Integrated Development Environment for SPACE Problem Analysis







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- 1 Introduction
- 2 Method and Result
- 3 Conclusions

1 Introduct		2 M
Background		Techno
	- Writing SPACE input in a typical text editor, separately	• C++
	- Running SPACE, separately	Obje
	- Checking syntax errors, separately	
	 Analyzing calculation results using plotting tools, separately 	• Qt fr
	Tedious routines doing above steps	class
New procedures	-Writing SPACE input in the IDE (A2SPA)	
	-Running SPACE on AESPA	• A fev
	Checking syntax errors by AESPA	• To re
	- Analyzing calculation results in AESPA A 2020 1	
	- No tedious job. It's really dynamic.	adoş
		• Dow



ethod and Results

ogies used

- mputer language is the main tool for developing the AESPA
- oriented programming technique
- eworks for graphic user interface. Many classes are subclassed from Qt
- number of third party source codes referred for Excel, plotting, etc.
- d and write the bunch of data, the parallel processing supported by C++ is

ad : https://github.com/jcsu1835/AESPA/blob/main/README.md

1 Introduction

Background

Current procedures - Writing SPACE input in a typical text editor, separately

- Running SPACE, separately
- Checking syntax errors, separately
- Analyzing calculation results using plotting tools, separately

Editor for

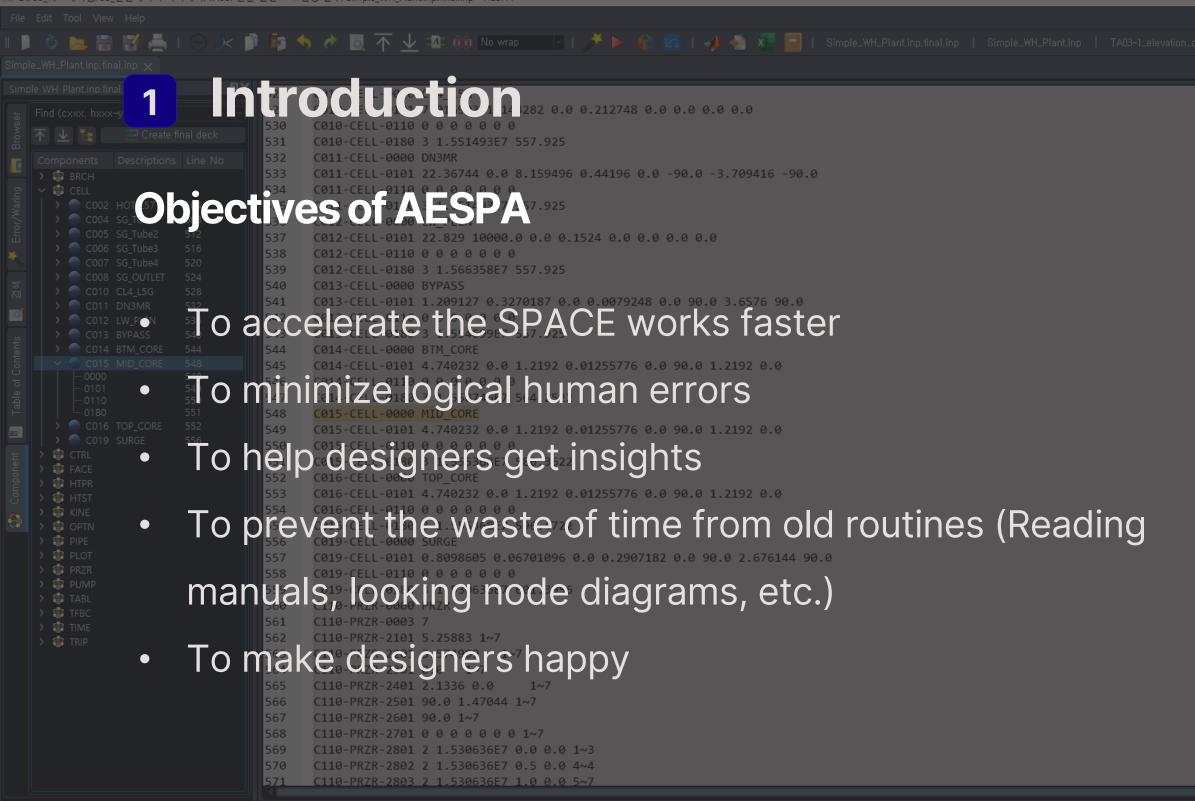
SPACE

Problem

- Tedious routines doing above steps

New procedures

- Writing SPACE input in the IDE (AESPAdvanced
- Running SPACE on AESPA
- Checking syntax errors by AESPA
- Analyzing calculation results in AESP Analysis
- No tedious job. It's really dynamic.



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Technologies used

- C++ computer language is the main tool for developing the AESPA ullet
- Object-oriented programming technique
- Qt frameworks for graphic user interface. Many classes are subclassed \bullet from Qt classes
- A few number of third party source codes referred for Excel, plotting, etc.
- To read and write the bunch of data, the parallel processing supported by C++ is adopted.
- Download : https://github.com/jcsu1835/AESPA/blob/main/README.md •

2-1. Input Edit Funtion (1)

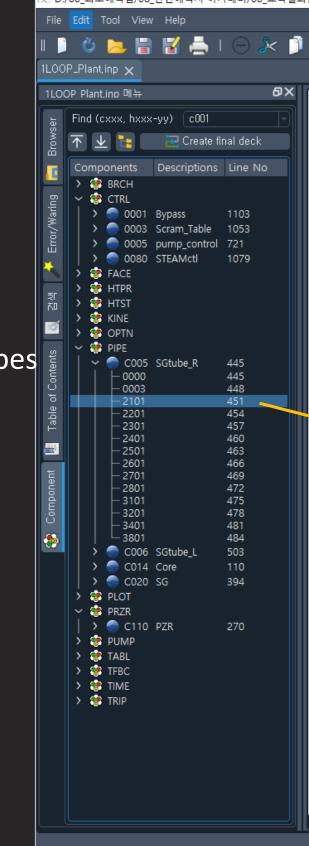
- One of main functions of the AESPA
- Edit, insert, replace, find, delete, copy, paste on rows
- Edit, insert, replace, find, delete, copy, paste on columi \bullet
- Drag-n-drop system is adopted. ullet
- Redo-undo stack technologies supports \bullet
- Texts zoom-in and zoom-out
- The appearance of editor such as font, font colors, ulletbackground color, etc., can be customized by users.



22 설정

2-1. Input Edit Function (2)

- Automatic input organizing
 - Input file with no errors
 - Generates input categorization based on component types
 - Supports Click-n-Go
 - Browser keeps inputs up to date
- SPACE input template support
 - Automatically insert minimum required inputs
 - SPACE input template including =, @, OPTN, TIME
 - Reduce designer's working time



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2-1. Input Edit Function (3)

User-supplied TOC (Table Of Conten \bullet

- Users make their own TOC with brackets, {} - Users can shared important input parts through TOC

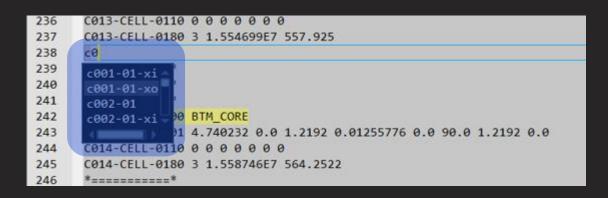
- Supports Click-n-Go

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2-1. Input Edit Function (4)

- Auto-completion mechanism
 - searches important keywords automatically
 - recommends words after typing 2 characters
 - Designers can know which components were already used.



2-1. Input Edit Function (5)

- On-click user's manual
 - No longer need to try to look for the paper manual
 - Just click the input card whenever you need a description
 - Reduce human errors and working time



5	H001-00-4003 587.12 r 1~10 z 3
6	H0 <mark>01-00-5001 1000 0.3250 0.0 (</mark>
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	1000 = 점동특성 계산에서
	1001 = 점동특성 계산에서
	1002 = 점동특성 계산에서 ³
	1003 = 점동특성 계산에서 ³
	1004 = 점동특성 계산에서 /
	1005 = 3차원 동특성(KIN3)
	2xxxx = 제어계통에서 계산
	Data2(R) 내부 열원 증배 계수 (In
	Data3(R) 좌측 경계 셀 대한 감속;
	Data4(R) 우측 경계 셀 대한 감속;
	Data5(C) 열구조체 범위: 예) 1~5
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	1069	C001-BRCH-1180 1 0.0 12400.31 0.0						
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	1073	C001-BRCH-1301 c016-01-xo c001-01-xi 0.139546 0.1524 0.0 0.0						
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001~3

Plant,inp |

2-1. Input Edit Function (6)

- Copying component block
 - Copy latest component input among same multiple inputs
 - Just select component and drag-n-drop it at designated line

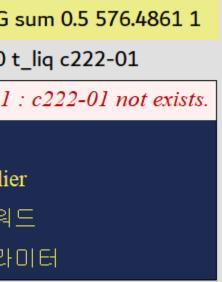
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2-2. Input Errors Check

- Checking the input errors before execution of SPACE code
 - Display warnings or errors under the line of related input
 - Can fix a problem with on-click user's manual quickly

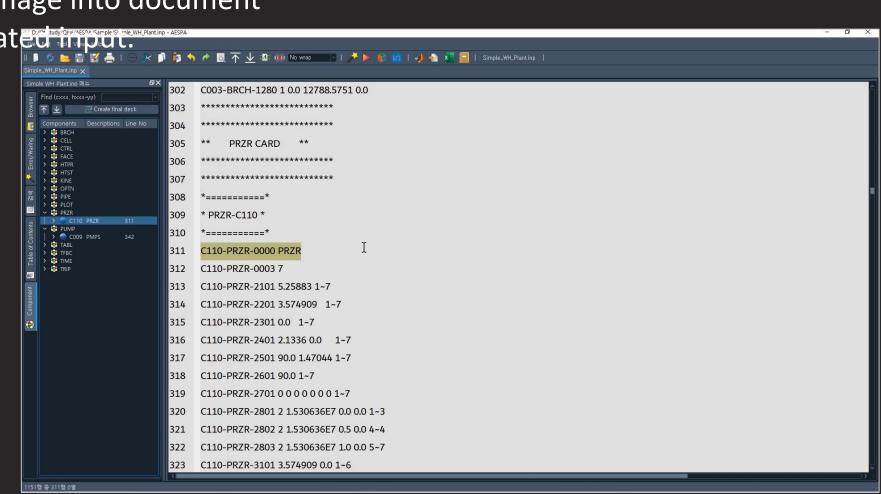
750	HTPR-004-000 INCONEL-600	937	CTRL-0002-00 T_AVG
	Warning!!! HTPR-004-000 (INCONEL-600) : Nuclear fuel property name must have uo2, gap, zirc.	938	CTRL-0002-01 0.0 1.0
	If this property is not for nuclear fuel, the warning can be ignored. If not, you must edit.		
	Wrong name for nuclear fuel property causes wrong fuel temperatures.		Error: CTRL-0002-0
751	HTPR-004-001 373.15 17.30735		Data1(R) A0 : 상수
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Data4(C) <u>변수명</u> 파라미터



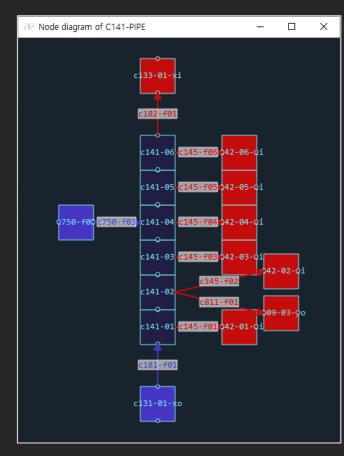
2-3. On-Click Node Diagram Generation (1)

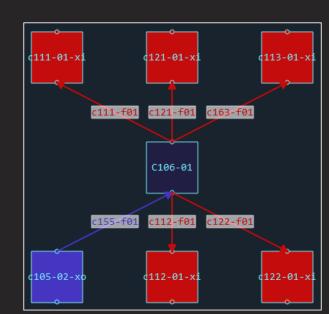
- Display the node diagram of a selected one
 - for CELL, BRCH, PUMP, PIPE, PRZR, SEPR
 - copy and paste diagram as image into document
 - click-n-go to navigate the related input.
 - help designers get insights



2-3. On-Click Node Diagram Genera

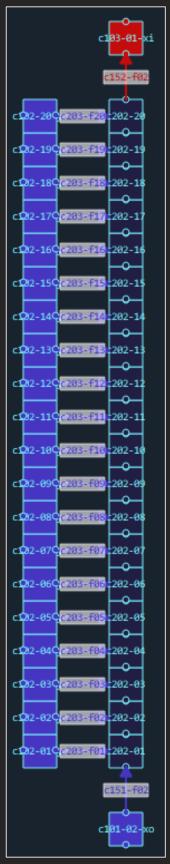
- Zoom-in and Zoom-out
- Moving
- It's hard to draw by hand.











2-4. On-Click Controller Diagram Generation (1)

- Display the CTRL node diagram of a selected controller
 - diagram shows description, controller ID, type and initial value (target value)
 - click-n-go to navigate the related input.
 - copy and paste diagram as image into document.
 - moving, zoom-in, zoom-out
 - help designers get insights while developing me
 - copy and paste diagram as image into docume

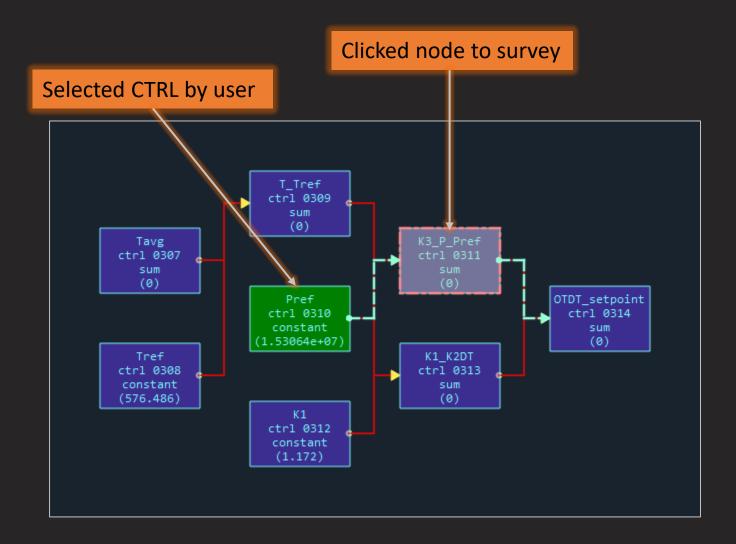
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		> 🈻 PUMP	[0001]		205	
		> 🤓 TABL	[0002]		200	C020-PIPE-2103 61.93979 3~3 C020-PIPE-2104 22.56181 4~4
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		> 🌞 TRIP	[0021]		200	C020-PIPE-2105 69.94635 5~5
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					210	C020-PIPE-2301 4.5157 1~1
					211	C020-PIPE-2302 4.7324 2~2
					212	C020-PIPE-2303 4.6175 3~3 C020-PIPE-2304 2.0377 4~4
					215	
					214	C020-PIPE-2305 3.2992 5~5
					215	C020-PIPE-2401 0.0341376 0.0 1~5
					216	C020-PIPE-2501 90.0 4.5157 1~1 C020-PIPE-2502 90.0 4.7324 2~2
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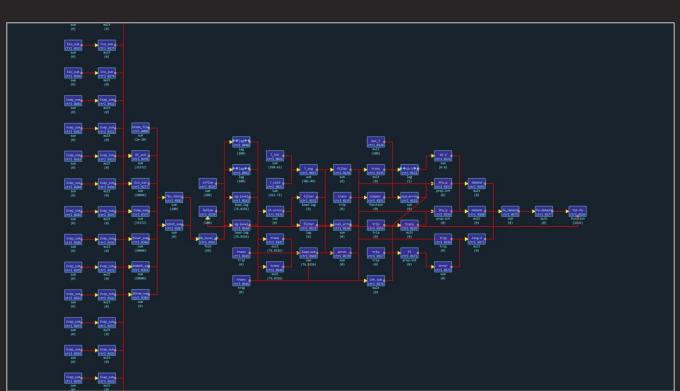


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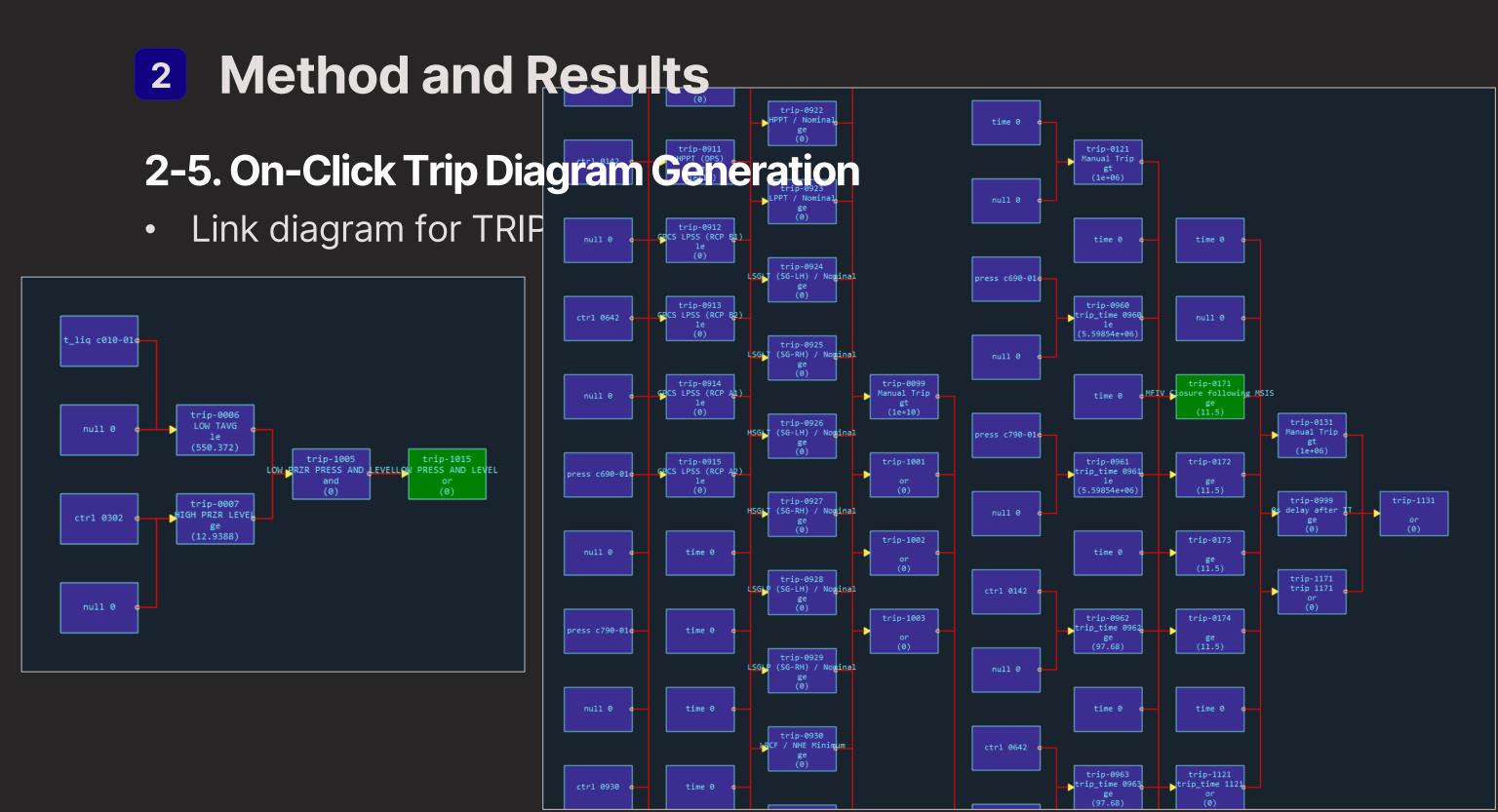
2-4. On-Click Controller Diagram Generation (2)

• Samples : from simple to complex









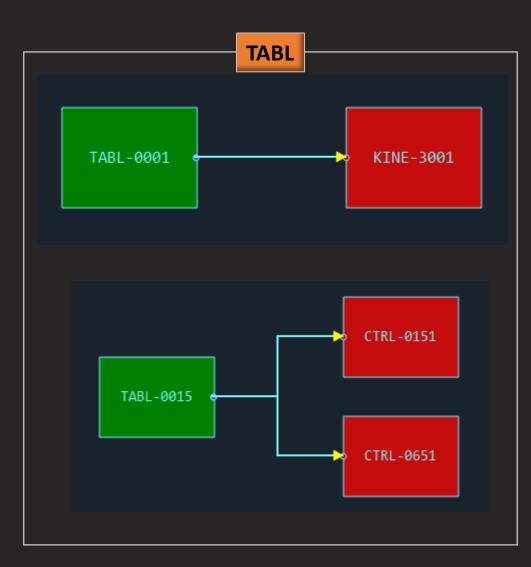
2-6. On-Click Face Diagram Generation

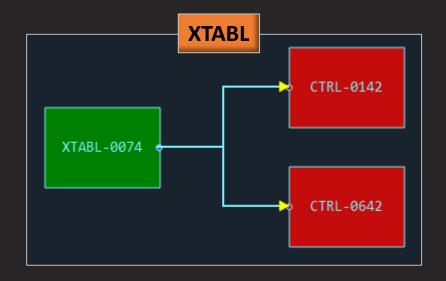
• Link diagram for FACE, VALV, MFACE, TFBC



2-7. On-Click Table Diagram Generation

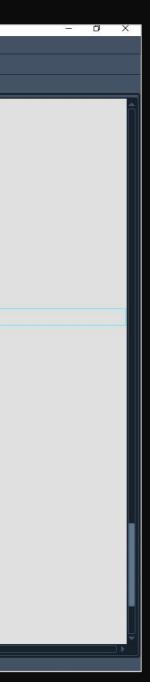
• Link diagram for TABL, XTABL





2-8. Execution of SPACE code with real-time plots

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Control	166 * PLOT-01 *	
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Component	170 PLOT-01-001 press C001-01	
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	174 PLOT-01-005 mflow C001-f02	
	175 PLOT-01-006 mflow C001-f03	
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	179 PLOT-01-010 mflow C001-f07	
	180 PLOT-01-011 press C001-04	
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	182 * Profiling Plot *	
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2-9. File and Directory Comparisons (1)

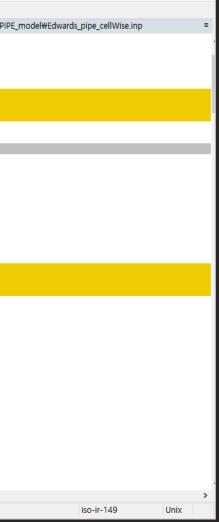
- Compare files to know the differences
- 3 files can be compared at one time
- Clean input deck generation for fancy comparisons

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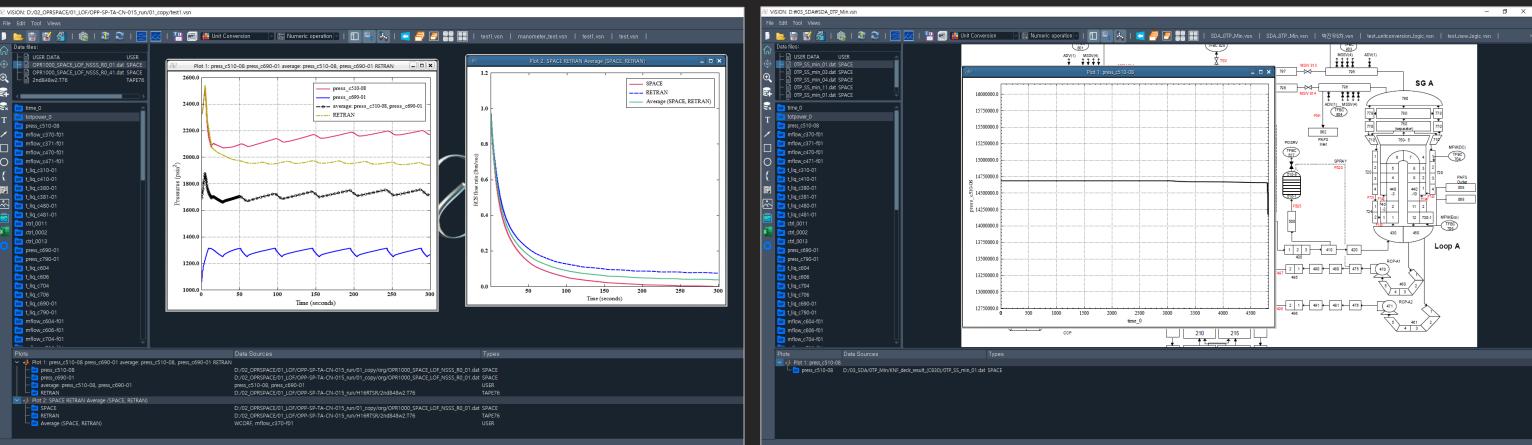
2-9. File and Directory Comparisons (2)

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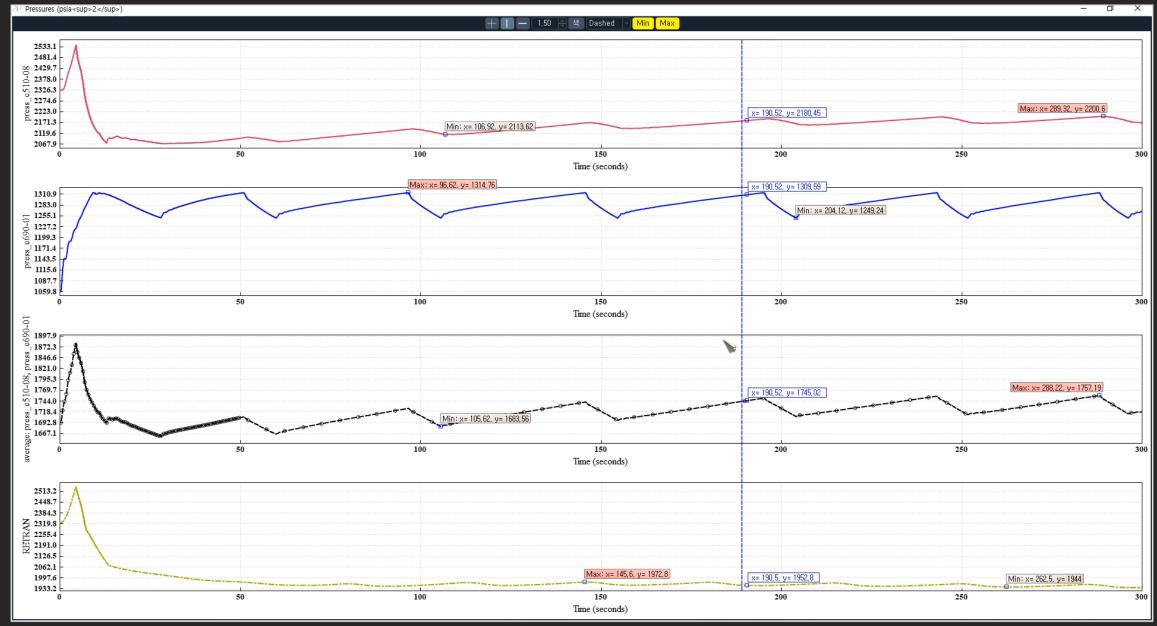


2-10. Offline Plotting

- use the offline plot function to get plots quickly
- SPACE-format, CESEC-format and custom-format data files can be added
- Set nodalization as background to know where the plots are for.



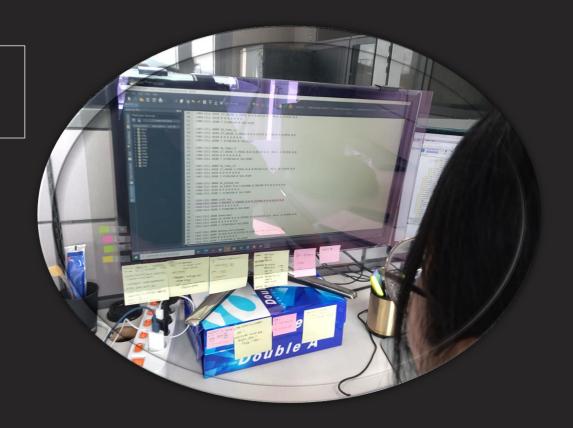
2-11. Analyzing calculation results through comparing graphs



2-12. Examples applied

- i-SMR Non-LOCA analysis
- Many design works using the SPACE code
- Education program for SPACE code

A beginner of SPACE code is making a new SPACE input using the AESPA





Future of AESPA

Maintenance	Fix hidden bugs and errors
Upgrade error notices	Make more intelligent and accurate error notices
More advanced link m	 Show the link map of CTRL, TRIP and T/H component Introduce path finding logic for links between nodes Introduce mini radar map for large scale diagram
Enhance the plot	Introduce another kinds of plot



Free Download : https://github.com/jcsu1835/AESPA/blob/main/README.md

Thank you for your attention

