Exercise 4. Spatial trip distribution

Trip generation tells how many trips start and end in each particular traffic analysis zone (TAZ). To obtain spatial distribution of travelers' flows, the *OD* (origin-destination) matrix (tab. 7) needs to be calculated.

OD matrix can be calculated either by means of proportional or gravity model. Proportional model (1) assumes that number of trips between two TAZs is directly proportional to production and attraction of these zones. Gravity model (2) in addition includes a cost-related term, e.g. distance between TAZs. This allows to account for the fact that, as travel cost (i.e. distance) between TAZs increases, the number of trips between them decreases.

Table 7. General OD matrix

Zones	1	2	...	j	...	n	Productions
1	T_{11}	T_{12}	...	T_{1j}	...	T_{1n}	O_1
2	T_{21}	T_{22}	...	T_{2j}	...	T_{2n}	O_2
⋮							⋮
	T_{i1}	T_{i2}	...	T_{ij}	...	T_{in}	O_i
⋮							⋮
n	T_{ni}	T_{n2}	...	T_{nj}	...	T_{nn}	O_n
Attractions	D_1	D_2	...	D_j	...	D_n	T

where $D_j = \sum_i T_{ij}$, $O_i = \sum_j T_{ij}$, and $T = \sum_{ij} T_{ij}$.

$$T_{ij} = \frac{P_i A_j}{\Sigma P} \tag{1}$$

$$T_{ij} = \frac{P_i A_j}{\Sigma P} \cdot F(l_{ij}) \tag{2}$$

Exercise

Please calculate number of trips between two TAZs during <u>afternoon peak hour</u> (15.00 – 16.00) with proportional and gravity model. Please assume that:

- total number of inner trips in Cracow (ΣP) during afternoon peak hour equals:

H-W	W-H	H-E	E-H	H-O	O-H	NHR
100	3 700	50	800	900	1 000	500

- travel cost term of gravity model is defined as a following function of trip distance:

$$F(l_{ij}) = 2{,}0 \cdot e^{-0{,}2 \cdot l_{ij}} \tag{3}$$

- distance between traffic zones i and j (between centroids of zones) measured over the road network l_{ij} equals: _____ km

Trip purpose	P_i	A_j	T_{ij} proportional model (1)	T_{ij} gravity model (2)	Comments
H-W					
W-H					
H-E					
E-H					
H-O					
O-H					
NHR					

Questions:
1. In which model the number of trips is bigger? Why?
2. How will the two above models react if distance between TAZs is doubled?

……

……

……

……