

Homework Assignment #0

Due Time/Date

2:20PM Wednesday, September 14, 2022. The purpose of this homework is for you to get warmed up and will not be counted as part of your grade of this course.

How to Submit

Please use a word processor or scan hand-written answers to produce a single PDF file. Name your file according to this pattern: “b097050xx-hw0”. Upload the PDF file to the NTU COOL site for Software Specification and Verification 2022. You may discuss the problems with others, but copying answers is strictly forbidden.

Problems

1. Consider the “untangling line segments” problem discussed in class. Your task is to refine the rank function given in class so that it maps program states to *non-negative integers*. Try to be precise (using mathematical concepts and notations). You must show in sufficient details that the execution of an untangling operation, if enabled, will decrease the value of the rank function by *at least one*.
2. Below is a function implementing a variant of Euclid’s algorithm:

```
Function myEuclid( $m, n$ );  
begin  
  // assume that  $m > 0$  and  $n > 0$   
   $x := m$ ;  
   $y := n$ ;  
  while  $x \neq y$  do  
    if  $x < y$  then swap( $x, y$ );  
     $x := x - y$ ;  
  od  
  ...  
end
```

where swap(x, y) exchanges the values of x and y .

Please give a suitable rank function (mapping program states to non-negative integers) for the while loop. Each iteration of the while loop (when the Boolean condition holds)

should reduce the value of the rank function by at least one. Again, try to be as precise as possible.