
paths

```
dirDataLocker = dirIO <> "rcs/tools/data/";
```

```
sciaccarcs = "rcs-values.dat";  
sciaccaelevation = "elevation.dat";
```

```
sciaccaMesh = Range[-180, 180];
```

linear algebra

```
Clear[BuildAFourierCos];  
BuildAFourierCos[mesh_List, degree_Integer] := Module[{λ, A, one, vector},  
  λ = Length[mesh];  
  one = Table[1, {λ}];  
  A = {one};  
  vector = 1;  
  Do[  
    vector = vector + mesh;  
    AppendTo[A, Cos[vector  $\frac{\pi}{180}$ ]]  
    , {k, degree}];  
  Return[AT];  
];
```

```
Clear[basisFourierCos];  
basisFourierCos[θ_, degree_Integer] := Module[{},  
  Return[Table[Cos[k θ], {k, 0, degree}]];  
]
```

```
Clear[κ];  
κ[A_List] := Module[{s},  
  s = SingularValueList[A];  
  Return[ $\frac{\text{First}[s]}{\text{Last}[s]}$ ];  
]
```

error

```

Clear[error];
error[A_List, solution_List, data_List] :=
Module[{σ, m, n, W, Winv, signalToNoise},
  m = Length[data];
  n = Length[solution];
  residual = A.solution - data;
  totalError = residual.residual;
  W = AH.A;
  Winv = Inverse[W];
  
$$\sigma = \sqrt{\frac{\text{totalError}}{m - n} \text{Diagonal}[Winv]};$$

  signalToNoise =  $\frac{\text{Abs}[solution]}{\sigma};$ 

  Return[{σ, signalToNoise}]
]

```

```

Clear[errorN];
errorN[A_List, solution_List, data_List] :=
Module[{σ, m, n, W, Winv, signalToNoise},
  m = Length[data];
  n = Length[solution];
  residual = A.solution - data;
  totalError = residual.residual;
  W = AH.A // N;
  Winv = Inverse[W];
  
$$\sigma = \sqrt{\frac{\text{totalError}}{m - n} \text{Diagonal}[Winv]};$$

  signalToNoise =  $\frac{\text{Abs}[solution]}{\sigma};$ 
  Return[{σ, signalToNoise}]
]

```

```

Clear[printError];
printError[solutionVector_List, errorVector_List] := Module[{m, n, W, Winv},
  Print[totalError, ": r.r = total squared error (totalError)"];
  Print[solutionVector, ": solution vector"];
  Print[errorVector, ": error vector (s)"];
  Print[ $\frac{\text{Abs[solutionVector]}}{\text{errorVector}}$ , ": signal to noise (signalToNoise)"];
  Print[residual, ": residual error vector (residual)"];
]

```

parameters

```

(* OTH frequency range *)
v = Range[3, 30];

```

```

Out[*]:= {3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15,
  16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30}

```

```

(* remap frequencies to [-1, 1] *)
 $\mu = \left( \frac{2}{27} \# - \frac{11}{9} \right) \& /@ v;$ 

```

```

Out[*]:=  $\left\{ -1, -\frac{25}{27}, -\frac{23}{27}, -\frac{7}{9}, -\frac{19}{27}, -\frac{17}{27}, -\frac{5}{9}, -\frac{13}{27}, -\frac{11}{27}, -\frac{1}{3}, -\frac{7}{27}, -\frac{5}{27}, \right.$ 
 $\left. -\frac{1}{9}, -\frac{1}{27}, \frac{1}{27}, \frac{1}{9}, \frac{5}{27}, \frac{7}{27}, \frac{1}{3}, \frac{11}{27}, \frac{13}{27}, \frac{5}{9}, \frac{17}{27}, \frac{19}{27}, \frac{7}{9}, \frac{23}{27}, \frac{25}{27}, 1 \right\}$ 

```

```

In[*]:= (* speed of light in vacuo *)
c = 299 792 458;

```

comparisons

utilities

```

clear[ClearAll] := Module[{},
  (* clear all variable names and assignments *)
  Clear["Global`*"]; ClearAll["Global`*"]; Remove["Global`*"];
  ClearSystemCache[];
];

```

```
Clear[cleanStreams];  
cleanStreams[] := Close[#] & /@ Drop[Streams[], 2]
```

end