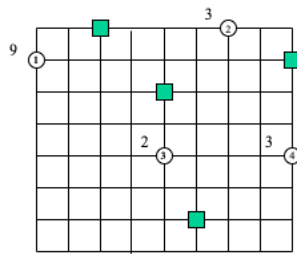


Given an instance of the sensor lifetime maximization problem



- 4 sensors (empty circles): 1,2,3,4 besides each sensor there is the initial number of batteries, e.g. for sensor 1 there are batteries for 9 days
- 4 targets (green squares) that should be covered by sensors in the **rectilinear** (Manhattan) metric (the unit length of grid is 1), The sensing radius is 5 (in rectilinear metric), i.e. sensor 1 covers two targets (the topmost and the middle squares), the bottom target is covered by sensors 3 and 4.
- Sensor cover is the minimal subset of sensors covering all targets; for example {sensor S1, sensor S4} is a sensor cover.

(a) List all sensor covers: SC1 = { S1, S4} SC2= { } SC3= { } SC4 = { }

(b) Write linear program formulation for sensor lifetime maximization problem variables:

objective:  
s.t.

Solution:

a) List of sensor Covers:

SC1 = {S<sub>1</sub>, S<sub>4</sub>}

SC2 = {S<sub>2</sub>, S<sub>3</sub>}

SC3 = {S<sub>2</sub>, S<sub>4</sub>}

b) Linear Program Formulation for sensor lifetime maximization problem:

Maximize  $\sum_{i=1}^n t_i$  where  $t_i$  is the time variable

Such that  $\sum_{j=1}^m C_{ij} \cdot t_j \leq b_i$

$C_{ij} = \begin{cases} 1 & \text{if sensor } i \text{ in sensor cover } j \\ 0 & \text{if sensor } i \text{ is not in sensor cover } j \end{cases}$

Maximize  $t_1 + t_2 + t_3$

Such that

$t_1 \leq 9$

$t_2 + t_3 \leq 3$

$t_2 \leq 2$

$t_1 + t_3 \leq 3$