## A TOOL TO CONTROL SUNLIGHTING IN THE PROJECT

It is essential for a designer to master the quantity of natural light that breaks into a building for two reasons. Natural lighting can be benefical because it provides visual confort in the inside spaces. On the other hand, the sun can bring too much termal input, especially when the facades are badly orientated and opened during summer.

While designing the shape of the building, the sun's course has to be taken into consideration. The following graph describes the sun's course at the latitude 48.5° North.



## STEREOGRAPHIC SOLAR DIAGRAM

"Maîtrise des ambiances - Contrôle de l'environnement physique"-1990

- CHAGAS

The following example will demonstrate that the shape of a building might have an important influence on its natural lighting performences.

According to the previous graph, during the summer, the sun is much higher, then the rays direction are more from above. On the south facade, the architect can take advantage of this fact in order to minimise the solar inputs during this season by setting the facade back from the roof. This way, the roof is a solar protection and the building gets only diffuse sunlight. The sun doen't shine through the windows, which helps avoiding overheating. During the winter the sun is lower. Then the roof won't prevent the sun to break into the building and it gets direct light during this season.



"Le Corbusier" used the phenomenon I've just discribed in the "unité d'Habitation". And this particular case that every architect or town planner should be aware of, demonstrates that the quality of a project's natural lightening is related to its volume. That's why a designer has to be aware of the sun course, as he shapes a building. Using the sun to lit doesn't only consist in implanting opening in the facades. As the sun's declension and direction are allways changing, the problem gets more complex. That's why it could be useful to give the user a tool to vizualize the way the sun breaks into the building all over the year.

The lighting performances of a project depends on its volume, then it is necessary for the designer to anticipate the ways it will react towards the sun, since the initial design phases. It would be usefull for the designer to have a tool that quickly shows the project's sunlighting performances during the architectural research. Thats' s why this tool should be associated to a sketch-based system.

The program I would like to create would allow the user to quickly control the sunlighting in the project.

Most modelers which are dedicated to architecture (Autocad, Archicad, 3dsMax...) include plugins programs which are designed to make a lighting simulation. The user has to specify the location of the project, the north direction and the time. Then the program places a spot light whose direction matches to the sun. This method is quite efficacious to make a realistic rendering (at a given moment), but it was not designed to analyse the project 's lighting performances on a period of time. So user can't figure out the way the building will be lited up during one hour, or one day, or one season.

This program would communicate the average sunlighting in the sketched spaces during a given period.

The first idea would consist in having the program marking plans and sections with squares. At the same time, it calculates the direct insolation rate in the generated squares. This rate is the ratio between the period when a given area that's fixed by a square gets no sunlight and the period when it does. Thoses squares are coloured according to the direct insolution rate.