sphere code is only limited to Tungsten Carbide (WC) as target material.