User documentation
ABuGeR
Automated Building Generation and Rendering

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1 Prerequisites

Before using the program, you need to install the C++ GDAL library.

1.1 GDAL installation on Linux

1. Download the GDAL 2.2.2 archive on `https://trac.osgeo.org/gdal/wiki/DownloadSource`
2. Unzip the file
3. Open a terminal inside the unzipped folder and prompt the following commands

```
$sudo apt install libgdal-dev
$./configue
$make
$sudo make install
```

4. Link the GDAL headers (.h) and libraries (.so)
   - so: /usr/local/lib/libgdal.so
   - h : /usr/local/include/gdal.h

1.2 Optional: OpenGL libraries

If you want to use the OpenGL rendering functionality, you will need to install several libraries. On Ubuntu:

```
$sudo apt install xorg-dev
$sudo apt install libglew-dev
$sudo apt install libsoil-dev
$sudo apt install libglfw3-dev
$sudo apt install libassimp-dev
$sudo apt install libglu1-mesa-dev
```

To compile correctly, you will need to link the corresponding libraries.

- /usr/lib/libSOIL.so
- /usr/lib/x86_64-linux-gnu/libGL.so
- /usr/lib/x86_64-linux-gnu/libGLEW.so
- /usr/lib/x86_64-linux-gnu/libglfw.so
- /usr/lib/x86_64-linux-gnu/libassimp.so

2 ABuGeR

2.1 What does ABuGeR do?

ABuGeR (Automated Building Generation and Rending), creates from two separate polygon shapefiles (one corresponding to the roads end the other to the parcels) a 3D model of procedurally generated buildings. The parcels, roads and buildings are stored as Wavefront .obj files that can be automatically rendered in an OpenGL window after the program execution (using the EAGL project)[1]. The models are also readable using the Blender 3D software.

2.2 Building types

ABuGeR works with 5 arbitrary building types : Office, Industry, Apartment building, Townhouse and Villa. These five types are present in different proportions according to their distance from the center of the city. The city is divided into three zones: the city center (0 to 1.5km), the periphery (1.5km to 4.5km) and the countryside (¿ 4.5km).

Building type	presence in the city center	presence on the periphery	presence in the countryside
Office	50%	10%	0%
Industry	0%	0%	25%
Apartment building	50%	60%	0%
Townhouse	0%	30%	25%
Villa	0%	0%	50%

Table 1: Building type distribution on city

Each building type comes with a set of parameters to apply the building rules.

- profitability: price of a m^2 of floor (€/m^2)
- floor height (m);
- gap: height of the first floor;
- margin parcel: distance between the building and another parcel (m);
- margin road: distance between the building and a road (m);
- type: type of the building;

[1] https://github.com/azarz/EAGL

Building type	profitability	floor height	gap	margin parcel	margin road	type
Office	4.0	3.0	5.0	0.001	0.001	Office
Industry	1.0	3.0	15.0	2.0	10.0	Industry
Apartment building	3.0	3.0	5.0	0.001	4.0	ApartmentBuilding
townhouse	1.0	3.0	3.0	0.1	0.5	Townhouse
Villa	1.0	3.0	3.0	5.0	9.0	Villa

Table 2: Building rule parameters according to the type

3 Use ABuGeR

To use ABuGeR, you need to have two shapefiles:

- Road shapefile: polygon shapefile with a importance field (integer: 1 principal road, 2 secondary road); Path and name: "ABuGeR/1_data/paris_test/route_secondaire_buffer.shp"
- Parcel shapefile: polygon shapefile containing the parcels (a parcel with a surface lesser than 50m^2 will be discarded); Path and name: "ABuGeR/1_data/paris_test/test_paris_seuil.shp";

The projection units must be meters for ABuGeR to run correctly.

Tu run ABuGeR, open a command prompt in the executable folder and enter the "./ABuGeR" command

EAGL viewer for AuCiGen controls

You can control the camera of the OpenGL window using the following controls:

- Moving: use the arrow keys or WASD (ZQSD on French keyboards) and the mouse.
- Switch the camera mode: press the space bar to switch the camera mode between ground camera and sky camera.
- Misc: press Shift while moving to move faster and CTRL to lower the camera viewpoint while moving slower.