CO21BTECH11002
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Theory Assignment 2

1)
The statement is true. If we replace the safe Boolean SRSW register array with an array of safeM-valued SRSW registers, then the construction does yield a safe M-valued MRSW register. If the read and write calls are non-overlapping, each table[i] will hold the most recently written value in them, which will be returned by the read() call. If they are overlapping, since each of the registers are safe, read() may return any value.

2)
The given proposal is correct.

For the register to be atomic, these conditions must be satisfied:

- It is never the case that $R^i \rightarrow W^i$.
- It is never the case that for some j , $W^i \rightarrow W^j \rightarrow R^i$.
- If $R^i \rightarrow R^j$, then $i \leq j$.

For the first condition:
Suppose W^i writes the value V. If R^i precedes W^i, the value of Vth register will be 0. Since the registers used are atomic, R^i would read 0 and will not return the value V. Hence, R^i cannot precede W^i.

For the second condition:
Let's say that W^i writes value X, V^j writes value Y. Consider the two situations:

1. X>Y :
   W^i modifies the array first:

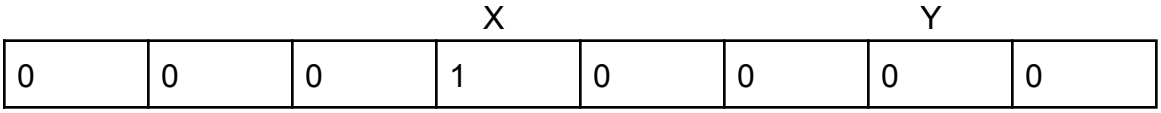
			Y			X	
0	0	0	0	0	0	1	0

   Then W^j modifies the array:

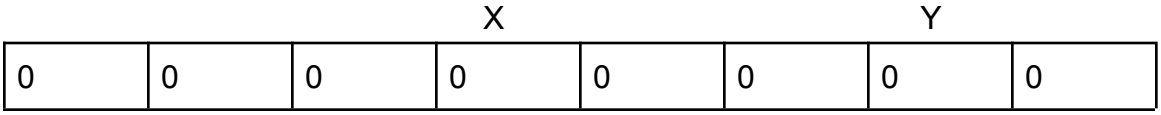
			Y			X	
0	0	0	1	0	0	1	0

   Now, the reader starts reading. Since the registers are atomic and W^j precedes the reader, the reader will read 1 at Y and return the value Y (written by W^j). Hence, the reader returns R^j.

2. Y>X :
   W^i modifies the array first:



   Then W^j modifies the array:

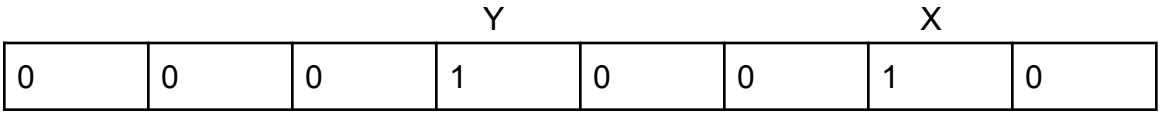


   Now, the reader starts reading. Since the registers are atomic and W^j precedes the reader, the reader will read 0 at X and continue. Then it will read 1 at Y and return the value Y (written by W^j). Hence, the reader returns R^j.

Hence, it is never the case that $W^i \rightarrow W^j \rightarrow R^i$.

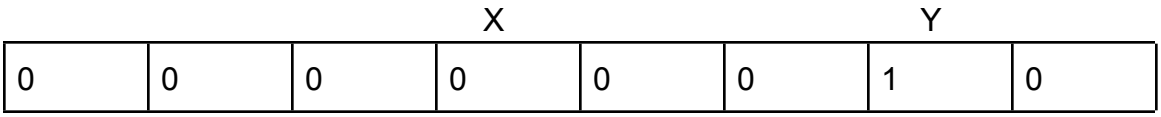
For the third condition:
Let's say that R^i reads value X, W writes value Y. Consider the two situations:

1. X>Y :
   W modifies the array:



   Now, the reader starts reading. Since the registers are atomic, the reader will read 1 at Y and return the value Y (written by W). Hence, the reader cannot return R^i.

2. Y>X :
   W modifies the array:



   Now, the reader starts reading. Since the registers are atomic, the reader will read 0 at X and continue. Then it will read 1 at Y and return the value Y (written by W). Hence, the reader cannot return R^i.

Hence, if $i \leq j$, it is never the case that $R^j \rightarrow R^i$.

Since the given proposal satisfies all three conditions, it is an atomic M-Valued SRSW register.