An R Markdown document converted from "Stress Influence Factor.ipynb"

Julian Tao

This notebook presents the common calculation methods for stress increment induced by a rectangular loading.

Defination of the problem:

Known: 1) the loading is uniformly applied on an area measures B (width) x L (Length) at the ground surface

2) Point A is located below the center of the area at a depth of zf
3) Point B is located below the corner of the area at a depth of zf

Solve: 1) the stress influence factor at A using a) Boussinesq method (Newark's solution); b) Poulos approximation method; c) 1:2 method

2) the stress influence factor at B using a) Boussinesq method (Newark's solution); b) 1:2 method

To Use the Code: 1) update the geometry parameters B, L and zf

2) hit run button and review the results

```
import math
```

```
## input
B = 0.5
L = 1.0
zf = 1.2
```

```
#### function IB defines the Newark's solution for Boussinesq method and calculate the influ
def IB(B, L, zf):

    if B**2+L**2+zf**2 < B**2*L**2/zf**2:
        I = 1/4/math.pi*((2*B*L*zf*(B**2+L**2+zf**2)**0.5/(zf**2*(B**2+L**2+zf**2)+B**2*L**2
    else:
        I = 1/4/math.pi*((2*B*L*zf*(B**2+L**2+zf**2)**0.5/(zf**2*(B**2+L**2+zf**2)+B**2*L**2
        return (I)

#### function I_Poulos defines Poulus approximation equation to calculate the influence fact
def I_Poulos(B, L, zf):
    I_Poulos = 1-(1/(1+(B/2/zf)**(1.38+0.62*B/L)))**(2.60-0.84*B/L)
    return (I_Poulos)

#### function I12 defines the 1:2 method to calculate the influence factor IB
def I12(B, L, zf):
    I12 = (B*L)/(B+zf)/(L+zf)
    return (I12)
```

```
IB_corner = IB(B, L, zf)
I12 = I12(B, L, zf)
IB_center=4*IB(B/2, L/2, zf)
I_Poulos = I_Poulos(B, L, zf)

print ('Under the center, the stress influence factor calculated using the Boussinesq method
print ('Under the center, the stress influence factor calculated using the Poulus approximat
print ('Under the center, the  stress influence factor calculated using the 1:2 method is: '
print ('Under the corner, the  stress influence factor calculated using the Boussinesq metho
```

```
Under the center, the stress influence factor calculated using the Boussinesq method is:  0.
Under the center, the stress influence factor calculated using the Poulus approximation meth
Under the center, the  stress influence factor calculated using the 1:2 method is:  0.133689
Under the corner, the  stress influence factor calculated using the Boussinesq method is:  0
```