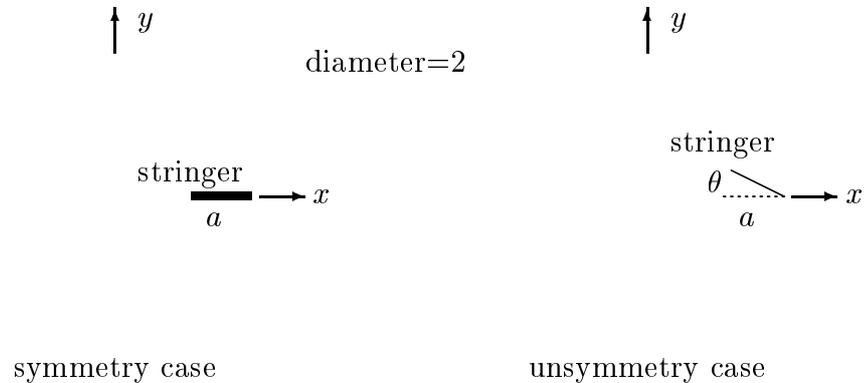


## 邊界元素法1999 第三次作業



### 1. The eigenvalue problem

$$\nabla^2 u(\mathbf{x}) + k^2 u(\mathbf{x}) = 0, \mathbf{x} \in D$$

with boundary condition

$$u(\mathbf{x}) = 0, \mathbf{x} \text{ on the boundary}$$

2. By discretizing the circular boundary into  $N$  elements,  $2M$  elements on crack boundary of orientation angle  $\theta$  with crack length  $a = 1.0$  (two on the upper crack line, the other two on the lower crack line), determine the first three critical wave numbers and the corresponding modes by using DUALREL program developed by MSV Lab. in NTOU.

3. After combining the dual equations, plot the determinant of  $[U] + [L]_c$  and  $[\bar{L}] + [U]_c$  versus  $k$  and determine the former three eigenvalues.

4. After obtaining the overdetermined equations from dual formulation, plot the first singular value,  $\sigma_1$ , of  $[U]$  and  $[\bar{L}]$  versus  $k$  and determine the former three eigenvalues. by employing the SVD technique.

5. Plot the boundary mode by extracting the right unitary vector.

6. Contour plot for the former three eigenmodes.

## References

- [1] J. T. Chen, C. X. Huang and K. H. Chen, 1999, Determination of spurious eigenvalues and multiplicities of true eigenvalues using the real-part dual BEM, Computational Mechanics, Accepted. (SCI and EI)