

Applying Formal Verification, SS 2012

Model Checking with Spin

Assignment 1

Complete the following PROMELA program, which should sum all even-indexed elements of an array:

```
active proctype SumEven() {
    int sum = 0;
    int i = 0;

    int a[5];
    a[0] = 3;
    a[1] = 48;
    a[2] = 71;
    a[3] = 2;
    a[4] = 99;

    /* Write your code here */

    printf("The sum of even-indexed elements of the array is: %d\n", sum)
}
```

Assignment 2

Do a random simulation of the following PROMELA Programm. What are the sources of nondeterminism in it? Do an interactive simulation and become a "Winner".

```
active proctype P() {
    int a = 0;
    do
        :: a < 21 -> a = a + 2
        :: a < 21 -> a = a + 5
        :: a > 21 -> printf("Loser.\n"); break
        :: a == 21 -> printf("Winner.\n"); break
    od
}
```

Assignment 3

The following PROMELA program implements a bubble sort algorithm. Add assertions after the main loop to check if it sorts the array correctly.

```
#define N 5

active proctype bubbleSort() {
    int i;
    int tmp;
    bool swapped;
```

```

int a[N];
a[0] = 3;
a[1] = 48;
a[2] = 71;
a[3] = 3;
a[4] = 99;

swapped = true;
do
:: !swapped -> break
:: else ->
    swapped = false;
    i = 1;
    do
    :: i >= N -> break
    :: else ->
        if
        :: a[i-1] > a[i] ->
            tmp = a[i-1];
            a[i-1] = a[i];
            a[i] = tmp;
            swapped = true
        :: else -> skip
        fi;
        i++;
    od
od;
}

```