Developing evaluation tools for the simulation of sunshine, lighting levels pertaining to existing houses

HASEGAWA Hiroshi(Ph.D (Engineering)), Research Coordinator for Housing Performance
Housing Department

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1. Foreword

Sunshine and lighting are important items that are considered when consumers select homes, however, the mechanism and technology to quantitatively evaluate those levels as housing performances have not been established. As well, after selecting a home, the levels of sunshine and lighting change due to the influence of surrounding buildings. As a result, for the purpose of spreading the use of good sunshine/lighting levels at housing distribution sites, a simulation evaluation tool was developed.

2. Overview of the simulation evaluation tool

The developed tool possesses the following functions.

Function (1): The evaluation of the sunshine/lighting levels based on the point of measure of each building under the building circumstances of the present condition of the block and each site inside the block.

Function (2): The evaluation of sunshine/lighting levels on the point of measure of each building in cases where each site was crowded with houses allowed to the maximum limit under current laws, or cases with a constant building control.

The overview of the simulation evaluation tool is shown below.

(1) Create a model for the possible building range

Condtions like the the collective default conditions of the target block, reverse light calculations and diagonal clearance, as well as the retraction distance from the boundary line of the adjacent land and boundary line of the street will be set, and a three-dimensional range of the maximum crowding of houses allowed under current laws will be created.

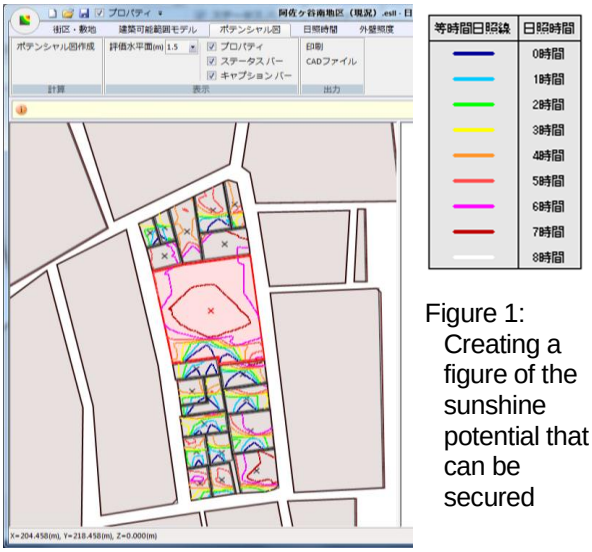

Figure 1: Creating a figure of the sunshine potential that can be secured

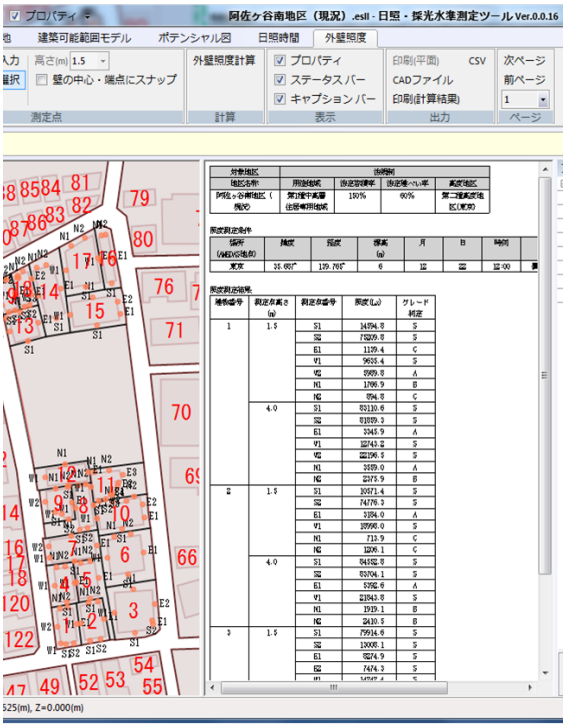

Figure 2: Simulation example of sunshine hours at each measurement point

(2) Creating a figure of the sunshine potential that can be secured

For buildings with a constant capacity of usage

placed on each site in the block, a "figure of sunshine securing potential" of isochronous sunshine projections on a horizontal plane with constant height at each site will be created, taking compound shade into consideration (Figure 1).

(3) Simulation measurement of the sunshine and lighting standard

Measurement conditions like latitude/longitude, the position and height of the building and capacity use will be designated, and simulation measurements of sunshine hours and lighting levels (outer wall surface illumination) will be made. Sunshine will be measured from 8:00 to 16:00 on the day of the winter solstice (Figure 2). The surface illumination will be measured with a CIE standard sky (overcast sky 15,0001x etc.).

3. Releasing and using the results

The developed tools are scheduled for released on the NILIM homepage. As well, further examinations will be made regarding mechanisms to position sunshine/lighting levels in the housing performance indication system.