Connectivity in Spatial Optimization

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Lecture 5 (5/17/2018)

Connectivity:
The Conrad et al. (2012) Model

Should parcel *i* be selected?

$$Max \sum_{i \in V} a_i x_i$$

$$s.t.:$$

$$\sum_{i \in V} c_i x_i \le B$$

$$x_t = 1 \qquad \forall t \in T$$

$$\sum_{j \in V} x_j = y_{0\hat{t}}$$

Variable to absorb residual flow

$$z_0 + y_{0\hat{t}} = n$$

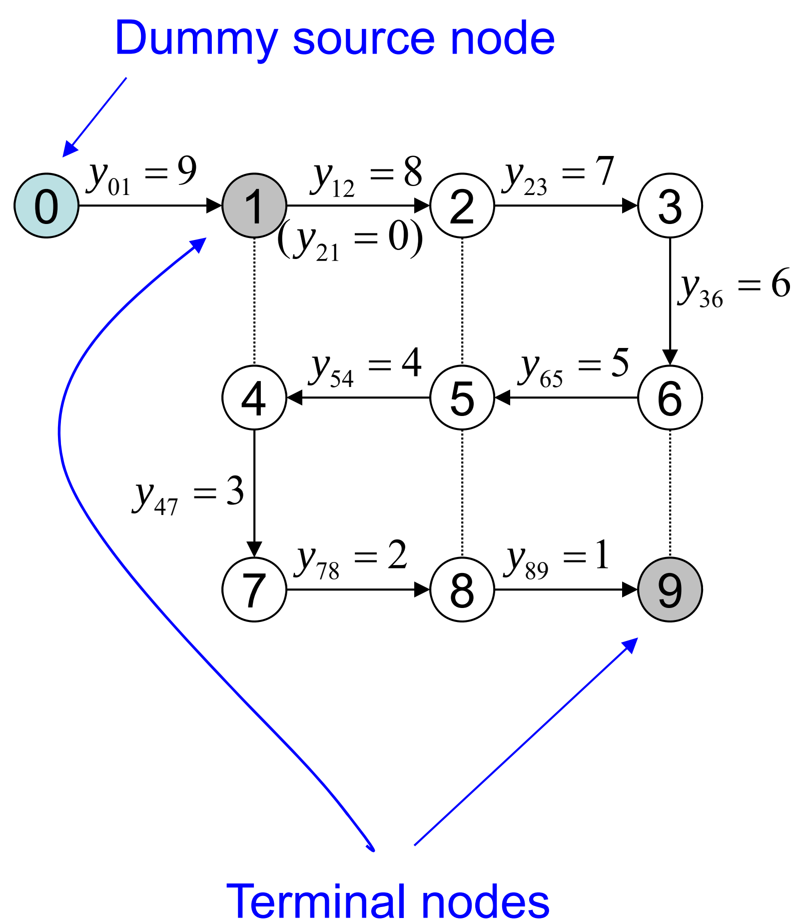
$$y_{ij} \le n x_j \qquad \forall (ij) \in E'$$

Directional flow from *i* to *j*

$$\sum_{i:(ij) \in E'} y_{ij} = x_j + \sum_{l:(jl) \in E'} y_{jl} \qquad \forall j \in V$$

$$x_i \in \{0,1\},\ z_0 \in [0,n]$$

$$y_{ij} \in \mathbb{R}^+$$



Connectivity:

The Önal and Briers (2006) Model

Should parcel *i* be selected?

$$Max \sum_{i \in V} a_i x_i$$

$$s.t.:$$

$$\sum_{i \in V} c_i x_i \le B$$

Should there be a flow from *i* to *j* ?

$$\sum_{i \in A_j} y_{ij} \le |A_j| x_j \qquad \forall j \in V$$

$$\sum_{j \in A_i} y_{ij} \le x_i \qquad \forall i \in V$$

$$\sum_{(ij) \in E} y_{ij} = \sum_{i \in V} x_i - 1$$

$$z_{ij} \ge w_i + 1 - m(1 - y_{ij}) \qquad \forall (ij) \in E \text{ with } i \ne j$$

$$w_j = \sum_{i \in V} z_{ij} \qquad \forall j \in V$$

Tail function contribution from parcel *i* to *j*

$$x_i, y_{ij} \in \{0,1\}$$

$$w_i, z_{ij} \in \mathbb{R}^+$$

Tail function for parcel *j*