The *SimNoise* application

Input data

The directory *SimNoise* includes 8 input data tables (.txt files). Those data tables can be modified for making simulations.

- *GvSatis* Evaluation of the actual annoyance by an agent characterised by the individual variable g_1 (*Housing occupancy status*) with respect to the noise level (h_1)
  Mathematical notation: $a_i^{(g1)}(h_1)$

- *GvStatut* Evaluation of the actual annoyance by an agent characterised by the individual variable (g_2) (S*atisfaction with respect of the neighbourhood of residence*) with respect to the noise level (h_1)
  Mathematical notation: $a_i^{(g2)}(h_1)$

- *GeneMoy* Assumed annoyance S_j
  Mathematical notation: $S_j(h_1)$

- *QStatutAge* Frequency distributions of each type of agents (g_1, g_3), living in each type of neighbourhood (h_2)
  Mathematical notation: $f^{(g1,g3)}(h_2)$

- *ParamSens* (called *Sensibilité au bruit* in the interface of the application). Influence of the individual variable (g_4) (*Sensibility to the traffic noise)* on the motivation for migrating due to the noise.
  Mathematical notation: $m^{(g4)}$

- *ParamMob* (called *Mobilité individus* in the interface of the application). Influence of the individual variables (g_1, g_3) (*Age* and *Housing occupancy status*) on the individual mobility. The table is organised as following: 2 rows (β and μ) et 6 columns (OwnerYoung, OwnerMiddleAged, OwnerOld, TenantYoung, TenantMiddleAged, TenantOld)
  Mathematical notation: β^g and μ^g

- *ParamInter* (called *Intérêt à migrer* in the interface of the application). Parameters α and γ used for calculating the Global Interest in Moving M_{ij}
  Mathematical notation: α and γ

- *fAgreg* Type of aggregation operators chosen for calculating the actual annoyance (A_i) (*Agreg Statut-Satis* in the interface of the application) and the propensity to move $\omega_i^g(h_1)$ (*Agreg Intérêt-Mobilité* in the interface of the application). Code *« 1 »* represents the arithmetical mean; code *« 2 »* represents the geometrical mean; code *« 3 »* represents the quadratic mean.

arithmetical mean	$\frac{\mu_A+\mu_B+\ldots\mu_N}{n}$
geometrical mean	$\sqrt[n]{\mu_A\mu_B\ldots\mu_N}$
quadratic mean	$\sqrt{\frac{1}{n}\ [(\mu_A)^2+(\mu_B)^2+\ldots(\mu_N)^2]}$

Outputs of the *SimNoise* application

The results of simulation are automatically saved in a new directory created in the parent directory called *SimNoise*.

Remark about the notations used:

8 noise levels and 7 types of neighbourhood are taken into account in the *SimNoise* application.

- A_1 is the actual annoyance considering the noise level 1, A_2 is the actual annoyance considering the noise level 2...
- S_1 is the assumed annoyance considering the noise level 1, S_2 is the assumed annoyance considering the noise level 2...
- $[h_2(1)]$ is the type of neighbourhood 1, $[h_2(2)]$ is the type of neighbourhood 2, $[h_2(3)]$ is the type of neighbourhood 3...

GeneVecue: *Actual annoyance (A_i)*

$$A_i = \otimes [\, a_i^{(g1)}(h_1),\, a_i^{(g2)}(h_1) \,]$$

… where $\otimes$ is a chosen aggregation operator

The table is organised as following:

- 8 columns: NotSatisfiedOwner, NotSatisfiedTenant, ModeratelySatisfiedOwner, ModeratelySatisfiedTenant, SatisfiedOwner, SatisfiedTenant, VerySatisfiedOwner, VerySatisfiedTenant
- 8 rows: each row corresponds to a given noise level

GeneSupp: *Assumed annoyance S_j*

The table is organised as following:

- 1 column: Assumed annoyance
- 8 rows: each row corresponds to a given noise level

DiffGene: *($A_i - S_j$)*

Remark: for practical reasons, *DiffGene* is calculated for the same arrival and departure zone (*e.g.* A_1S_1). However, these results should not be used for the following steps of calculation.

The table is organised as following:

- 8 columns: NotSatisfiedOwner, NotSatisfiedTenant, ModeratelySatisfiedOwner, ModeratelySatisfiedTenant, SatisfiedOwner, SatisfiedTenant, VerySatisfiedOwner, VerySatisfiedTenant
- 64 rows: A_1S_1, A_1S_2... A_2S_1, A_2S_2... A_8S_8

DiffGeneMod: *Dissatisfaction Level*

$$D_{ij} = m^{(g4)}\,(MAX[(A_i - S_j)\,,\,0]) + 0.001$$

The table is organised as following:

- 24 columns: LowNoiseSensitivityNotSatisfiedOwner, LowNoiseSensitivityNotSatisfiedTenant, LowNoiseSensitivityModeratelySatisfiedOwner... MediumNoiseSensitivityNotSatisfiedOwner, MediumNoiseSensitivityNotSatisfiedTenant, MediumNoiseSensitivityModeratelySatisfiedOwner...
- 64 rows: A_1S_1, A_1S_2... A_2S_1, A_2S_2... A_8S_8

InteretMigr: *Global Interest to Move*

$$M_{ij} = \frac{1}{e^{-\gamma\left[\frac{\sum_{j=1}^{n} D_{ij}}{n} - \alpha\right]} + 1}$$

The table is organised as following:

- 24 columns: LowNoiseSensitivityNotSatisfiedOwner, LowNoiseSensitivityNotSatisfiedTenant, LowNoiseSensitivityModeratelySatisfiedOwner... MediumNoiseSensitivityNotSatisfiedOwner, MediumNoiseSensitivityNotSatisfiedTenant, MediumNoiseSensitivityModeratelySatisfiedOwner...
- 8 rows: each row corresponds to a given noise level

MobInd: *Individual Mobility*

$$\xi(A_i)^{(g)} = \frac{1}{e^{-\beta^g\left(A_i - \mu^g\right)} + 1}$$

The table is organised as following:

- 24 columns: NotSatisfiedOwnerYoung, NotSatisfiedTenantYoung, ModeratelySatisfiedOwnerYoung, ModeratelySatisfiedTenantYoung... NotSatisfiedOwnerMiddleAged, NotSatisfiedTenantMiddleAged, ModeratelySatisfiedOwnerMiddleAged, ModeratelySatisfiedTenantMiddleAged...
- 8 rows: each row corresponds to a given noise level

Omega: *Individual Propensity to Move*

$$\omega_i^g(h_1) = \xi(A_i)^g \otimes M_{ij}$$

... where $\otimes$ *is a chosen aggregation operator*

The table is organised as following:

- 72 columns: LowNoiseSensitivityNotSatisfiedOwnerYoung, LowNoiseSensitivityNotSatisfiedTenantYoung...
- 8 rows: each row corresponds to a given noise level

ProbaMigr: *Probability of one agent of type* g *living in the spatial unit* i *going to one of the spatial units* j

$$p_{ij}^{(g)} = \frac{D_{ij}^{(g)}}{\sum_{j \neq i} D_{ij}^{(g)}} \cdot \omega_i^{(g)}$$

The table is organised as following:

- 72 columns: LowNoiseSensitivityNotSatisfiedOwnerYoung, LowNoiseSensitivityNotSatisfiedTenantYoung...
- 64 rows: A_1S_1, A_1S_2... A_2S_1, A_2S_2... A_8S_8

ProbAgregIJ: *Probability of the agents living in the same spatial unit* i *going to one of the spatial units* j *whatever their type*

$$P_{ij}(h_1,h_2) = \sum_{g=1}^{z} p_{ij}{}^{g}(h_1) \cdot f^{g}(h_2)$$

The table is organised as following:

- 12 columns: LowNoiseSensitivityNotSatisfied, LowNoiseSensitivityModeratelySatisfied, LowNoiseSensitivitySatisfied...
- 448 rows: $[h_2(1)]A_1S_1$, $[h_2(1)]A_1S_2$... $[h_2(1)]A_2S_1$, $[h_2(1)]A_2S_2$... $[h_2(1)]A_8S_8$... $[h_2(7)]A_1S_1$, $[h_2(7)]A_1S_2$... $[h_2(7)]A_2S_1$,$[h_2(7)]A_2S_2$... $[h_2(7)]A_8S_8$

ProbAgreg: *Aggregated Propensity to Move* (probability that the agents living in the same spatial unit leave it whatever their type).

$$\Omega_i(h_1,h_2) = \sum_{g=1}^{z} \omega_i{}^{g}(h_1) \cdot f^{g}(h_2)$$

The table is organised as following:

- 12 columns: LowNoiseSensitivityNotSatisfied, LowNoiseSensitivityModeratelySatisfied, LowNoiseSensitivitySatisfied...
- 56 rows: $[h_2(1)]A_1$, $[h_2(1)]A_2$... $[h_2(7)]A_7$, $[h_2(7)]A_8$