**CS6456 (F2015) Operating Systems**

**Project 3: Check Valid Sudoku Solution With Multithread**

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1. **Function**
2. int parseInput(char\* input, char(\*output)[9])

turn input string into a 2-dimensional array.

1. void \*checkSubgrid(void \*inputArg)
   1. check each subgrid and print all the missing number in this subgrid.
   2. If there is any number is missed is this subgrid, set the flag to -1, which means this solution is already invalid.
2. void \*checkRow(void \*inputArg)
   1. check each row and print, if a number is missed in a row, print the number and the row.
   2. As required, if several numbers are missed in a row, the program should print several times.
   3. If there is any number is missed in any row, set the flag to -1, which means this solution is already invalid.
3. void \*checkColumn(void \*inputArg)
   1. check each column and print, if a number is missed in a column, print the number and the row.
   2. As required, if several numbers are missed in a column, the program should print several times.
   3. If there is any number is missed in any column, set the flag to -1, which means this solution is already invalid.
4. **threads arrangement**

thread tid[0] is used to check each row; thread[1] is used to check each column; thread[2] to thread[11] are used to check 9 subgrid.

1. **data structure**

Since pthread\_create() can only pass one parameter to a function, I define a type - argument as the parameter of the function.

typedef struct{

int\* flag\_p;

char (\*wgrid)[9];

parameters para;

}argument;

In this struct flag\_p is used to record whether the solution is still valid during the check process. Wgrid is used to pass the input solution to functions, para is another struct type-partameters, which is used to pass the starting solution of the subgrid to the function.

The type parameters looks like this

typedef struct{

int row;

int column;

}parameters;

1. **the structure of the program**

In the main function, First I use fgets() to get the input of solution file. I suppose the input is 1 2 3 4 5 6 7 8 9 2 3 4 5 6 7 8 9 1 3 4 5 6 7 8 9 1 2 4 5 6 7 8 9 1 2 3 5 6 7 8 9 1 2 3 4 6 7 8 9 1 2 3 4 5 7 8 9 1 2 3 4 5 6 8 9 1 2 3 4 5 6 7 9 1 2 3 4 5 6 7 8, eight-one number with ‘ ’ as separation. (if there is not standard input during the test , you can email me to make the change for it.)

Secondly, function parseInput is called to store the input is a 2-dimensional array.

Then, the program calls the pthread\_create to run the function checkrow and pass the data to the function.

After that, the program calls the pthread\_create to run the function checkColumn and pass the data to the function.

The program then call enter the loop of calling pthread\_create and call function checkSubgrid for 9 times.

Finally, the process waits for each thread finishing its work.