Zplane(Module(

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1 This is a module which has a function zplane and can be used for plotting the poles and zeroes of given transfer function (z-plane). It plots the zeros and poles with respect to a given unit circle.

1.0.1 Input:

Using this function user provides 2 vectors of values as parameters: the variable 'nullstellen'(zeros) takes the zeros(roots of the numerator of transfer function) as a vector. the variable 'pole' takes the poles(roots of the denominator of the transfer function) as a vector.

1.0.2 Output:

Plot with a unit circle and positions of poles as 'x' and zeros as 'o' on the plot.

1.0.3 Import relevant modules and define the function.

```python
In [1]: #Gerald Schuller, June 2016
        import numpy as np
        import scipy as sp
        import matplotlib.pyplot as plt

        def zplane(nullstellen, pole, axis = None):
            """Usage: zplane(zeros, poles)
            plots the location of zeros and poles in the complex z-plane, with a unit circle.
            zeros are circles, poles are crosses.
            zeros, poles: array like, complex."""
            plt.figure()
            #Plotte die Pole in der komplexen Ebene als 'x':
            plt.plot(np.real(pole),np.imag(pole),'x')
            #Plotte die Nullstellen als 'o':
            plt.plot(np.real(nullstellen),np.imag(nullstellen),'o')


            #passende Axen-Skalierung:
            plt.axis('equal')
            if axis is not None:
                plt.axis(axis)
```

```python
    #Plot unit circle:
    circlere=np.zeros(512)
    circleim=np.zeros(512)
    for k in range(512):
        circlere[k]=np.cos(2*np.pi/512*k)
        circleim[k]=np.sin(2*np.pi/512*k)

    plt.plot(circlere,circleim)
    plt.title('Complex z-Plane')
    plt.show()
    return()
```

1.0.4 Example below:

```python
In [2]: #b - list of zeros
        #a - list of poles

        import numpy as np
        # import zplane

        b = np.array([.5, -.6, 2.5])
        a = np.array([.3, -.3, .1])

        zplane(b, a)
```

```
Out[2]: ()
```

1.0.5 Note:

For using this module file use 'import zplane' and call the function using zplane.zplane(param...).
This module is also available in the moodle webpage.