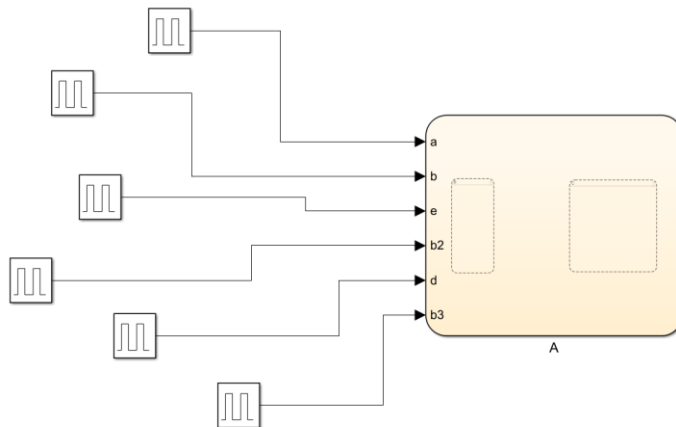


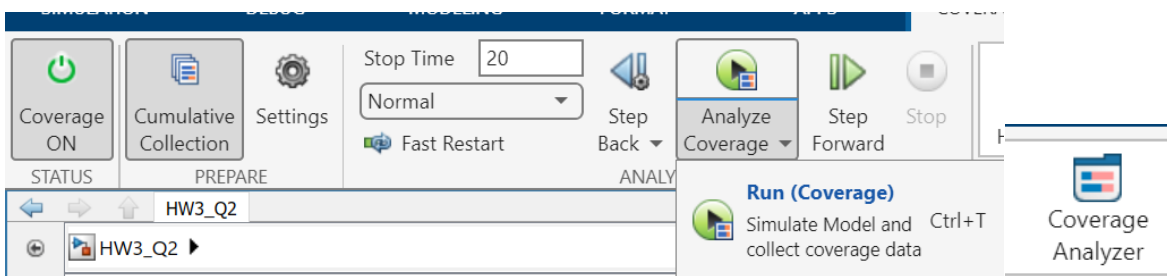
گزارش

(الف)

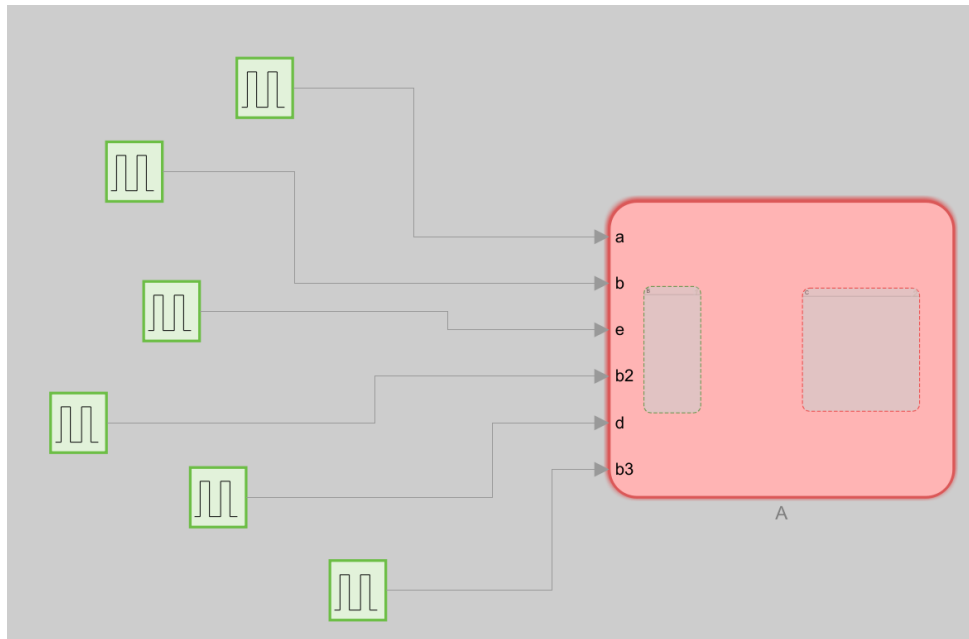
برای سوال سوم از مدلی که در تمرین شماره 3 پیاده سازی کردیم استفاده میکنیم که مدل آن به صورت زیر است :



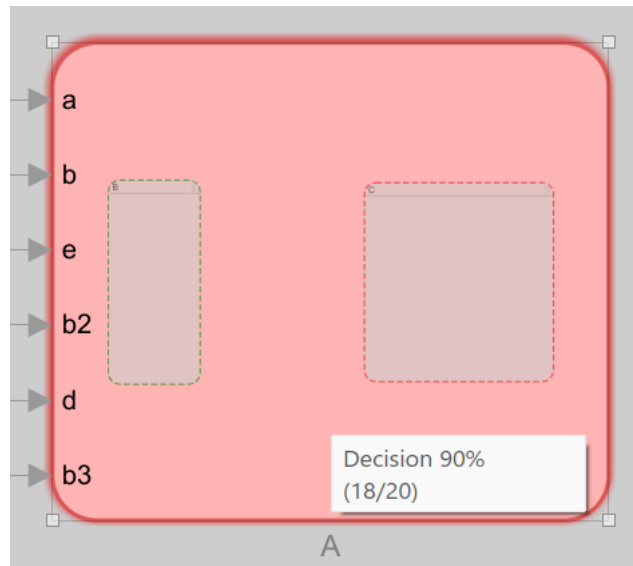
در قسمت APPS با برنامه Coverage analyzer مدل خودمون رو انالیز میکنیم :



بعد از ران گرفتن مدل به شکل زیر درمیآید :



که وقتی روی قسمت قرمز ماوس را نگه میداریم به ما درصد **coverage** را میدهد که در اینجا 18/20 است که میشود 90% :



و همچنین در بخش **coverage details** تمامی اطلاعات به صورت زیر آمده اند :

Coverage Report for HW3_Q2

Table of Contents

1. [Analysis Information](#)
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4. [Details](#)

Analysis Information

Coverage Data Information

Collected in version (R2022a)

Model Information

Model version 1.0
Author Erfan
Last saved Fri Apr 21 22:04:07 2023

Simulation Optimization Options

Default parameter behavior tunable
Block reduction forced off
Conditional branch optimization on








Coverage Options

Analyzed model HW3_Q2
Logic block short circuiting off

Tests

Test	Started execution	Ended execution
Run 1	06-Jun-2023 04:49:32	06-Jun-2023 04:49:35

Summary

		Decision	Execution
1. HW3_Q2	15	90% 	100% 
2.... A	14	90% 	NA
3..... SF' A	13	90% 	NA
4..... SF' B	6	100% 	NA
5..... SF' C	7	86% 	NA
6..... SF: D	4	75% 	NA

Details

1. Model "HW3_Q2"

Child Systems: [A](#)

Metric	Coverage (this object)	Coverage (inc. descendants)
Cyclomatic Complexity	1	15
Decision	NA	90% (18/20) decision outcomes
Execution	NA	100% (6/6) objective outcomes

Full Coverage

Model Object	Metric
DiscretePulseGenerator block " Pulse Generator "	Execution
DiscretePulseGenerator block " Pulse Generator1 "	Execution
DiscretePulseGenerator block " Pulse Generator2 "	Execution
DiscretePulseGenerator block " Pulse Generator3 "	Execution
DiscretePulseGenerator block " Pulse Generator4 "	Execution
DiscretePulseGenerator block " Pulse Generator5 "	Execution

2. SubSystem block "A"

[Justify or Exclude](#)

Parent: [/HW3_Q2](#)

Child Systems: [A](#)

Metric	Coverage (this object)	Coverage (inc. descendants)
Cyclomatic Complexity	1	14
Decision	NA	90% (18/20) decision outcomes

3. Chart "A"

[Justify or Exclude](#)

Parent: [HW3 Q2/A](#)

Child Systems: B, C

Metric	Coverage (this object)	Coverage (inc. descendants)
Cyclomatic Complexity	0	13
Decision	NA	90% (18/20) decision outcomes

4. State "B"

[Justify or Exclude](#)

Parent: [HW3 Q2/A](#)

Metric	Coverage (this object)	Coverage (inc. descendants)
Cyclomatic Complexity	1	6
Decision	100% (2/2) decision outcomes	100% (6/6) decision outcomes
Decisions analyzed		

Substate executed	100%
State "State_1"	15/20
State "State_2"	5/20

Full Coverage

Model Object

Metric

Transition "[c]" from "State_1" to "State_2"

Decision

Transition "[(b (b2 b§) && in(C.D.D2)]" from "State_2" to "State_1"

Decision

5. State "C"

[Justify or Exclude](#)

Parent: [HW3 Q2/A](#)

Child Systems: D

Metric	Coverage (this object)	Coverage (inc. descendants)
--------	------------------------	-----------------------------

Cyclomatic Complexity 1 7
 Decision 100% (2/2) decision outcomes 86% (12/14) decision outcomes
 Decisions analyzed

Substate executed	100%
State "D"	8/20
State "G"	12/20

Full Coverage

Model Object	Metric
Transition "[d]" from "D" to "G"	Decision
Transition "[a](c = 1;)" from "G" to "D"	Decision


6. State "D"

[Justify or Exclude](#)

Parent: [HW3 Q2/A.C](#)

Uncovered Links: ➡

Metric	Coverage (this object)	Coverage (inc. descendants)
Cyclomatic Complexity	2	4
Decision	75% (3/4) decision outcomes	75% (6/8) decision outcomes
Decisions analyzed		

Substate executed	100%
State "D1"	4/7
State "D2"	3/7
Substate exited when parent exits	50%
State "D1"	
State "D2"	1/1

Transition "[e]" from "D2" to "D2"

[Justify or Exclude](#)

Parent: [HW3 Q2/A.C.D](#)

Uncovered Links: ➡

Metric	Coverage
Cyclomatic Complexity	1
Decision	50% (1/2) decision outcomes

1 [e]

#1: [e]

Decisions analyzed

e	50%
false	3/3
true	0/3

Full Coverage

Model Object	Metric
Transition "[e] (c = 0;)." from "D1" to "D2"	Decision

(ب)

: SLOC

language	files	code	comment	blank	total
C	1	113	49	32	194

: Global

```
#define HW3_Q2_IN_D ((uint8_T)1U)
#define HW3_Q2_IN_D1 ((uint8_T)1U)
#define HW3_Q2_IN_D2 ((uint8_T)2U)
#define HW3_Q2_IN_G ((uint8_T)2U)
#define HW3_Q2_IN_NO_ACTIVE_CHILD ((uint8_T)0U)
#define HW3_Q2_IN_State_1 ((uint8_T)1U)
#define HW3_Q2_IN_State_2 ((uint8_T)2U)
```

: SCC

تعداد شروط منطقی 30 تا است که بعلاوه 1 میشود 31.

$$SF = 31 + 7*5 + (113/20) = 31 + 35 + 5.65 = 71.65$$

ج)

ابتدا برای کد generate شده به صورت زیر test مینویسیم :

```
void set_pulse_sequence(double a, double b, double e, double b2, double d, double b3) {
    Pulses.a_Amp = a;
    Pulses.b_Amp = b;
    Pulses.e_Amp = e;
    Pulses.b2_Amp = b2;
    Pulses.d_Amp = d;
    Pulses.b3_Amp = b3;
}

void test_HW3_Q2_step_initial(void) {
    // Initialize the model
    HW3_Q2_initialize();

    // Call the step function
    HW3_Q2_step();

    // Check the initial conditions
    TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_State_1, HW3_Q2_DW.is_B);
    TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_G, HW3_Q2_DW.is_C);
    TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_NO_ACTIVE_CHILD, HW3_Q2_DW.is_D);
}

void test_HW3_Q2_step_a(void) {
    // Set pulse a
    set_pulse_sequence(1.0, 0.0, 0.0, 0.0, 0.0, 0.0);

    // Call the step function
    HW3_Q2_step();

    // Check the conditions for pulse a
    TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_State_1, HW3_Q2_DW.is_B);
    TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_D, HW3_Q2_DW.is_C);
    TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_D1, HW3_Q2_DW.is_D);
}

void test_HW3_Q2_step_b(void) {
    // Set pulse a
    set_pulse_sequence(0.0, 1.0, 0.0, 0.0, 0.0, 0.0);

    // Call the step function
    HW3_Q2_step();

    // Check the conditions for pulse a
    TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_State_1, HW3_Q2_DW.is_B);
    TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_D, HW3_Q2_DW.is_C);
}
```



```

    TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_D1, HW3_Q2_DW.is_D);
}

void test_HW3_Q2_step_e(void) {
    // Set pulse a
    set_pulse_sequence(0.0, 0.0, 1.0, 0.0, 0.0, 0.0);

    // Call the step function
    HW3_Q2_step();

    // Check the conditions for pulse a
    TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_State_1, HW3_Q2_DW.is_B);
    TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_D, HW3_Q2_DW.is_C);
    TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_D1, HW3_Q2_DW.is_D);
}

void test_HW3_Q2_step_b2(void) {
    // Set pulse a
    set_pulse_sequence(0.0, 0.0, 0.0, 1.0, 0.0, 0.0);

    // Call the step function
    HW3_Q2_step();

    // Check the conditions for pulse a
    TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_State_1, HW3_Q2_DW.is_B);
    TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_D, HW3_Q2_DW.is_C);
    TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_D1, HW3_Q2_DW.is_D);
}

void test_HW3_Q2_step_d(void) {
    // Set pulse a
    set_pulse_sequence(0.0, 0.0, 0.0, 0.0, 1.0, 0.0);

    // Call the step function
    HW3_Q2_step();

    // Check the conditions for pulse a
    TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_State_1, HW3_Q2_DW.is_B);
    TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_D, HW3_Q2_DW.is_C);
    TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_D1, HW3_Q2_DW.is_D);
}

void test_HW3_Q2_step_b3(void) {
    // Set pulse a
    set_pulse_sequence(0.0, 0.0, 0.0, 0.0, 0.0, 1.0);

    // Call the step function
    HW3_Q2_step();

    // Check the conditions for pulse a
    TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_State_1, HW3_Q2_DW.is_B);
    TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_D, HW3_Q2_DW.is_C);
    TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_D1, HW3_Q2_DW.is_D);
}

int main(void) {

```

```

UNITY_BEGIN();

// Initial
RUN_TEST(test_HW3_Q2_step_initial);

// Pulse a
RUN_TEST(test_HW3_Q2_step_a);

// Pulse b
RUN_TEST(test_HW3_Q2_step_b);

// Pulse e
RUN_TEST(test_HW3_Q2_step_e);

// Pulse b2
RUN_TEST(test_HW3_Q2_step_b2);

// Pulse d
RUN_TEST(test_HW3_Q2_step_d);

// Pulse b3
RUN_TEST(test_HW3_Q2_step_b3);

return UNITY_END();
}

```

سپس در مرحله بعدی build گرفته و فایل platform.ini را برای وصل شدن به بورد modify میکنیم و unity را به پروژه اد میکنیم :

```

; PlatformIO Project Configuration File
;
; Build options: build flags, source filter
; Upload options: custom upload port, speed and extra flags
; Library options: dependencies, extra library storages
; Advanced options: extra scripting
;
; Please visit documentation for the other options and examples
; https://docs.platformio.org/page/projectconf.html

[env:megaatmega2560]
platform = atmelavr
board = megaatmega2560
framework = arduino
lib_deps = throwtheswitch/Unity@^2.5.2
upload_port = /dev/ttyACM2
test_port = /dev/ttyACM2

```

سپس در مرحله بعدی با دستور ترمینال به بورد وصل می‌شویم :

```
PROBLEMS 1 OUTPUT DEBUG CONSOLE TERMINAL

WARNING: Target directory C:\Users\efnos\.platformio\packages\contrib-pioremote\bin already exists. Specify --upgrade to force replacement.
WARNING: You are using pip version 21.2.4; however, version 23.1.2 is available.
You should consider upgrading via the 'C:\Users\efnos\.platformio\penv\Scripts\python.exe -m pip install --upgrade pip' command.
Tool Manager: contrib-pioremote@1.0.1 has been installed!
2023-06-06 15:47:27 [info] Name: CPSLAB-Laptop-1
2023-06-06 15:47:27 [info] Connecting to PlatformIO Remote Development Cloud
2023-06-06 15:47:29 [info] Successfully connected
2023-06-06 15:47:29 [info] Authenticating
2023-06-06 15:47:31 [info] Successfully authorized
```

```
test > C:\HW3_Q2.c> ...
586 // Check the conditions for pulse a
587 TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_State_1, HW3_Q2_DW.is_B);
588 TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_D, HW3_Q2_DW.is_C);
589 TEST_ASSERT_EQUAL_UINT8(HW3_Q2_IN_D1, HW3_Q2_DW.is_D);
590 }
591
592 int main(void) {
593     UNITY_BEGIN();
594
595     // Initial
596     RUN_TEST(test_HW3_Q2_step_initial);
597
598     // Pulse a
599     RUN_TEST(test_HW3_Q2_step_a);
600
601     // Pulse b
602     RUN_TEST(test_HW3_Q2_step_b);
603
604     // Pulse e
605     RUN_TEST(test_HW3_Q2_step_e);
606
607     // Pulse b2
608     RUN_TEST(test_HW3_Q2_step_b2);
609
610     // Pulse d
611     RUN_TEST(test_HW3_Q2_step_d);
612
613     // Pulse b3
614     RUN_TEST(test_HW3_Q2_step_b3);
615 }
```

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

2023-06-06 21:09:23 [info] Successfully connected
2023-06-06 21:09:23 [info] Authenticating
2023-06-06 21:09:26 [info] Successfully authorized
2023-06-06 21:11:12 [info] Successfully disconnected

D:\Telegram\Embedded Systems\HW8\Q3\HW8>pio remote agent start -n CPSLab-Laptop-1
2023-06-06 21:26:41 [info] Name: CPSLab-Laptop-1
2023-06-06 21:26:41 [info] Connecting to PlatformIO Remote Development Cloud
2023-06-06 21:26:43 [info] Successfully connected
2023-06-06 21:26:43 [info] Authenticating
2023-06-06 21:26:45 [info] Successfully authorized
```

در مرحله بعدی به بوردی که وصل شدیم تست می‌گیریم :

```
D:\Telegram\Embedded Systems\HW8\Q3\HW8>pio remote test
Building project locally
Verbosity level can be increased via `-v, -vv, or -vvv` option
Collected 1 tests
```

و در ادامه SUCCESS می‌شود :

```
Processing * in megaatmega2560 environment
Building...
----- megaatmega2560:* [PASSED] Took 1.30 seconds -----

===== 0 test cases: 0 succeeded in 00:00:01.305 =====

Testing project remotely
[CPSLab-Laptop-1] [CPSLab-Laptop-1] [CPSLab-Laptop-1] [CPSLab-Laptop-1] [CPSLab-Laptop-1] [CPSLab-Laptop-1] [CPSLab-Laptop-1] [CPSLab-Laptop-1] Verbosity level can be i
ncreased via `-v, -vv, or -vvv` option
Collected 1 tests

Processing * in megaatmega2560 environment
```

در ادامه بورد ما timeout داد و نتوانستیم وصل شویم (10 بار امتحان کردیم و نتیجه نداد).

```
-----
Building & Uploading...
avrdude: ser_open(): can't open device "/dev/ttyACM3": The system cannot find the path specified.

avrdude: ser_drain(): read error: The handle is invalid.

avrdude: ser_send(): write error: sorry no info avail
avrdude: stk500_send(): failed to send command to serial port
avrdude: ser_recv(): read error: The handle is invalid.

avrdude: stk500v2_ReceiveMessage(): timeout
avrdude: ser_send(): write error: sorry no info avail
avrdude: stk500_send(): failed to send command to serial port
avrdude: ser_recv(): read error: The handle is invalid.

avrdude: stk500v2_ReceiveMessage(): timeout
avrdude: ser_send(): write error: sorry no info avail
avrdude: stk500_send(): failed to send command to serial port
avrdude: ser_recv(): read error: The handle is invalid.

avrdude: stk500v2_ReceiveMessage(): timeout
avrdude: ser_send(): write error: sorry no info avail
avrdude: stk500_send(): failed to send command to serial port
avrdude: ser_recv(): read error: The handle is invalid.

avrdude: stk500v2_ReceiveMessage(): timeout
avrdude: ser_send(): write error: sorry no info avail
megaatmega2560 *          ERRORED   00:00:00.820
===== 1 test cases: 0 succeeded in 00:00:00.820 =====
avrdude: stk500v2_ReceiveMessage(): timeout
avrdude: stk500v2_ReceiveMessage(): timeout
avrdude: stk500v2_ReceiveMessage(): timeout
avrdude: stk500v2_ReceiveMessage(): timeout
avrdude: stk500v2_ReceiveMessage(): timeout
avrdude: stk500v2_ReceiveMessage(): timeout
avrdude: stk500v2_getsync(): timeout communicating with programmer

avrdude done.  Thank you.

*** [upload] Error 1
Uploading stage has failed, see errors above. Use `pio test -vvv` option to enable verbose output.
----- megaatmega2560:* [ERRORED] Took 30.87 seconds -----

===== SUMMARY =====
Environment    Test    Status    Duration
-----
megaatmega2560 *          ERRORED   00:00:30.867
===== 1 test cases: 0 succeeded in 00:00:30.867 =====
```