McView: McCARD Input Visualization Tool

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1. Introduction

The neutron and photon transport code McCARD has been used for various reactor core analysis and modeling [1]. The more complex the modeling is, the harder it is to write an input file and the longer it takes to review it. In the worst case scenario, failure to recognize errors in input may lead to incorrect results. For this reason, there has been a demand for input visualization tool from the McCARD users.

The main purpose of the McCARD input visualization tool, McView, is visualizing input and shortening the modeling time. McView is developed with Microsoft Foundation Classes (MFC). In this paper, McView is introduced and the function of the McView is described.

2. User Interface

In this section, the user-interface (UI) of the McView is described. The UI consists of below four parts.

1. Cell hierarchy,
2. Main view,
3. Information view, and
4. Output pane

Fig.1. shows the user interface of the McView.

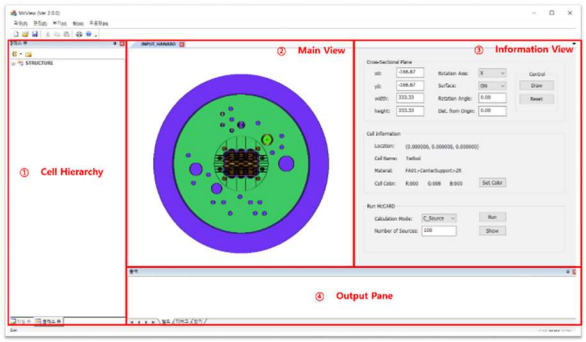

Fig. 1. User interface of the McView

2.1 Cell Hierarchy

Cell hierarchy section shows the cell hierarchy of the visualized input file as tree view. When user click the plus (+) button at the left side of the cell, the substructure of that cell drops down. As going down to the substructure, the surfaces consisting the cells are displayed. Fig. 2. shows the cell hierarchy section and the mapping of the substructure with visualized input in main view.

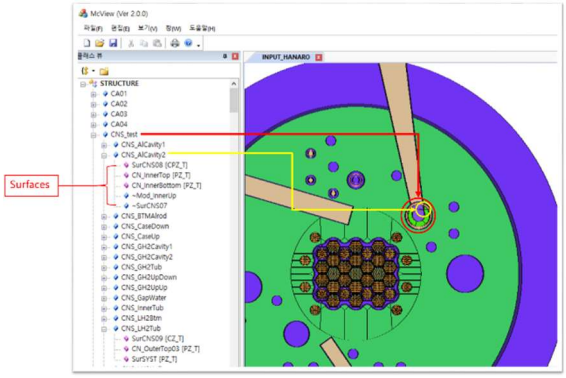

Fig. 2. Cell hierarchy section and the mapping of the substructure with visualized input in main view

2.2 Main View

In main view, user can control view using mouse or touch pad. Below is a description of mouse event.

Event	Function
Left click	Print cell information corresponding to the clicked position without changing zoom center.
Left double click	Print cell information corresponding to the clicked position with changing zoom center.
Drag	Parallel translation of drawing context
Scroll up	Zoom in around zoom center (×1.2)
Scroll down	Zoom out around zoom center (÷1.2)

Table. 1. Description of mouse event

2.3 Information View

In information view, user can set cross-sectional plane by edit box including ray starting position. Width and height of drawing context, rotation angle, and distance from origin as bellows.

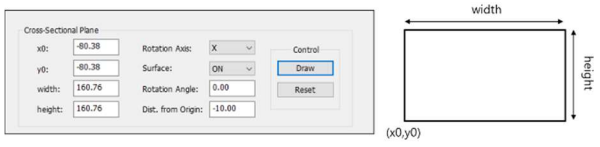

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Fig. 3. Setting control of cross-sectional plane

The rotation and movement of the cross-sectional plane is described in Fig.4. In this figure, the red and yellow arrow represents rotation axis and moving direction respectively. And the black arrow represents the ray direction.

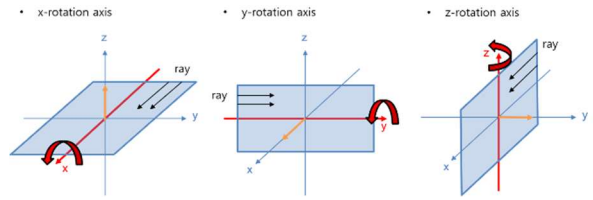

Fig. 4. Rotation and movement of the cross-sectional plane

Cell information describes the clicked location and corresponding cell and material name. In this section, user can select cell color by 'Set Color' button. Fig. 5. shows the cell information section.

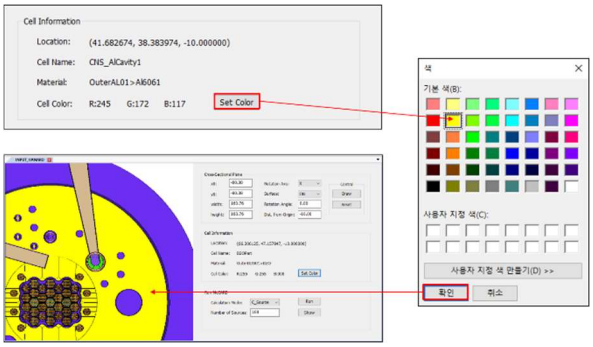

Fig. 5. Cell information section

As the McView has the McCARD particle transport engine, McCARD calculation can be conducted by 'Run McCARD' button and the calculation log is printed at output pane. Furthermore, McView can record visualized particle track. Fig. 6. Is visualized simulation result for source mode calculations.

Fig. 6. Visualized simulation result

5. Conclusion

In this paper, the McCARD visualization tool, McView, is introduced. By this tool, user can check their input and shortening the modeling time. As future work, the tally visualization would be conducted and this tool can be a milestone for nuclear digital twin.

REFERENCES

[1] H.J. Shim, B.S. Han, J.S. Jung, H.J. Park, and C.H. Kim, "McCARD: Monte Carlo Code for Advanced Reactor Design and Analysis", Nuclear Engineering and Technology, vol. 44, no. 2, pp. 128-138, 2000.