Simplification of MATRA Code Input Parameters and Development of MATRA GUI

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1. Introduction

MATRA code is a sub-channel analysis code developed by KAERI. The input type of the MATRA code consists of 14 input cards and the input type was used for an old-style computer. In the input, many parameters are reiterated and some parameters are useless. In this study, the 14 input cards are analyzed to be simplified and regrouped as 6 groups. And based on the simplified 6 groups, the MATRA GUI program is developed.

2. Simplification of MATRA code INPUT and Development of MATRA GUI Program

2.1 Structure of MATRA INPUT[1]

Table 1 shows the structure of the MATRA code. The MATRA code consists of Initial Card, Case Control card, and 12 Group Data Cards. Also, each card requires additional data cards. Figure 1 shows the input format.

Table 1. Structure of INPUT

Group	Description	Case		
No.	L L	First	Subsequent	
-	Initial card	required	not required	
-	Case control card	required	required	
1	Fluid properties	required	optional	
2	Friction factor, heat transfer coefficient,	required	optional	
	and two - phase flow correlations			
3	Axial heat flux distribution	required	optional	
4	Channel layout and dimensions	required	optional	
5	Channel area variation	optional	optional	
6	Gap spacing variation	optional	optional	
7	Wire wrap and grid spacer information	optional	optional	
8		required	optional	
9	Calculation control	required	optional	
10	Lateral transport models	required	optional	
11	Operating conditions	required	optional	
	and transient forcing functions			
12	Output display options	required	optional	

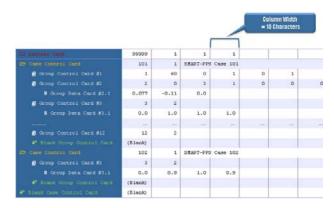


Figure 1. INPUT Format

2.2 Simplification of MATRA INPUT

In this study, dependencies, between the 14 input cards, are analyzed and regrouped as 6 groups ("Model", "Fluid info", "Calculation Option", "Solver Control", "Operation condition", "Run"). Figure 2 shows simplified input structure.

The group "Model" consists of "Rod Info", "Subchannel Info", "Gap Info", "Wire Wrap and Grid Spacer Info", and "Lateral Transport Model". And layout and dimension of a target model are determined in this group. And parameters, in the group "Fluid Info" and the group "Calculation Option", are determined to depend on the group "Model".

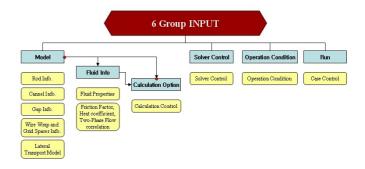


Figure 2. Structure of 6 Group INPUT

2.3 Development of MATRA GUI Program

By using the new input structure, the MATRA GUI program is developed in this study. By using the program, it is expected that the possibility of error will be reduced and the user's convenience improved.

Model form



Dimension and layout of rod, channel, gap, wire wrap and grid, and lateral transport model are determined in this form

- Calculation Option



According to the group "Model", Only required calculation options are proposed in this form.

- Solver Control

	Work			
SE Title : Click here				
Model Calculation Option Calculat	tion Option	Solver Control	Operating Condition	Run
Solver Control				
1. Combined momentum equation solver :				
Diversion crossflow solved by SOR	Diversion cro	ossflow solved by G	E	
Axial pressure gradient solved by SOR	O Axial pres	sure gradient solve	i by GE	
Number of axial nodes : 1000 Maximum number of external iterations : (for Value ≤ 0, Value = 20)	(for Value	momentum factor : 0 < 0. Value = 0) prientation (from vertical) [d	igrees]: 0	
- Maximum number of internal iterations ;	100		ion of velocities from the do	
Maximum number of internal iterations ; External convergence limit for crossflow (for Value 50, Value 51)		and rece (for Value	iver channels in u* calculati s < 0, Value = 0)	on z 0
 External convergence limit for crossflow (for Value ≤ 0, Value = 0.1) Internal convergence limit for crossflow or axial pressure gradient : 		and rece (for Value - Accelerat between	iver channels in u* calculati	on z 0
 External convergence limit for crossflow (for Value ≤ 0, Value = 0.1) Internal convergence limit for crossflow 	÷ 0.1	and rece (for Value - Accelerat between (for Value - Accelerat axial pre	iver channels in u° calculati = < 0, Value = 0) on factor for iterative press adjacent channel ;	on 2 0 ure difference 0.8

In this form, parameters, such as time step and convergence limits, are determined.

- Operating Condition

	MATHA-AL						3
Model Calculation Option Calculation Option Run Operating Condition Selver Control Operating Condition Run 1. Option for specified lotet enthalpy or temperature : Image: Condition Run 2. Option for specified lotet enthalpy or temperature : Image: Condition Run 3. Transient forcing fuction for lotet anthalpy or temperature : Image: Condition Image: Condition 4. Transient forcing fuction for lotet anthalpy or temperature : Image: Condition for solate : Run Image: Transient forcing fuction for lotet anthalpy or temperature : Image: Condition for solate : Image: Condition for solate : Image: Transient forcing fuction for lotet anthalpy or temperature : Image: Condition for solate : Image: Condition for solate : Image: Transient forcing fuction for lotet antax vision or pressure dog: : Image: Condition for solate : Image: Condition for solate :	the Unit System	Set Working Directory					
Operating Condition Subtract or combine @ 1. Option for specified lotter controlling or temperature : [Information control in the system pressure : 2. Option for specified lotter control in the system pressure : [Information control in the system pressure : 3. Transient forcing function for lotter and realized in pairs of values : [Information control in the system pressure : 4. Transient forcing function for lotter anal values : [Information control in the system pressure : [Information control in the system pressure information control in the system pressure	CASE Title	: Click here					
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2. Option for specified inlet mass velocity : Arrange lands many velocity (indexided classed laber free function) 3. Transient forcing havins of values 4. Transient forcing function for left entitles certainly or transperature :	Operating	Condition Selecta	condition 👻				
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4. Translerd forcing fuction for index embalgy or temperature : (© No © Read mpairs of rakes							
No Read in pairs of values Read in pairs of values (Read in pairs of values (At each channe)) Transient forcing fuction for inlet mass velocity or pressure drop :	® No C	Read in pairs of value	8				
5. Transient forcing fuction for inlet mass velocity or pressure drop :	4. Transient	forcing fuction for inle	t enthalpy or temperatu	re :			
	I No C	Read in pairs of value	s O Read in	pairs of values (At e	ach channel)		
In O Read in pairs of values	5, Transient	forcing fuction for inle	t mass velocity or pres	sure drop :			
	® No €	Read in pairs of value	9				

In this form, operation conditions such as inlet condition and transient forcing function are determined.

3. Conclusions

Many parameters in the original MATRA input were reiterated and not used in the calculation and in the MATRA input format errors easily occur.

In this study, The MATRA code input was simplified and by using the simplified input, the MATRA GUI program was developed. The GUI program could reduce the possibility of errors and improve the user's convenience.

The MATRA GUI program is expected to be upgraded for SMART reactor core sub-channel analysis and the program to contribute to export of the MATRA code.

REFERENCES

[1] Y. J. Yoo, D. H. Hwang, T. H. J, "Development of Subchannel Analysis Code MATRA (Ver. α)", KAERI/TR-1033/98, Korea Atomic Energy Research Institute, April 1998.