

جامعة الانبار
كلية العلوم
قسم الرياضيات التطبيقية
نظرية البيانات

Cut- Set Matrix / Part 2

Fundamental Cut-Set Matrix

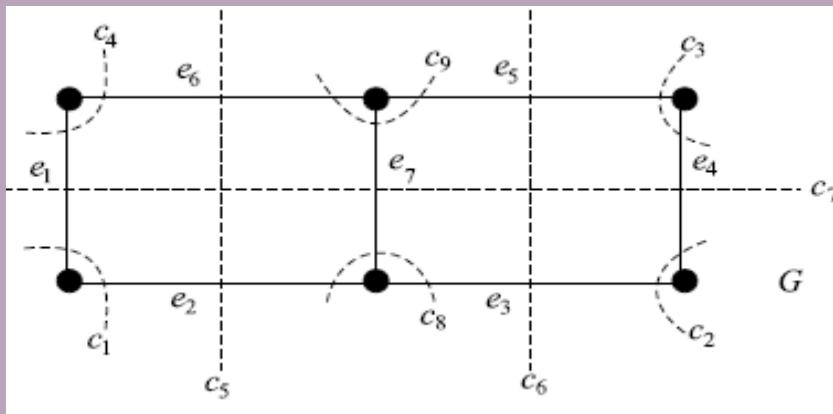
م. د. امين شامان امين

Fundamental Cut- Set Matrix

Lecture # 5
Part # 2

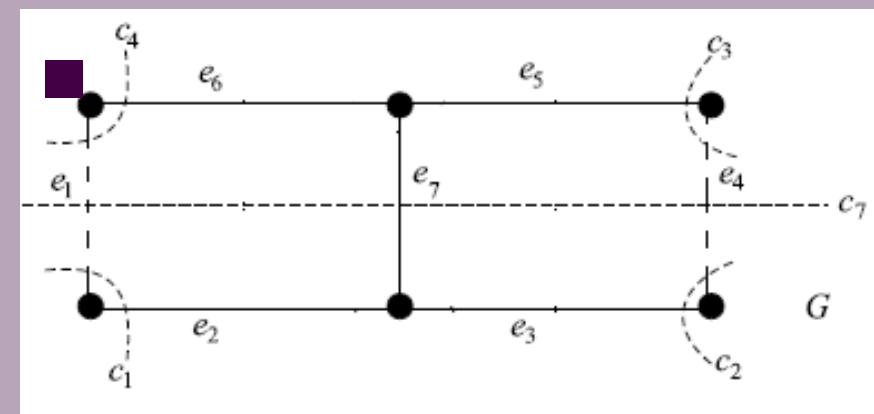
Fundamental Cut- Set:

Definition: Let T be a spanning tree of a connected graph G . A cut set S of G containing exactly one branch of T is called a fundamental cut-set of G with regard to T .



The cut- set of G as follows:

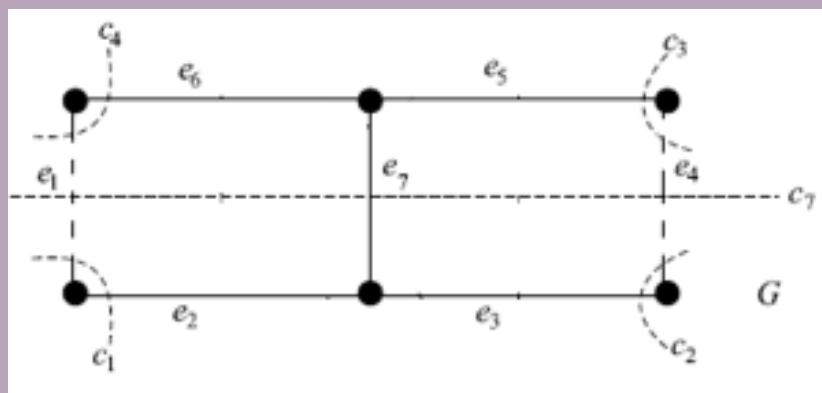
$$\begin{aligned}C_1 &= \{e_1, e_2\}, C_2 = \{e_3, e_4\}, \\C_3 &= \{e_4, e_5\}, C_4 = \{e_1, e_6\}, \\C_5 &= \{e_2, e_6\}, C_6 = \{e_3, e_5\}, \\C_7 &= \{e_1, e_4, e_7\}, C_8 = \{e_2, e_3, e_7\}, \\C_9 &= \{e_5, e_6, e_7\}.\end{aligned}$$



The fundamental cut- set of G as follows:

$$\begin{aligned}C_1 &= \{e_1, e_2\}, C_2 = \{e_3, e_4\}, \\C_3 &= \{e_4, e_5\}, C_4 = \{e_1, e_6\}, \\C_7 &= \{e_1, e_4, e_7\}.\end{aligned}$$

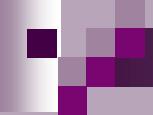
Note: A fundamental cut-set matrix C_f can be partitioned into two submatrices, one of which is an identity matrix I_{n-1} of order $n - 1$. That is, $C_f = [C_c : I_{n-1}]$, where the last $n - 1$ columns forming the identity matrix correspond to the $n - 1$ branches of the spanning tree and the first $e - n + 1$ columns forming C_c correspond to the chords.



$$C_f(G) = \begin{bmatrix} e_1 & e_4 & e_2 & e_3 & e_5 & e_6 & e_8 \\ C_1 & \begin{bmatrix} 1 & 0 & \vdots & 1 & 0 & 0 & 0 \\ C_2 & \begin{bmatrix} 0 & 1 & \vdots & 0 & 1 & 0 & 0 \\ C_3 & \begin{bmatrix} 0 & 1 & \vdots & 0 & 0 & 1 & 0 \\ C_4 & \begin{bmatrix} 1 & 0 & \vdots & 0 & 0 & 0 & 1 \\ C_7 & \begin{bmatrix} 1 & 1 & \vdots & 0 & 0 & 0 & 1 \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

$$C_f(G) = \begin{bmatrix} e_1 & e_2 & e_3 & e_4 & e_5 & e_6 & e_8 \\ C_1 & \begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 0 & 0 \\ C_2 & \begin{bmatrix} 0 & 0 & 1 & 1 & 0 & 0 & 0 \\ C_3 & \begin{bmatrix} 0 & 0 & 0 & 1 & 1 & 0 & 0 \\ C_4 & \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 1 & 0 \\ C_7 & \begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 0 & 1 \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

$$C_f(G) = [C_c \quad : \quad I_{n-1}]$$



THANK YOU

References:

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