Design and development of UI for creating secondary variables in CFD

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Introduction

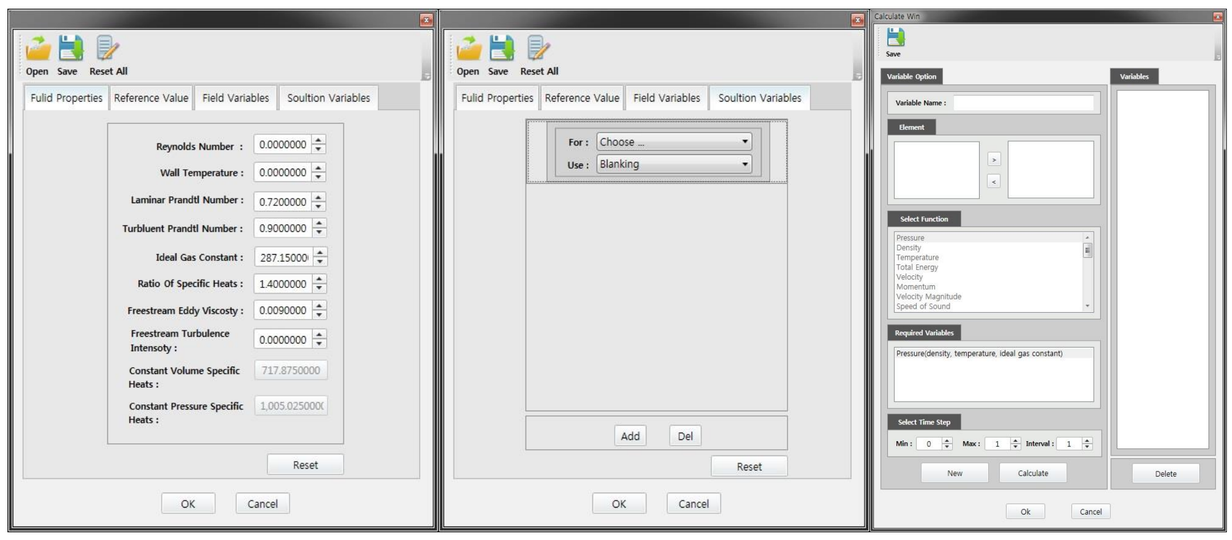
- Secondary variables are the variables generated by adding modifications or algorithms to original simulation data
- To generate additional variables, it is necessary to set initial conditions for simulation
- We present a new user interface framework for generating secondary variables, which enhances the convenience of entering simulation conditions and primary variables, identifies the computable secondary variables based on input, and offers the list of variables which can be calculated under the given conditions to users

Software Usability

- The user interface can be an important component which can determine the quality of software
- The concept of software user interface is to design and estimate in terms of the user's aspect to develop a system easy to use.
- ISO 0241-11, the international standard guide for usability, defines the usability as effectiveness, efficiency, and satisfaction
- Effectiveness means whether use can complete the task, Efficiency means the effort to complete the task, and satisfaction means the user satisfaction measurement to the software.

The UI for Secondary Variables

- The UI for creating secondary variables is divided in two parts: The UI for inputting conditions and executing calculations
- UI for conditions consists of 4 tabs for inputting fluid properties, reference values, field variables, and solution variables
- The solution variables are already calculated, existing variables
- The solution variables are managed as semantics so that automatically used when calculating secondary variables
- The newly generated secondary variables can be automatically identified as solution variables



Result

- By defining and managing solution variables as semantics
  - It is not necessary to define existing variables whenever calculating secondary variables
  - It can enhance the usability by automatically identifying the variables which can be calculated
  - It is possible to identify the shortest path to calculate the variable
- The result of the usability test

	Measurement	Proposed UI	Existing UI
Effectiveness	# of help	0	4
	# of error	0	1
Efficiency	Average task time(sec)	18.9	60.12
	Total task time(sec)	234.74	317.77
Satisfaction	SUS	81.25	56.88

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