

09M3

Bus Assignment

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The Bus Assignment Problem

- 11 bus lines
<id> <length_km> <pax_h>
- 2 bus types
 $X = 80$ pax, $Y = 150$ pax
- operation
linewise, perpetually,
roundabout
- parameters
turn = 0:10, $v = 18$ km/h
- service
at least 5 busses per hour,
transport demand
- What is the min no of buses?
- You have only 145 Y. Min X?
- You have only 145 Y + 150 X.
What do you do?
 - Reducing the turning time?
 - Increasing vehicle velocity?
 - Relaxing the frequency?
 - Leaving some passengers?
- Develop a model.
- Analyze the situation.
- Suggest something decent.



Integer Programming Model

$$\begin{array}{llll}
 \min & \sum (x_i + y_i) & | & \sum s_i & | & s \\
 & t_i / (x_i + y_i) & \leq & f_i & & \forall \text{ lines } i \\
 & (80x_i + 150y_i) / t_i & \geq & (d_i - s_i) / 60 & & \forall \text{ lines } i \\
 & s & \geq & s_i & & \forall \text{ lines } i \\
 & \sum x_i & \leq & n_x & & \\
 & \sum y_i & \leq & n_y & & \\
 & x_i, y_i & \in & \mathbb{N}_0 & & \forall \text{ lines } i \\
 & s, s_i & \geq & 0 & & \forall \text{ lines } i
 \end{array}$$



Analysis

FREQ	TURN	VMAX	LIMX	LIMY	MAXS	MAXP	OBJ	X	Y	XY	S	MAXS	P	STATUS
12	10	18	INF	INF	0	0.0	sumxy	0	296	296	0	0	0.00	opt
12	10	18	INF	145	0	0.0	sumxy	203	296	348	0	0	0.00	opt
12	10	18	150	145	0	0.0	sumxy	-	-	-	-	-	-	inf
12	9	18	150	145	0	0.0	sumxy	-	-	-	-	-	-	inf
12	8	18	150	145	0	0.0	sumxy	-	-	-	-	-	-	inf
...														
12	-5	18	150	145	0	0.0	sumxy	149	145	294	0	0	0.00	opt
12	10	19	150	145	0	0.0	sumxy	-	-	-	-	-	-	inf
...														
12	10	21	150	145	0	0.0	sumxy	141	145	286	0	0	0.00	inf
300	10	21	150	145	0	0.0	sumxy	-	-	-	-	-	-	inf
12	10	18	150	145	INF	1.0	sumxy	86	145	231	8800	1300	1.00	opt
12	10	18	150	145	INF	1.0	sums	150	145	295	853.6	488.6	1.00	opt
12	10	18	150	145	90	1.0	sums	-	-	-	-	-	-	inf
12	10	18	150	145	100	1.0	sums	-	-	-	-	-	-	inf
12	10	18	150	145	120	1.0	sums	-	-	-	-	-	-	inf
12	10	18	150	145	130	1.0	sums	-	-	-	-	-	-	inf
12	10	18	150	145	140	1.0	sums	150	145	295	944.0	140	1.00	opt
12	10	18	150	145	150	1.0	sums	150	145	295	929.3	150	1.00	opt
12	10	18	150	145	INF	INF	maxs	150	145	295	949.4	138.5	1.00	opt
12	10	18	150	145	INF	INF	maxp	150	145	295	943.3	165.6	0.13	opt

