

Unittest for state_machine

December 21, 2020

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1 Test Information

1.1 Test Candidate Information

This Module helps implementing state machines.

Library Information

Name	state_machine
State	Released
Supported Interpreters	python2, python3
Version	546dd35cad32b0e414df9820aefd442

Dependencies

1.2 Unittest Information

Unittest Information

Version	88eb21720b062b30078e96dd6204ccdd
Testruns with	python 2.7.18 (final), python 3.8.5 (final)

1.3 Test System Information

System Information

Architecture	64bit
Distribution	Linux Mint 20 ulyana
Hostname	ahorn
Kernel	5.4.0-58-generic (#64-Ubuntu SMP Wed Dec 9 08:16:25 UTC 2020)
Machine	x86_64
Path	/user_data/data/dirk/prj/unittest/state_machine/unittest
System	Linux
Username	dirk

2 Statistic

2.1 Test-Statistic for testrun with python 2.7.18 (final)

Number of tests	20
Number of successfull tests	20
Number of possibly failed tests	0
Number of failed tests	0

Executionlevel	Full Test (all defined tests)
Time consumption	1.654s

2.2 Test-Statistic for testrun with python 3.8.5 (final)

Number of tests	20
Number of successfull tests	20
Number of possibly failed tests	0
Number of failed tests	0

Executionlevel	Full Test (all defined tests)
Time consumption	1.661s

2.3 Coverage Statistic

Module- or Filename	Line-Coverage	Branch-Coverage
state_machine	100.0%	100.0%
state_machine.__init__.py	100.0%	

3 Tested Requirements

3.1 Module Initialisation

3.1.1 Default State

Description

The state machine shall start in the state, given while module initialisation.

Reason for the implementation

Creation of a defined state after initialisation.

Fitcriterion

State machine is in the initial state after initialisation.

Testresult

This test was passed with the state: **Success**. See also full trace in section A.1.1!

Testrun:	python 2.7.18 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/...init...py (22)
Start-Time:	2020-12-21 01:53:48,736
Finished-Time:	2020-12-21 01:53:48,737
Time-Consumption	0.001s

Testsummary:

Info	Initialising the state machine with state.c
Success	State after initialisation is correct (Content 'state.c' and Type is <type 'str'>).

Testresult

This test was passed with the state: **Success**. See also full trace in section B.1.1!

Testrun:	python 3.8.5 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/...init...py (22)
Start-Time:	2020-12-21 01:53:51,053
Finished-Time:	2020-12-21 01:53:51,054
Time-Consumption	0.001s

Testsummary:

Info	Initialising the state machine with state.c
Success	State after initialisation is correct (Content 'state.c' and Type is <class 'str'>).

3.1.2 Default Last Transition Condition

Description

The state machine shall return the string `__init__` for last transition condition after initialisation.

Reason for the implementation

Creation of a defined state after initialisation.

Fitcriterion

The last transition condition is `__init__` after initialisation.

Testresult

This test was passed with the state: **Success**. See also full trace in section A.1.2!

Testrun:	python 2.7.18 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/__init__.py (23)
Start-Time:	2020-12-21 01:53:48,737
Finished-Time:	2020-12-21 01:53:48,737
Time-Consumption	0.000s

Testsummary:

Info	Initialising the state machine with state_c
Success	Last transition condition after initialisation is correct (Content ' <code>__init__</code> ' and Type is <code><type 'str'></code>).

Testresult

This test was passed with the state: **Success**. See also full trace in section B.1.2!

Testrun:	python 3.8.5 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/__init__.py (23)
Start-Time:	2020-12-21 01:53:51,054
Finished-Time:	2020-12-21 01:53:51,054
Time-Consumption	0.000s

Testsummary:

Info	Initialising the state machine with state_c
Success	Last transition condition after initialisation is correct (Content ' <code>__init__</code> ' and Type is <code><class 'str'></code>).

3.1.3 Default Previous State

Description

The state machine shall return `None` for previous state after initialisation.

Reason for the implementation

Creation of a defined state after initialisation.

Fitcriterion

The previous state is `None` after initialisation.

Testresult

This test was passed with the state: **Success**. See also full trace in section A.1.3!

Testrun:	python 2.7.18 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/___init___py (24)
Start-Time:	2020-12-21 01:53:48,737
Finished-Time:	2020-12-21 01:53:48,738
Time-Consumption	0.000s

Testsummary:

Info	Initialising the state machine with state.c
Success	Last state after initialisation is correct (Content None and Type is <type 'NoneType'>).

Testresult

This test was passed with the state: **Success**. See also full trace in section B.1.3!

Testrun:	python 3.8.5 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/___init___py (24)
Start-Time:	2020-12-21 01:53:51,055
Finished-Time:	2020-12-21 01:53:51,055
Time-Consumption	0.000s

Testsummary:

Info	Initialising the state machine with state.c
Success	Last state after initialisation is correct (Content None and Type is <class 'NoneType'>).

3.1.4 Additional Keyword Arguments

Description

The state machine shall store all given keyword arguments as variables of the classes instance.

Reason for the implementation

Store further information (e.g. for calculation of the transition conditions).

Fitcriterion

At least two given keyword arguments with different types are available after initialisation.

Testresult

This test was passed with the state: **Success**. See also full trace in section A.1.4!

Testrun:	python 2.7.18 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/___init___py (25)
Start-Time:	2020-12-21 01:53:48,738
Finished-Time:	2020-12-21 01:53:48,739
Time-Consumption	0.001s

Testsummary:

Info	Initialising the state machine with state.c
Success	Keyword argument kw_arg_no.4 stored in state_machine is correct (Content {'1': 1, '2': 'two'} and Type is <type 'dict'>).
Success	Keyword argument kw_arg_no.1 stored in state_machine is correct (Content 1 and Type is <type 'int'>).
Success	Keyword argument kw_arg_no.3 stored in state_machine is correct (Content True and Type is <type 'bool'>).
Success	Keyword argument kw_arg_no.2 stored in state_machine is correct (Content '2' and Type is <type 'str'>).

Testresult

This test was passed with the state: **Success**. See also full trace in section B.1.4!

Testrun:	python 3.8.5 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/...init....py (25)
Start-Time:	2020-12-21 01:53:51,055
Finished-Time:	2020-12-21 01:53:51,056
Time-Consumption	0.001s

Testsummary:

Info	Initialising the state machine with state.c
Success	Keyword argument kw_arg_no.1 stored in state_machine is correct (Content 1 and Type is <class 'int'>).
Success	Keyword argument kw_arg_no.2 stored in state_machine is correct (Content '2' and Type is <class 'str'>).
Success	Keyword argument kw_arg_no.3 stored in state_machine is correct (Content True and Type is <class 'bool'>).
Success	Keyword argument kw_arg_no.4 stored in state_machine is correct (Content {'1': 1, '2': 'two'} and Type is <class 'dict'>).

3.2 Transition Changes

3.2.1 Transitiondefinition and -flow

Description

The user shall be able to define multiple states and transitions for the state machine. A transition shall have a start state, a target state and a transition condition. The transition condition shall be a method, where the user is able to calculate the condition on demand.

Reason for the implementation

Definition of the transitions for a state machine.

Fitcriterion

The order of at least three state changes is correct.

Testresult

This test was passed with the state: **Success**. See also full trace in section A.1.5!

Testrun:	python 2.7.18 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/...init...py (28)
Start-Time:	2020-12-21 01:53:48,739
Finished-Time:	2020-12-21 01:53:48,740
Time-Consumption	0.001s

Testsummary:

Info	Initialising state machine with state_a
Success	Initial state after Initialisation is correct (Content 'state_a' and Type is <type 'str'>).
Info	Work routine executed the 1st time to do the state change. Defined Transitions are: True→state_b (0.0s); False→state_c (0.0s)
Success	State after 1st execution of work method is correct (Content 'state_b' and Type is <type 'str'>).
Info	Work routine executed the 2nd time to do the state change. Defined Transitions are: False→state_a (0.0s); True→state_c (0.0s)
Success	State after 2nd execution of work method is correct (Content 'state_c' and Type is <type 'str'>).
Info	Work routine executed the 3rd time with no effect. No Transitions starting from state_c (dead end)
Success	State after 3rd execution of work method is correct (Content 'state_c' and Type is <type 'str'>).

Testresult

This test was passed with the state: **Success**. See also full trace in section B.1.5!

Testrun:	python 3.8.5 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/...init...py (28)
Start-Time:	2020-12-21 01:53:51,056
Finished-Time:	2020-12-21 01:53:51,057
Time-Consumption	0.001s

Testsummary:

Info	Initialising state machine with state_a
Success	Initial state after Initialisation is correct (Content 'state_a' and Type is <class 'str'>).
Info	Work routine executed the 1st time to do the state change. Defined Transitions are: True→state_b (0.0s); False→state_c (0.0s)
Success	State after 1st execution of work method is correct (Content 'state_b' and Type is <class 'str'>).
Info	Work routine executed the 2nd time to do the state change. Defined Transitions are: False→state_a (0.0s); True→state_c (0.0s)
Success	State after 2nd execution of work method is correct (Content 'state_c' and Type is <class 'str'>).
Info	Work routine executed the 3rd time with no effect. No Transitions starting from state_c (dead end)
Success	State after 3rd execution of work method is correct (Content 'state_c' and Type is <class 'str'>).

3.2.2 Transitiontiming

Description

The user shall be able to define for each transition a transition time. On change of the transition condition to True, the transition timer starts counting the time from 0.0s. After reaching the transition time, the transition gets active.

Reason for the implementation

Robustness of the state changes (e.g. Oscillating conditions shall be ignored).

Fitcriterion

The transition time and the restart of the transition timer by setting the transition condition to False and to True again results in the expected transition timing ($\pm 0.05s$).

Testresult

This test was passed with the state: **Success**. See also full trace in section A.1.6!

Testrun:	python 2.7.18 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/__init__.py (29)
Start-Time:	2020-12-21 01:53:48,740
Finished-Time:	2020-12-21 01:53:49,119
Time-Consumption	0.379s

Testsummary:

Info	Initialising state machine with state_a
Success	Initial state after Initialisation is correct (Content 'state_a' and Type is <type 'str'>).
Info	Waiting for 0.160s or state change
Success	State after 1st cycle is correct (Content 'state_b' and Type is <type 'str'>).
Success	Transition time after 1st cycle is correct (Content 0.15047717094421387 in [0.145 ... 0.155] and Type is <type 'float'>).
Info	Waiting for 0.235s or state change
Success	State after 2nd cycle is correct (Content 'state_c' and Type is <type 'str'>).
Success	Transition time after 2nd cycle is correct (Content 0.15042805671691895 in [0.145 ... 0.155] and Type is <type 'float'>).
Success	Previous state duration is correct (Content 0.22568202018737793 in [0.21999999999999997 ... 0.22999999999999998] and Type is <type 'float'>).

Testresult

This test was passed with the state: **Success**. See also full trace in section B.1.6!

Testrun:	python 3.8.5 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/__init__.py (29)
Start-Time:	2020-12-21 01:53:51,058
Finished-Time:	2020-12-21 01:53:51,438
Time-Consumption	0.380s

Testsummary:

Info	Initialising state machine with state_a
-------------	---

Success Initial state after Initialisation is correct (Content 'state_a' and Type is <class 'str'>).
Info Waiting for 0.160s or state change
Success State after 1st cycle is correct (Content 'state_b' and Type is <class 'str'>).
Success Transition time after 1st cycle is correct (Content 0.15067315101623535 in [0.145 ... 0.155] and Type is <class 'float'>).
Info Waiting for 0.235s or state change
Success State after 2nd cycle is correct (Content 'state_c' and Type is <class 'str'>).
Success Transition time after 2nd cycle is correct (Content 0.1506359577178955 in [0.145 ... 0.155] and Type is <class 'float'>).
Success Previous state duration is correct (Content 0.22591900825500488 in [0.21999999999999997 ... 0.22999999999999998] and Type is <class 'float'>).

3.2.3 Transitionpriorisation

Description

The state machine shall use the first active transition. If multiple transition are active, the transition with the highest overlap time will be used.

Reason for the implementation

Compensate the weakness of the execution quantisation.

Fitcriterion

At least one transition with at least two active conditions results in the expected state change.

Testresult

This test was passed with the state: **Success**. See also full trace in section A.1.7!

Testrun: python 2.7.18 (final)
 Caller: /user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/__init__.py (30)
 Start-Time: 2020-12-21 01:53:49,119
 Finished-Time: 2020-12-21 01:53:49,365
 Time-Consumption 0.246s

Testsummary:

Info Initialising state machine with state_a, a transition to state_b after 0.151s and a transition to state_c after 0.150s
Success Initial state after Initialisation is correct (Content 'state_a' and Type is <type 'str'>).
Info Waiting for 0.300s or state change
Success State after 1st cycle is correct (Content 'state_c' and Type is <type 'str'>).

Testresult

This test was passed with the state: **Success**. See also full trace in section B.1.7!

Testrun: python 3.8.5 (final)
 Caller: /user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/__init__.py (30)
 Start-Time: 2020-12-21 01:53:51,438

Finished-Time: 2020-12-21 01:53:51,684
 Time-Consumption 0.246s

Testsummary:

Info Initialising state machine with state_a, a transition to state_b after 0.151s and a transition to state_c after 0.150s
Success Initial state after Initialisation is correct (Content 'state_a' and Type is <class 'str'>).
Info Waiting for 0.300s or state change
Success State after 1st cycle is correct (Content 'state_c' and Type is <class 'str'>).

3.3 Module Interface

3.3.1 This State

Description

The Module shall have a method for getting the current state.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least one returned state fits to the expectation.

Testresult

This test was passed with the state: **Success**. See also full trace in section A.1.8!

Testrun: python 2.7.18 (final)
 Caller: /user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/__init__.py (33)
 Start-Time: 2020-12-21 01:53:49,365
 Finished-Time: 2020-12-21 01:53:49,365
 Time-Consumption 0.001s

Testsummary:

Info Initialising the state machine with state_c
Success Returnvalue of this_state() is correct (Content 'state_c' and Type is <type 'str'>).

Testresult

This test was passed with the state: **Success**. See also full trace in section B.1.8!

Testrun: python 3.8.5 (final)
 Caller: /user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/__init__.py (33)
 Start-Time: 2020-12-21 01:53:51,684
 Finished-Time: 2020-12-21 01:53:51,685
 Time-Consumption 0.001s

Testsummary:

Info Initialising the state machine with state_c
Success Returnvalue of this_state() is correct (Content 'state.c' and Type is <class 'str'>).

3.3.2 This State is

Description

The Module shall have a method for checking if the given state is currently active.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least two calls with different return values fit to the expectation.

Testresult

This test was passed with the state: **Success**. See also full trace in section A.1.9!

Testrun:	python 2.7.18 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/__init__.py (34)
Start-Time:	2020-12-21 01:53:49,366
Finished-Time:	2020-12-21 01:53:49,368
Time-Consumption	0.002s

Testsummary:

Info Initialising the state machine with state_c
Success Returnvalue of this_state_is(state_c) is correct (Content True and Type is <type 'bool'>).
Success Returnvalue of this_state_is(state_b) is correct (Content False and Type is <type 'bool'>).

Testresult

This test was passed with the state: **Success**. See also full trace in section B.1.9!

Testrun:	python 3.8.5 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/__init__.py (34)
Start-Time:	2020-12-21 01:53:51,685
Finished-Time:	2020-12-21 01:53:51,686
Time-Consumption	0.001s

Testsummary:

Info Initialising the state machine with state_c
Success Returnvalue of this_state_is(state_c) is correct (Content True and Type is <class 'bool'>).
Success Returnvalue of this_state_is(state_b) is correct (Content False and Type is <class 'bool'>).

3.3.3 This State Duration

Description

The Module shall have a method for getting the time since the last state change appears.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least one returned duration fits to the current state duration ($\pm 0.05s$).

Testresult

This test was passed with the state: **Success**. See also full trace in section A.1.10!

Testrun:	python 2.7.18 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/___init___py (35)
Start-Time:	2020-12-21 01:53:49,368
Finished-Time:	2020-12-21 01:53:49,622
Time-Consumption	0.253s

Testsummary:

Info	Running state machine test sequence.
Success	Return Value of this_state_duration() is correct (Content 0.25178098678588867 in [0.2 ... 0.3] and Type is <type 'float'>).

Testresult

This test was passed with the state: **Success**. See also full trace in section B.1.10!

Testrun:	python 3.8.5 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/___init___py (35)
Start-Time:	2020-12-21 01:53:51,687
Finished-Time:	2020-12-21 01:53:51,938
Time-Consumption	0.252s

Testsummary:

Info	Running state machine test sequence.
Success	Return Value of this_state_duration() is correct (Content 0.2508413791656494 in [0.2 ... 0.3] and Type is <class 'float'>).

3.3.4 Last Transition Condition

Description

The Module shall have a method for getting the last transition condition.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least one returned transition condition fits to the expectation.

Testresult

This test was passed with the state: **Success**. See also full trace in section A.1.11!

Testrun:	python 2.7.18 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/...init...py (36)
Start-Time:	2020-12-21 01:53:49,622
Finished-Time:	2020-12-21 01:53:49,624
Time-Consumption	0.002s

Testsummary:

Info	Running state machine test sequence.
Success	Returnvalue of last_transition_condition() is correct (Content 'condition_a' and Type is <type 'str'>).

Testresult

This test was passed with the state: **Success**. See also full trace in section B.1.11!

Testrun:	python 3.8.5 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/...init...py (36)
Start-Time:	2020-12-21 01:53:51,938
Finished-Time:	2020-12-21 01:53:51,939
Time-Consumption	0.001s

Testsummary:

Info	Running state machine test sequence.
Success	Returnvalue of last_transition_condition() is correct (Content 'condition_a' and Type is <class 'str'>).

3.3.5 Last Transition Condition was

Description

The Module shall have a method for checking if the given condition was the last transition condition.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least two calls with different return values fit to the expectation.

Testresult

This test was passed with the state: **Success**. See also full trace in section A.1.12!

Testrun:	python 2.7.18 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/...init...py (37)
Start-Time:	2020-12-21 01:53:49,624
Finished-Time:	2020-12-21 01:53:49,626
Time-Consumption	0.002s

Testsummary:

Info	Running state machine test sequence.
Success	Returnvalue of last_transition_condition(condition_a) is correct (Content True and Type is <type 'bool'>).
Success	Returnvalue of last_transition_condition(condition_c) is correct (Content False and Type is <type 'bool'>).

Testresult

This test was passed with the state: **Success**. See also full trace in section B.1.12!

Testrun:	python 3.8.5 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/...init...py (37)
Start-Time:	2020-12-21 01:53:51,940
Finished-Time:	2020-12-21 01:53:51,942
Time-Consumption	0.002s

Testsummary:

Info	Running state machine test sequence.
Success	Returnvalue of last_transition_condition(condition_a) is correct (Content True and Type is <class 'bool'>).
Success	Returnvalue of last_transition_condition(condition_c) is correct (Content False and Type is <class 'bool'>).

3.3.6 Previous State

Description

The Module shall have a method for getting the previous state.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least one returned state fits to the expectation.

Testresult

This test was passed with the state: **Success**. See also full trace in section A.1.13!

Testrun: python 2.7.18 (final)
 Caller: /user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/...init...py (38)
 Start-Time: 2020-12-21 01:53:49,626
 Finished-Time: 2020-12-21 01:53:49,627
 Time-Consumption 0.001s

Testsummary:

Info Running state machine test sequence.
Success Returnvalue of previous_state() is correct (Content 'state_a' and Type is <type 'str'>).

Testresult

This test was passed with the state: **Success**. See also full trace in section B.1.13!

Testrun: python 3.8.5 (final)
 Caller: /user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/...init...py (38)
 Start-Time: 2020-12-21 01:53:51,942
 Finished-Time: 2020-12-21 01:53:51,943
 Time-Consumption 0.001s

Testsummary:

Info Running state machine test sequence.
Success Returnvalue of previous_state() is correct (Content 'state_a' and Type is <class 'str'>).

3.3.7 Previous State was

Description

The Module shall have a method for checking if the given state was the previous state.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least two calls with different return values fit to the expectation.

Testresult

This test was passed with the state: **Success**. See also full trace in section A.1.14!

Testrun: python 2.7.18 (final)
 Caller: /user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/...init...py (39)
 Start-Time: 2020-12-21 01:53:49,627
 Finished-Time: 2020-12-21 01:53:49,628
 Time-Consumption 0.001s

Testsummary:

Info Running state machine test sequence.

Success Returnvalue of previous_state_was(state_a) is correct (Content True and Type is <type 'bool'>).
Success Returnvalue of previous_state_was(state_b) is correct (Content False and Type is <type 'bool'>).

Testresult

This test was passed with the state: **Success**. See also full trace in section B.1.14!

Testrun: python 3.8.5 (final)
 Caller: /user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/__init__.py (39)
 Start-Time: 2020-12-21 01:53:51,944
 Finished-Time: 2020-12-21 01:53:51,945
 Time-Consumption 0.001s

Testsummary:

Info Running state machine test sequence.
Success Returnvalue of previous_state_was(state_a) is correct (Content True and Type is <class 'bool'>).
Success Returnvalue of previous_state_was(state_b) is correct (Content False and Type is <class 'bool'>).

3.3.8 Previous State Duration

Description

The Module shall have a method for getting active time for the previous state.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least one returned duration fits to the previous state duration ($\pm 0.05s$).

Testresult

This test was passed with the state: **Success**. See also full trace in section A.1.15!

Testrun: python 2.7.18 (final)
 Caller: /user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/__init__.py (40)
 Start-Time: 2020-12-21 01:53:49,628
 Finished-Time: 2020-12-21 01:53:50,381
 Time-Consumption 0.753s

Testsummary:

Info Running state machine test sequence.
Success Return Value of previous_state_duration() is correct (Content 0.7515342235565186 in [0.7 ... 0.8] and Type is <type 'float'>).

Testresult

This test was passed with the state: **Success**. See also full trace in section B.1.15!

Testrun: python 3.8.5 (final)
 Caller: /user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/...init...py (40)
 Start-Time: 2020-12-21 01:53:51,945
 Finished-Time: 2020-12-21 01:53:52,697
 Time-Consumption 0.752s

Testsummary:

Info Running state machine test sequence.
Success Return Value of previous_state_duration() is correct (Content 0.7511894702911377 in [0.7 ... 0.8] and Type is <class 'float'>).

3.4 Transition Callbacks

3.4.1 State change callback for a defined transition and targetstate

Description

The state machine shall call all registered methods in the same order like the registration with all user given arguments for a defined set of *transition_condition* and *target_state*.

Reason for the implementation

Triggering state change actions for a specific transition condition and targetstate.

Fitcriterion

Methods are called in the registration order after state change with all user given arguments for the defined transition condition and targetstate and at least for one other condition not.

Testresult

This test was passed with the state: **Success**. See also full trace in section A.1.16!

Testrun: python 2.7.18 (final)
 Caller: /user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/...init...py (43)
 Start-Time: 2020-12-21 01:53:50,382
 Finished-Time: 2020-12-21 01:53:50,387
 Time-Consumption 0.005s

Testsummary:

Info Running state machine sequence and storing sequence number for each callback
Success Execution of state machine callback (1) (state_b, condition_a) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.
Success Execution of state machine callback (2) (state_b, condition_a) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.

Testresult

This test was passed with the state: **Success**. See also full trace in section B.1.16!

Testrun: python 3.8.5 (final)
 Caller: /user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/...init...py (43)
 Start-Time: 2020-12-21 01:53:52,698
 Finished-Time: 2020-12-21 01:53:52,704
 Time-Consumption 0.007s

Testsummary:

Info	Running state machine sequence and storing sequence number for each callback
Success	Execution of state machine callback (1) (state_b, condition_a) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.
Success	Execution of state machine callback (2) (state_b, condition_a) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.

3.4.2 State change callback for a defined transition

Description

The state machine shall call all registered methods in the same order like the registration with all user given arguments for a defined *transition_condition* and all *target_states*.

Reason for the implementation

Triggering state change actions for a specific transition condition.

Fitcriterion

Methods are called in the registration order after state change with all user given arguments for the defined transition condition and at least for one other transition condition not.

Testresult

This test was passed with the state: **Success**. See also full trace in section A.1.17!

Testrun: python 2.7.18 (final)
 Caller: /user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/...init...py (44)
 Start-Time: 2020-12-21 01:53:50,388
 Finished-Time: 2020-12-21 01:53:50,391
 Time-Consumption 0.003s

Testsummary:

Info	Running state machine sequence and storing sequence number for each callback
Success	Execution of state machine callback (1) (all_transitions, condition_b) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.
Success	Execution of state machine callback (2) (all_transitions, condition_b) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.

Testresult

This test was passed with the state: **Success**. See also full trace in section B.1.17!

Testrun:	python 3.8.5 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/...init...py (44)
Start-Time:	2020-12-21 01:53:52,705
Finished-Time:	2020-12-21 01:53:52,710
Time-Consumption	0.005s

Testsummary:

Info	Running state machine sequence and storing sequence number for each callback
Success	Execution of state machine callback (1) (all_transitions, condition_b) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.
Success	Execution of state machine callback (2) (all_transitions, condition_b) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.

3.4.3 State change callback for a defined targetstate

Description

The state machine shall call all registered methods in the same order like the registration with all user given arguments for all *transition_conditions* and a defined *target_state*.

Reason for the implementation

Triggering state change actions for a specific targetstate.

Fitcriterion

Methods are called in the registration order after state change with the defined targetstate and at least for one other targetstate not.

Testresult

This test was passed with the state: **Success**. See also full trace in section A.1.18!

Testrun:	python 2.7.18 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/...init...py (45)
Start-Time:	2020-12-21 01:53:50,391
Finished-Time:	2020-12-21 01:53:50,393
Time-Consumption	0.002s

Testsummary:

Info	Running state machine sequence and storing sequence number for each callback
Success	Execution of state machine callback (1) (state_b, all_conditions) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.
Success	Execution of state machine callback (2) (state_b, all_conditions) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.

Testresult

This test was passed with the state: **Success**. See also full trace in section B.1.18!

Testrun:	python 3.8.5 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/__init__.py (45)
Start-Time:	2020-12-21 01:53:52,711
Finished-Time:	2020-12-21 01:53:52,714
Time-Consumption	0.003s

Testsummary:

Info	Running state machine sequence and storing sequence number for each callback
Success	Execution of state machine callback (1) (state_b, all_conditions) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.
Success	Execution of state machine callback (2) (state_b, all_conditions) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.

3.4.4 State change callback for all kind of state changes

Description

The state machine shall call all registered methods in the same order like the registration with all user given arguments for all transitions.

Reason for the implementation

Triggering state change actions for all transition conditions and targetstates.

Fitcriterion

Methods are called in the registration order after state change.

Testresult

This test was passed with the state: **Success**. See also full trace in section A.1.19!

Testrun:	python 2.7.18 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/__init__.py (46)
Start-Time:	2020-12-21 01:53:50,393
Finished-Time:	2020-12-21 01:53:50,395
Time-Consumption	0.003s

Testsummary:

Info	Running state machine sequence and storing sequence number for each callback
Success	Execution of state machine callback (1) (all_transitions, all_conditions) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.
Success	Execution of state machine callback (2) (all_transitions, all_conditions) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.

Testresult

This test was passed with the state: **Success**. See also full trace in section B.1.19!

Testrun:	python 3.8.5 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/__init__.py (46)
Start-Time:	2020-12-21 01:53:52,714
Finished-Time:	2020-12-21 01:53:52,718
Time-Consumption	0.004s

Testsummary:

Info	Running state machine sequence and storing sequence number for each callback
Success	Execution of state machine callback (1) (all_transitions, all_conditions) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.
Success	Execution of state machine callback (2) (all_transitions, all_conditions) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.

3.4.5 Execution order of Callbacks

Description

The callbacks shall be executed in the same order as they had been registered.

Reason for the implementation

User shall have the control about the execution order.

Fitcriterion

A callback with specific targetstate and condition will be executed before a non specific callback if the specific one had been regestered first.

Testresult

This test was passed with the state: **Success**. See also full trace in section A.1.20!

Testrun:	python 2.7.18 (final)
Caller:	/user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/__init__.py (47)
Start-Time:	2020-12-21 01:53:50,395
Finished-Time:	2020-12-21 01:53:50,397
Time-Consumption	0.001s

Testsummary:

Success	Callback execution order: Values and number of submitted values is correct. See detailed log for more information.
----------------	--

Testresult

This test was passed with the state: **Success**. See also full trace in section B.1.20!

Unittest for state_machine

Testrun: python 3.8.5 (final)
Caller: /user_data/data/dirk/prj/unittest/state_machine/unittest/src/tests/_init_.py (47)
Start-Time: 2020-12-21 01:53:52,718
Finished-Time: 2020-12-21 01:53:52,721
Time-Consumption 0.002s

Testsummary:

Success Callback execution order: Values and number of submitted values is correct. See detailed log for more information.

A Trace for testrun with python 2.7.18 (final)

A.1 Tests with status Info (20)

A.1.1 Default State

Description

The state machine shall start in the state, given while module initialisation.

Reason for the implementation

Creation of a defined state after initialisation.

Fitcriterion

State machine is in the initial state after initialisation.

Testresult

This test was passed with the state: **Success**.

Info Initialising the state machine with state_c

```
StateMachine: State change ('__init__'): None -> 'state_c'
```

Success State after initialisation is correct (Content 'state_c' and Type is <type 'str'>).

```
Result (State after initialisation): 'state_c' (<type 'str'>)
```

```
Expectation (State after initialisation): result = 'state_c' (<type 'str'>)
```

A.1.2 Default Last Transition Condition

Description

The state machine shall return the string `__init__` for last transition condition after initialisation.

Reason for the implementation

Creation of a defined state after initialisation.

Fitcriterion

The last transition condition is `__init__` after initialisation.

Testresult

This test was passed with the state: **Success**.

```

Info   Initialising the state machine with state_c
    
```

```

StateMachine: State change ('__init__'): None -> 'state_c'
    
```

```

Success Last transition condition after initialisation is correct (Content '__init__' and Type is <type 'str'>).
    
```

```

Result (Last transition condition after initialisation): '__init__' (<type 'str'>)
Expectation (Last transition condition after initialisation): result = '__init__' (<type
↳ 'str'>)
    
```

A.1.3 Default Previous State

Description

The state machine shall return `None` for previous state after initalisation.

Reason for the implementation

Creation of a defined state after initialisation.

Fitcriterion

The previous state is `None` after initialisation.

Testresult

This test was passed with the state: **Success**.

```

Info   Initialising the state machine with state_c
    
```

```

StateMachine: State change ('__init__'): None -> 'state_c'
    
```

```

Success Last state after initialisation is correct (Content None and Type is <type 'NoneType'>).
    
```

```

Result (Last state after initialisation): None (<type 'NoneType'>)
Expectation (Last state after initialisation): result = None (<type 'NoneType'>)
    
```

A.1.4 Additional Keyword Arguments

Description

The state machine shall store all given keyword arguments as variables of the classes instance.

Reason for the implementation

Store further information (e.g. for calculation of the transition conditions).

Fitcriterion

At least two given keyword arguments with different types are available after initialisation.

Testresult

This test was passed with the state: **Success**.

Info	Initialising the state machine with state_c
<pre>StateMachine: State change ('__init__'): None -> 'state_c'</pre>	
Success	Keyword argument kw_arg_no.4 stored in state_machine is correct (Content {'1': 1, '2': 'two'} and Type is <type 'dict'>).
<pre>Result (Keyword argument kw_arg_no.4 stored in state_machine): { '1': 1, '2': 'two' } (<type 'dict'> ↪ 'dict'>)</pre>	
<pre>Expectation (Keyword argument kw_arg_no.4 stored in state_machine): result = { '1': 1, '2': 'two' } (<type 'dict'> ↪ 'two' } (<type 'dict'>)</pre>	
Success	Keyword argument kw_arg_no.1 stored in state_machine is correct (Content 1 and Type is <type 'int'>).
<pre>Result (Keyword argument kw_arg_no.1 stored in state_machine): 1 (<type 'int'>)</pre>	
<pre>Expectation (Keyword argument kw_arg_no.1 stored in state_machine): result = 1 (<type 'int'>)</pre>	
Success	Keyword argument kw_arg_no.3 stored in state_machine is correct (Content True and Type is <type 'bool'>).
<pre>Result (Keyword argument kw_arg_no.3 stored in state_machine): True (<type 'bool'>)</pre>	
<pre>Expectation (Keyword argument kw_arg_no.3 stored in state_machine): result = True (<type 'bool'> ↪ 'bool'>)</pre>	
Success	Keyword argument kw_arg_no.2 stored in state_machine is correct (Content '2' and Type is <type 'str'>).
<pre>Result (Keyword argument kw_arg_no.2 stored in state_machine): '2' (<type 'str'>)</pre>	
<pre>Expectation (Keyword argument kw_arg_no.2 stored in state_machine): result = '2' (<type 'str'> ↪ 'str'>)</pre>	

A.1.5 Transitiondefinition and -flow

Description

The user shall be able to define multiple states and transitions for the state machine. A transition shall have a start state, a target state and a transition condition. The transition condition shall be a method, where the user is able to calculate the condition on demand.

Reason for the implementation

Definition of the transitions for a state machine.

Fitcriterion

The order of at least three state changes is correct.

Testresult

This test was passed with the state: **Success**.

Info Initialising state machine with state_a

StateMachine: State change ('__init__'): None -> 'state_a'

Success Initial state after Initialisation is correct (Content 'state_a' and Type is <type 'str'>).

Result (Initial state after Initialisation): 'state_a' (<type 'str'>)

Expectation (Initial state after Initialisation): result = 'state_a' (<type 'str'>)

Info Work routine executed the 1st time to do the state change. Defined Transitions are: True→state_b (0.0s); False→state_c (0.0s)

StateMachine: State change ('condition_true'): 'state_a' -> 'state_b'

Success State after 1st execution of work method is correct (Content 'state_b' and Type is <type 'str'>).

Result (State after 1st execution of work method): 'state_b' (<type 'str'>)

Expectation (State after 1st execution of work method): result = 'state_b' (<type 'str'>)

Info Work routine executed the 2nd time to do the state change. Defined Transitions are: False→state_a (0.0s); True→state_c (0.0s)

StateMachine: State change ('condition_true'): 'state_b' -> 'state_c'

Success State after 2nd execution of work method is correct (Content 'state_c' and Type is <type 'str'>).

Result (State after 2nd execution of work method): 'state_c' (<type 'str'>)

Expectation (State after 2nd execution of work method): result = 'state_c' (<type 'str'>)

Info Work routine executed the 3rd time with no effect. No Transitions starting from state_c (dead end)

Success State after 3rd execution of work method is correct (Content 'state_c' and Type is <type 'str'>).

Result (State after 3rd execution of work method): 'state_c' (<type 'str'>)

Expectation (State after 3rd execution of work method): result = 'state_c' (<type 'str'>)

A.1.6 Transitiontiming

Description

The user shall be able to define for each transition a transition time. On change of the transition condition to True, the transition timer starts counting the time from 0.0s. After reaching the transition time, the transition gets active.

Reason for the implementation

Robustness of the state changes (e.g. Oscillating conditions shall be ignored).

Fitcriterion

The transition time and the restart of the transition timer by setting the transition condition to False and to True again results in the expected transition timing ($\pm 0.05s$).

Testresult

This test was passed with the state: **Success**.

Info Initialising state machine with state_a

StateMachine: State change ('__init__'): None -> 'state_a'

Success Initial state after Initialisation is correct (Content 'state_a' and Type is <type 'str'>).

Result (Initial state after Initialisation): 'state_a' (<type 'str'>)

Expectation (Initial state after Initialisation): result = 'state_a' (<type 'str'>)

Info Waiting for 0.160s or state change

StateMachine: State change ('condition_true'): 'state_a' -> 'state_b'

Success State after 1st cycle is correct (Content 'state_b' and Type is <type 'str'>).

Result (State after 1st cycle): 'state_b' (<type 'str'>)

Expectation (State after 1st cycle): result = 'state_b' (<type 'str'>)

Success Transition time after 1st cycle is correct (Content 0.15047717094421387 in [0.145 ... 0.155] and Type is <type 'float'>).

Result (Transition time after 1st cycle): 0.15047717094421387 (<type 'float'>)

Expectation (Transition time after 1st cycle): 0.145 <= result <= 0.155

Info Waiting for 0.235s or state change

StateMachine: State change ('condition_true'): 'state_b' -> 'state_c'

Success State after 2nd cycle is correct (Content 'state_c' and Type is <type 'str'>).

Result (State after 2nd cycle): 'state_c' (<type 'str'>)

Expectation (State after 2nd cycle): result = 'state_c' (<type 'str'>)

Success Transition time after 2nd cycle is correct (Content 0.15042805671691895 in [0.145 ... 0.155] and Type is <type 'float'>).

Result (Transition time after 2nd cycle): 0.15042805671691895 (<type 'float'>)

Expectation (Transition time after 2nd cycle): 0.145 <= result <= 0.155

Success Previous state duration is correct (Content 0.22568202018737793 in [0.2199999999999997 ... 0.2299999999999998] and Type is <type 'float'>).

Result (Previous state duration): 0.22568202018737793 (<type 'float'>)

Expectation (Previous state duration): 0.2199999999999997 <= result <= 0.2299999999999998

A.1.7 Transitionpriorisation

Description

The state machine shall use the first active transition. If multiple transition are active, the transition with the highest overlap time will be used.

Reason for the implementation

Compensate the weakness of the execution quantisation.

Fitcriterion

At least one transition with at least two active conditions results in the expected state change.

Testresult

This test was passed with the state: **Success**.

Info Initialising state machine with state_a, a transition to state_b after 0.151s and a transition to state_c after 0.150s

StateMachine: State change ('__init__'): None -> 'state_a'

Success Initial state after Initialisation is correct (Content 'state_a' and Type is <type 'str'>).

Result (Initial state after Initialisation): 'state_a' (<type 'str'>)

Expectation (Initial state after Initialisation): result = 'state_a' (<type 'str'>)

Info Waiting for 0.300s or state change

Executing method work after 0.000s

Executing method work after 0.060s

Executing method work after 0.121s

Executing method work after 0.182s

StateMachine: State change ('condition_true'): 'state_a' -> 'state_c'

Success State after 1st cycle is correct (Content 'state_c' and Type is <type 'str'>).

Result (State after 1st cycle): 'state_c' (<type 'str'>)

Expectation (State after 1st cycle): result = 'state_c' (<type 'str'>)

A.1.8 This State

Description

The Module shall have a method for getting the current state.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least one returned state fits to the expectation.

Testresult

This test was passed with the state: **Success**.

Info Initialising the state machine with state_c

```
StateMachine: State change ('__init__'): None -> 'state_c'
```

Success Returnvalue of this_state() is correct (Content 'state_c' and Type is <type 'str'>).

```
Result (Returnvalue of this_state()): 'state_c' (<type 'str'>)
```

```
Expectation (Returnvalue of this_state()): result = 'state_c' (<type 'str'>)
```

A.1.9 This State is

Description

The Module shall have a method for checking if the given state is currently active.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least two calls with different return values fit to the expectation.

Testresult

This test was passed with the state: **Success**.

Info Initialising the state machine with state_c

```
StateMachine: State change ('__init__'): None -> 'state_c'
```

Success Returnvalue of this_state_is(state_c) is correct (Content True and Type is <type 'bool'>).

```
Result (Returnvalue of this_state_is(state_c)): True (<type 'bool'>)
```

```
Expectation (Returnvalue of this_state_is(state_c)): result = True (<type 'bool'>)
```

Success Returnvalue of this_state_is(state_b) is correct (Content False and Type is <type 'bool'>).

```
Result (Returnvalue of this_state_is(state_b)): False (<type 'bool'>)
```

```
Expectation (Returnvalue of this_state_is(state_b)): result = False (<type 'bool'>)
```

A.1.10 This State Duration

Description

The Module shall have a method for getting the time since the last state change appears.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least one returned duration fits to the current state duration ($\pm 0.05s$).

Testresult

This test was passed with the state: **Success**.

Info Running state machine test sequence.

```
StateMachine: State change ('__init__'): None -> 'state_a'
```

```
StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'
```

```
Waiting for 0.25s
```

Success Return Value of this_state_duration() is correct (Content 0.25178098678588867 in [0.2 ... 0.3] and Type is <type 'float'>).

```
Result (Return Value of this_state_duration()): 0.25178098678588867 (<type 'float'>)
```

```
Expectation (Return Value of this_state_duration()): 0.2 <= result <= 0.3
```

A.1.11 Last Transition Condition

Description

The Module shall have a method for getting the last transition condition.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least one returned transition condition fits to the expectation.

Testresult

This test was passed with the state: **Success**.

Info Running state machine test sequence.

StateMachine: State change ('__init__'): None -> 'state_a'

StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'

Success Returnvalue of last_transition_condition() is correct (Content 'condition_a' and Type is <type 'str'>).

Result (Returnvalue of last_transition_condition()): 'condition_a' (<type 'str'>)

Expectation (Returnvalue of last_transition_condition()): result = 'condition_a' (<type 'str'>)
 ↪ 'str'>)

A.1.12 Last Transition Condition was

Description

The Module shall have a method for checking if the given condition was the last transition condition.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least two calls with different return values fit to the expectation.

Testresult

This test was passed with the state: **Success**.

Info Running state machine test sequence.

StateMachine: State change ('__init__'): None -> 'state_a'

StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'

Success Returnvalue of last_transition_condition(condition_a) is correct (Content True and Type is <type 'bool'>).

Result (Returnvalue of last_transition_condition(condition_a)): True (<type 'bool'>)

Expectation (Returnvalue of last_transition_condition(condition_a)): result = True (<type 'bool'>)
 ↪ 'bool'>)

Success Returnvalue of last_transition_condition(condition_c) is correct (Content False and Type is <type 'bool'>).

Result (Returnvalue of last_transition_condition(condition_c)): False (<type 'bool'>)

Expectation (Returnvalue of last_transition_condition(condition_c)): result = False (<type 'bool'>)
 ↪ 'bool'>)

A.1.13 Previous State

Description

The Module shall have a method for getting the previous state.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least one returned state fits to the expectation.

Testresult

This test was passed with the state: **Success**.

Info Running state machine test sequence.

```
StateMachine: State change ('__init__'): None -> 'state_a'
```

```
StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'
```

Success Returnvalue of previous_state() is correct (Content 'state_a' and Type is <type 'str'>).

```
Result (Returnvalue of previous_state()): 'state_a' (<type 'str'>)
```

```
Expectation (Returnvalue of previous_state()): result = 'state_a' (<type 'str'>)
```

A.1.14 Previous State was

Description

The Module shall have a method for checking if the given state was the previous state.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least two calls with different return values fit to the expectation.

Testresult

This test was passed with the state: **Success**.

Info Running state machine test sequence.

```
StateMachine: State change ('__init__'): None -> 'state_a'
```

```
StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'
```

Success Returnvalue of previous_state_was(state_a) is correct (Content True and Type is <type 'bool'>).

```
Result (Returnvalue of previous_state_was(state_a)): True (<type 'bool'>)
```

```
Expectation (Returnvalue of previous_state_was(state_a)): result = True (<type 'bool'>)
```

Success Returnvalue of previous_state_was(state.b) is correct (Content False and Type is <type 'bool'>).

```
Result (Returnvalue of previous_state_was(state_b)): False (<type 'bool'>)
```

```
Expectation (Returnvalue of previous_state_was(state_b)): result = False (<type 'bool'>)
```

A.1.15 Previous State Duration

Description

The Module shall have a method for getting active time for the previous state.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least one returned duration fits to the previous state duration ($\pm 0.05s$).

Testresult

This test was passed with the state: **Success**.

Info Running state machine test sequence.

```
StateMachine: State change ('__init__'): None -> 'state_a'
```

```
StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'
```

```
Waiting for 0.75s
```

```
StateMachine: State change ('condition_b'): 'state_b' -> 'state_a'
```

Success Return Value of previous_state_duration() is correct (Content 0.7515342235565186 in [0.7 ... 0.8] and Type is <type 'float'>).

```
Result (Return Value of previous_state_duration()): 0.7515342235565186 (<type 'float'>)
```

```
Expectation (Return Value of previous_state_duration()): 0.7 <= result <= 0.8
```

A.1.16 State change callback for a defined transition and targetstate

Description

The state machine shall call all registered methods in the same order like the registration with all user given arguments for a defined set of *transition_condition* and *target_state*.

Reason for the implementation

Triggering state change actions for a specific transition condition and targetstate.

Fitcriterion

Methods are called in the registration order after state change with all user given arguments for the defined transition condition and targetstate and at least for one other condition not.

Testresult

This test was passed with the state: **Success**.

Info Running state machine sequence and storing sequence number for each callback

```

StateMachine: State change ('__init__'): None -> 'state_a'
Increasing sequence number to 1 caused by sequence progress
StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'
Executing callback 0 - tests.test_callbacks.exec_with_counter
Increasing sequence number to 2 caused by callback_execution
Executing callback 1 - tests.test_callbacks.exec_with_counter
Increasing sequence number to 3 caused by callback_execution
Increasing sequence number to 4 caused by sequence progress
StateMachine: State change ('condition_b'): 'state_b' -> 'state_a'
Increasing sequence number to 5 caused by sequence progress
StateMachine: State change ('condition_b'): 'state_a' -> 'state_b'
Increasing sequence number to 6 caused by sequence progress
StateMachine: State change ('condition_c'): 'state_b' -> 'state_c'
    
```

Success Execution of state machine callback (1) (state_b, condition_a) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.

```

Result (Execution of state machine callback (1) (state_b, condition_a) identified by a
↳ sequence number): [ 1 ] (<type 'list'>)
Expectation (Execution of state machine callback (1) (state_b, condition_a) identified by a
↳ sequence number): result = [ 1 ] (<type 'list'>)
Result (Submitted value number 1): 1 (<type 'int'>)
Expectation (Submitted value number 1): result = 1 (<type 'int'>)
Submitted value number 1 is correct (Content 1 and Type is <type 'int'>).
    
```

Success Execution of state machine callback (2) (state_b, condition_a) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.

```

Result (Execution of state machine callback (2) (state_b, condition_a) identified by a
↳ sequence number): [ 2 ] (<type 'list'>)
Expectation (Execution of state machine callback (2) (state_b, condition_a) identified by a
↳ sequence number): result = [ 2 ] (<type 'list'>)
Result (Submitted value number 1): 2 (<type 'int'>)
Expectation (Submitted value number 1): result = 2 (<type 'int'>)
Submitted value number 1 is correct (Content 2 and Type is <type 'int'>).
    
```

A.1.17 State change callback for a defined transition

Description

The state machine shall call all registered methods in the same order like the registration with all user given arguments for a defined *transition_condition* and all *target_states*.

Reason for the implementation

Triggering state change actions for a specific transition condition.

Fitcriterion

Methods are called in the registration order after state change with all user given arguments for the defined transition condition and at least for one other transition condition not.

Testresult

This test was passed with the state: **Success**.

Info	Running state machine sequence and storing sequence number for each callback
	StateMachine: State change ('__init__'): None -> 'state_a'
	Increasing sequence number to 1 caused by sequence progress
	StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'
	Increasing sequence number to 2 caused by sequence progress
	StateMachine: State change ('condition_b'): 'state_b' -> 'state_a'
	Executing callback 0 - tests.test_callbacks.exec_with_counter
	Increasing sequence number to 3 caused by callback_execution
	Executing callback 1 - tests.test_callbacks.exec_with_counter
	Increasing sequence number to 4 caused by callback_execution
	Increasing sequence number to 5 caused by sequence progress
	StateMachine: State change ('condition_b'): 'state_a' -> 'state_b'
	Executing callback 0 - tests.test_callbacks.exec_with_counter
	Increasing sequence number to 6 caused by callback_execution
	Executing callback 1 - tests.test_callbacks.exec_with_counter
	Increasing sequence number to 7 caused by callback_execution
	Increasing sequence number to 8 caused by sequence progress
	StateMachine: State change ('condition_c'): 'state_b' -> 'state_c'
Success	Execution of state machine callback (1) (all_transitions, condition_b) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.

```
Result (Execution of state machine callback (1) (all_transitions, condition_b) identified by
↳ a sequence number): [ 2, 5 ] (<type 'list'>)
```

```
Expectation (Execution of state machine callback (1) (all_transitions, condition_b)
↳ identified by a sequence number): result = [ 2, 5 ] (<type 'list'>)
```

```
Result (Submitted value number 1): 2 (<type 'int'>)
```

```
Expectation (Submitted value number 1): result = 2 (<type 'int'>)
```

```
Submitted value number 1 is correct (Content 2 and Type is <type 'int'>).
```

```
Result (Submitted value number 2): 5 (<type 'int'>)
```

```
Expectation (Submitted value number 2): result = 5 (<type 'int'>)
```

```
Submitted value number 2 is correct (Content 5 and Type is <type 'int'>).
```

Success Execution of state machine callback (2) (all_transitions, condition_b) identified by a sequence number:
Values and number of submitted values is correct. See detailed log for more information.

```
Result (Execution of state machine callback (2) (all_transitions, condition_b) identified by
↳ a sequence number): [ 3, 6 ] (<type 'list'>)
```

```
Expectation (Execution of state machine callback (2) (all_transitions, condition_b)
↳ identified by a sequence number): result = [ 3, 6 ] (<type 'list'>)
```

```
Result (Submitted value number 1): 3 (<type 'int'>)
```

```
Expectation (Submitted value number 1): result = 3 (<type 'int'>)
```

```
Submitted value number 1 is correct (Content 3 and Type is <type 'int'>).
```

```
Result (Submitted value number 2): 6 (<type 'int'>)
```

```
Expectation (Submitted value number 2): result = 6 (<type 'int'>)
```

```
Submitted value number 2 is correct (Content 6 and Type is <type 'int'>).
```

A.1.18 State change callback for a defined targetstate

Description

The state machine shall call all registered methods in the same order like the registration with all user given arguments for all *transition_conditions* and a defined *target_state*.

Reason for the implementation

Triggering state change actions for a specific targetstate.

Fitcriterion

Methods are called in the registration order after state change with the defined targetstate and at least for one other targetstate not.

Testresult

This test was passed with the state: **Success**.

Info Running state machine sequence and storing sequence number for each callback

```

StateMachine: State change ('__init__'): None -> 'state_a'
Increasing sequence number to 1 caused by sequence progress
StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'
Executing callback 0 - tests.test_callbacks.exec_with_counter
Increasing sequence number to 2 caused by callback_execution
Executing callback 1 - tests.test_callbacks.exec_with_counter
Increasing sequence number to 3 caused by callback_execution
Increasing sequence number to 4 caused by sequence progress
StateMachine: State change ('condition_b'): 'state_b' -> 'state_a'
Increasing sequence number to 5 caused by sequence progress
StateMachine: State change ('condition_b'): 'state_a' -> 'state_b'
Executing callback 0 - tests.test_callbacks.exec_with_counter
Increasing sequence number to 6 caused by callback_execution
Executing callback 1 - tests.test_callbacks.exec_with_counter
Increasing sequence number to 7 caused by callback_execution
Increasing sequence number to 8 caused by sequence progress
StateMachine: State change ('condition_c'): 'state_b' -> 'state_c'
    
```

Success Execution of state machine callback (1) (state_b, all_conditions) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.

```

Result (Execution of state machine callback (1) (state_b, all_conditions) identified by a
↪ sequence number): [ 1, 5 ] (<type 'list'>)
Expectation (Execution of state machine callback (1) (state_b, all_conditions) identified by
↪ a sequence number): result = [ 1, 5 ] (<type 'list'>)
Result (Submitted value number 1): 1 (<type 'int'>)
Expectation (Submitted value number 1): result = 1 (<type 'int'>)
Submitted value number 1 is correct (Content 1 and Type is <type 'int'>).
Result (Submitted value number 2): 5 (<type 'int'>)
Expectation (Submitted value number 2): result = 5 (<type 'int'>)
Submitted value number 2 is correct (Content 5 and Type is <type 'int'>).
    
```

Success Execution of state machine callback (2) (state_b, all_conditions) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.

```

Result (Execution of state machine callback (2) (state_b, all_conditions) identified by a
↪ sequence number): [ 2, 6 ] (<type 'list'>)
Expectation (Execution of state machine callback (2) (state_b, all_conditions) identified by
↪ a sequence number): result = [ 2, 6 ] (<type 'list'>)
Result (Submitted value number 1): 2 (<type 'int'>)
Expectation (Submitted value number 1): result = 2 (<type 'int'>)
Submitted value number 1 is correct (Content 2 and Type is <type 'int'>).
Result (Submitted value number 2): 6 (<type 'int'>)
Expectation (Submitted value number 2): result = 6 (<type 'int'>)
Submitted value number 2 is correct (Content 6 and Type is <type 'int'>).
    
```

A.1.19 State change callback for all kind of state changes

Description

The state machine shall call all registered methods in the same order like the registration with all user given arguments for all transitions.

Reason for the implementation

Triggering state change actions for all transition conditions and targetstates.

Fitcriterion

Methods are called in the registration order after state change.

Testresult

This test was passed with the state: **Success**.

Info	Running state machine sequence and storing sequence number for each callback
	StateMachine: State change ('__init__'): None -> 'state_a'
	Increasing sequence number to 1 caused by sequence progress
	StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'
	Executing callback 0 - tests.test_callbacks.exec_with_counter
	Increasing sequence number to 2 caused by callback_execution
	Executing callback 1 - tests.test_callbacks.exec_with_counter
	Increasing sequence number to 3 caused by callback_execution
	Increasing sequence number to 4 caused by sequence progress
	StateMachine: State change ('condition_b'): 'state_b' -> 'state_a'
	Executing callback 0 - tests.test_callbacks.exec_with_counter
	Increasing sequence number to 5 caused by callback_execution
	Executing callback 1 - tests.test_callbacks.exec_with_counter
	Increasing sequence number to 6 caused by callback_execution
	Increasing sequence number to 7 caused by sequence progress
	StateMachine: State change ('condition_b'): 'state_a' -> 'state_b'
	Executing callback 0 - tests.test_callbacks.exec_with_counter
	Increasing sequence number to 8 caused by callback_execution
	Executing callback 1 - tests.test_callbacks.exec_with_counter
	Increasing sequence number to 9 caused by callback_execution
	Increasing sequence number to 10 caused by sequence progress
	StateMachine: State change ('condition_c'): 'state_b' -> 'state_c'
	Executing callback 0 - tests.test_callbacks.exec_with_counter
	Increasing sequence number to 11 caused by callback_execution
	Executing callback 1 - tests.test_callbacks.exec_with_counter
	Increasing sequence number to 12 caused by callback_execution
Success	Execution of state machine callback (1) (all_transitions, all_conditions) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.

```

Result (Execution of state machine callback (1) (all_transitions, all_conditions) identified
↳ by a sequence number): [ 1, 4, 7, 10 ] (<type 'list'>)
Expectation (Execution of state machine callback (1) (all_transitions, all_conditions)
↳ identified by a sequence number): result = [ 1, 4, 7, 10 ] (<type 'list'>)
Result (Submitted value number 1): 1 (<type 'int'>)
Expectation (Submitted value number 1): result = 1 (<type 'int'>)
Submitted value number 1 is correct (Content 1 and Type is <type 'int'>).
Result (Submitted value number 2): 4 (<type 'int'>)
Expectation (Submitted value number 2): result = 4 (<type 'int'>)
Submitted value number 2 is correct (Content 4 and Type is <type 'int'>).
Result (Submitted value number 3): 7 (<type 'int'>)
Expectation (Submitted value number 3): result = 7 (<type 'int'>)
Submitted value number 3 is correct (Content 7 and Type is <type 'int'>).
Result (Submitted value number 4): 10 (<type 'int'>)
Expectation (Submitted value number 4): result = 10 (<type 'int'>)
Submitted value number 4 is correct (Content 10 and Type is <type 'int'>).

```

Success Execution of state machine callback (2) (all_transitions, all_conditions) identified by a sequence number:
 Values and number of submitted values is correct. See detailed log for more information.

```

Result (Execution of state machine callback (2) (all_transitions, all_conditions) identified
↳ by a sequence number): [ 2, 5, 8, 11 ] (<type 'list'>)
Expectation (Execution of state machine callback (2) (all_transitions, all_conditions)
↳ identified by a sequence number): result = [ 2, 5, 8, 11 ] (<type 'list'>)
Result (Submitted value number 1): 2 (<type 'int'>)
Expectation (Submitted value number 1): result = 2 (<type 'int'>)
Submitted value number 1 is correct (Content 2 and Type is <type 'int'>).
Result (Submitted value number 2): 5 (<type 'int'>)
Expectation (Submitted value number 2): result = 5 (<type 'int'>)
Submitted value number 2 is correct (Content 5 and Type is <type 'int'>).
Result (Submitted value number 3): 8 (<type 'int'>)
Expectation (Submitted value number 3): result = 8 (<type 'int'>)
Submitted value number 3 is correct (Content 8 and Type is <type 'int'>).
Result (Submitted value number 4): 11 (<type 'int'>)
Expectation (Submitted value number 4): result = 11 (<type 'int'>)
Submitted value number 4 is correct (Content 11 and Type is <type 'int'>).

```

A.1.20 Execution order of Callbacks

Description

The callbacks shall be executed in the same order as they had been registered.

Reason for the implementation

User shall have the control about the execution order.

Fitcriterion

A callback with specific targetstate and condition will be executed before a non specific callback if the specific one had been registered first.

Testresult

This test was passed with the state: **Success**.

Success Callback execution order: Values and number of submitted values is correct. See detailed log for more information.

```

StateMachine: State change ('__init__'): None -> 'state_a'
StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'
Executing callback 0 - unittest.test.report_value
Executing callback 2 - unittest.test.report_value
StateMachine: State change ('condition_b'): 'state_b' -> 'state_a'
Executing callback 1 - unittest.test.report_value
Executing callback 2 - unittest.test.report_value
Result (Callback execution order): [ 'specific callback for reaching state_b', 'nonspecific
↳ callback', 'specific callback for reaching state_a', 'nonspecific callback' ] (<type
↳ 'list'>)
Expectation (Callback execution order): result = [ 'specific callback for reaching state_b',
↳ 'nonspecific callback', 'specific callback for reaching state_a', 'nonspecific callback'
↳ ] (<type 'list'>)
Result (Submitted value number 1): 'specific callback for reaching state_b' (<type 'str'>)
Expectation (Submitted value number 1): result = 'specific callback for reaching state_b'
↳ (<type 'str'>)
Submitted value number 1 is correct (Content 'specific callback for reaching state_b' and
↳ Type is <type 'str'>).
Result (Submitted value number 2): 'nonspecific callback' (<type 'str'>)
Expectation (Submitted value number 2): result = 'nonspecific callback' (<type 'str'>)
Submitted value number 2 is correct (Content 'nonspecific callback' and Type is <type 'str'>).
Result (Submitted value number 3): 'specific callback for reaching state_a' (<type 'str'>)
Expectation (Submitted value number 3): result = 'specific callback for reaching state_a'
↳ (<type 'str'>)
Submitted value number 3 is correct (Content 'specific callback for reaching state_a' and
↳ Type is <type 'str'>).
Result (Submitted value number 4): 'nonspecific callback' (<type 'str'>)
Expectation (Submitted value number 4): result = 'nonspecific callback' (<type 'str'>)
Submitted value number 4 is correct (Content 'nonspecific callback' and Type is <type 'str'>).

```

B Trace for testrun with python 3.8.5 (final)

B.1 Tests with status Info (20)

B.1.1 Default State

Description

The state machine shall start in the state, given while module initialisation.

Reason for the implementation

Creation of a defined state after initialisation.

Fitcriterion

State machine is in the initial state after initialisation.

Testresult

This test was passed with the state: **Success**.

Info Initialising the state machine with state_c

```
StateMachine: State change ('__init__'): None -> 'state_c'
```

Success State after initialisation is correct (Content 'state_c' and Type is <class 'str'>).

```
Result (State after initialisation): 'state_c' (<class 'str'>)
```

```
Expectation (State after initialisation): result = 'state_c' (<class 'str'>)
```

B.1.2 Default Last Transition Condition

Description

The state machine shall return the string `__init__` for last transition condition after initialisation.

Reason for the implementation

Creation of a defined state after initialisation.

Fitcriterion

The last transition condition is `__init__` after initialisation.

Testresult

This test was passed with the state: **Success**.

```

Info   Initialising the state machine with state_c
    
```

```

StateMachine: State change ('__init__'): None -> 'state_c'
    
```

```

Success Last transition condition after initialisation is correct (Content '__init__' and Type is <class 'str'>).
    
```

```

Result (Last transition condition after initialisation): '__init__' (<class 'str'>)
Expectation (Last transition condition after initialisation): result = '__init__' (<class
↳ 'str'>)
    
```

B.1.3 Default Previous State

Description

The state machine shall return `None` for previous state after initalisation.

Reason for the implementation

Creation of a defined state after initialisation.

Fitcriterion

The previous state is `None` after initialisation.

Testresult

This test was passed with the state: **Success**.

```

Info   Initialising the state machine with state_c
    
```

```

StateMachine: State change ('__init__'): None -> 'state_c'
    
```

```

Success Last state after initialisation is correct (Content None and Type is <class 'NoneType'>).
    
```

```

Result (Last state after initialisation): None (<class 'NoneType'>)
Expectation (Last state after initialisation): result = None (<class 'NoneType'>)
    
```

B.1.4 Additional Keyword Arguments

Description

The state machine shall store all given keyword arguments as variables of the classes instance.

Reason for the implementation

Store further information (e.g. for calculation of the transition conditions).

Fitcriterion

At least two given keyword arguments with different types are available after initialisation.

Testresult

This test was passed with the state: **Success**.

Info Initialising the state machine with state_c

```
StateMachine: State change ('__init__'): None -> 'state_c'
```

Success Keyword argument kw_arg_no.1 stored in state_machine is correct (Content 1 and Type is <class 'int'>).

```
Result (Keyword argument kw_arg_no.1 stored in state_machine): 1 (<class 'int'>)
```

```
Expectation (Keyword argument kw_arg_no.1 stored in state_machine): result = 1 (<class 'int'>)
```

Success Keyword argument kw_arg_no.2 stored in state_machine is correct (Content '2' and Type is <class 'str'>).

```
Result (Keyword argument kw_arg_no.2 stored in state_machine): '2' (<class 'str'>)
```

```
Expectation (Keyword argument kw_arg_no.2 stored in state_machine): result = '2' (<class  
↪ 'str'>)
```

Success Keyword argument kw_arg_no.3 stored in state_machine is correct (Content True and Type is <class 'bool'>).

```
Result (Keyword argument kw_arg_no.3 stored in state_machine): True (<class 'bool'>)
```

```
Expectation (Keyword argument kw_arg_no.3 stored in state_machine): result = True (<class  
↪ 'bool'>)
```

Success Keyword argument kw_arg_no.4 stored in state_machine is correct (Content {'1': 1, '2': 'two'} and Type is <class 'dict'>).

```
Result (Keyword argument kw_arg_no.4 stored in state_machine): { '1': 1, '2': 'two' } (<class  
↪ 'dict'>)
```

```
Expectation (Keyword argument kw_arg_no.4 stored in state_machine): result = { '1': 1, '2':  
↪ 'two' } (<class 'dict'>)
```

B.1.5 Transitiondefinition and -flow**Description**

The user shall be able to define multiple states and transitions for the state machine. A transition shall have a start state, a target state and a transition condition. The transition condition shall be a method, where the user is able to calculate the condition on demand.

Reason for the implementation

Definition of the transitions for a state machine.

Fitcriterion

The order of at least three state changes is correct.

Testresult

This test was passed with the state: **Success**.

Info	Initialising state machine with state_a
-------------	---

<code>StateMachine: State change ('__init__'): None -> 'state_a'</code>	
--	--

Success	Initial state after Initialisation is correct (Content 'state_a' and Type is <class 'str'>).
----------------	--

<code>Result (Initial state after Initialisation): 'state_a' (<class 'str'>)</code>	
<code>Expectation (Initial state after Initialisation): result = 'state_a' (<class 'str'>)</code>	

Info	Work routine executed the 1st time to do the state change. Defined Transitions are: True→state_b (0.0s); False→state_c (0.0s)
-------------	---

<code>StateMachine: State change ('condition_true'): 'state_a' -> 'state_b'</code>	
---	--

Success	State after 1st execution of work method is correct (Content 'state_b' and Type is <class 'str'>).
----------------	--

<code>Result (State after 1st execution of work method): 'state_b' (<class 'str'>)</code>	
<code>Expectation (State after 1st execution of work method): result = 'state_b' (<class 'str'>)</code>	

Info	Work routine executed the 2nd time to do the state change. Defined Transitions are: False→state_a (0.0s); True→state_c (0.0s)
-------------	---

<code>StateMachine: State change ('condition_true'): 'state_b' -> 'state_c'</code>	
---	--

Success	State after 2nd execution of work method is correct (Content 'state_c' and Type is <class 'str'>).
----------------	--

<code>Result (State after 2nd execution of work method): 'state_c' (<class 'str'>)</code>	
<code>Expectation (State after 2nd execution of work method): result = 'state_c' (<class 'str'>)</code>	

Info	Work routine executed the 3rd time with no effect. No Transitions starting from state_c (dead end)
-------------	--

Success	State after 3rd execution of work method is correct (Content 'state_c' and Type is <class 'str'>).
----------------	--

<code>Result (State after 3rd execution of work method): 'state_c' (<class 'str'>)</code>	
<code>Expectation (State after 3rd execution of work method): result = 'state_c' (<class 'str'>)</code>	

B.1.6 Transitiontiming

Description

The user shall be able to define for each transition a transition time. On change of the transition condition to True, the transition timer starts counting the time from 0.0s. After reaching the transition time, the transition gets active.

Reason for the implementation

Robustness of the state changes (e.g. Oscillating conditions shall be ignored).

Fitcriterion

The transition time and the restart of the transition timer by setting the transition condition to False and to True again results in the expected transition timing ($\pm 0.05s$).

Testresult

This test was passed with the state: **Success**.

Info Initialising state machine with state_a

StateMachine: State change ('__init__'): None -> 'state_a'

Success Initial state after Initialisation is correct (Content 'state_a' and Type is <class 'str'>).

Result (Initial state after Initialisation): 'state_a' (<class 'str'>)

Expectation (Initial state after Initialisation): result = 'state_a' (<class 'str'>)

Info Waiting for 0.160s or state change

StateMachine: State change ('condition_true'): 'state_a' -> 'state_b'

Success State after 1st cycle is correct (Content 'state_b' and Type is <class 'str'>).

Result (State after 1st cycle): 'state_b' (<class 'str'>)

Expectation (State after 1st cycle): result = 'state_b' (<class 'str'>)

Success Transition time after 1st cycle is correct (Content 0.15067315101623535 in [0.145 ... 0.155] and Type is <class 'float'>).

Result (Transition time after 1st cycle): 0.15067315101623535 (<class 'float'>)

Expectation (Transition time after 1st cycle): 0.145 <= result <= 0.155

Info Waiting for 0.235s or state change

StateMachine: State change ('condition_true'): 'state_b' -> 'state_c'

Success State after 2nd cycle is correct (Content 'state_c' and Type is <class 'str'>).

Result (State after 2nd cycle): 'state_c' (<class 'str'>)

Expectation (State after 2nd cycle): result = 'state_c' (<class 'str'>)

Success Transition time after 2nd cycle is correct (Content 0.1506359577178955 in [0.145 ... 0.155] and Type is <class 'float'>).

Result (Transition time after 2nd cycle): 0.1506359577178955 (<class 'float'>)

Expectation (Transition time after 2nd cycle): 0.145 <= result <= 0.155

Success Previous state duration is correct (Content 0.22591900825500488 in [0.2199999999999997 ... 0.2299999999999998] and Type is <class 'float'>).

Result (Previous state duration): 0.22591900825500488 (<class 'float'>)

Expectation (Previous state duration): 0.2199999999999997 <= result <= 0.2299999999999998

B.1.7 Transitionpriorisation

Description

The state machine shall use the first active transition. If multiple transition are active, the transition with the highest overlap time will be used.

Reason for the implementation

Compensate the weakness of the execution quantisation.

Fitcriterion

At least one transition with at least two active conditions results in the expected state change.

Testresult

This test was passed with the state: **Success**.

Info Initialising state machine with state_a, a transition to state_b after 0.151s and a transition to state_c after 0.150s

StateMachine: State change ('__init__'): None -> 'state_a'

Success Initial state after Initialisation is correct (Content 'state_a' and Type is <class 'str'>).

Result (Initial state after Initialisation): 'state_a' (<class 'str'>)

Expectation (Initial state after Initialisation): result = 'state_a' (<class 'str'>)

Info Waiting for 0.300s or state change

Executing method work after 0.000s

Executing method work after 0.060s

Executing method work after 0.121s

Executing method work after 0.182s

StateMachine: State change ('condition_true'): 'state_a' -> 'state_c'

Success State after 1st cycle is correct (Content 'state_c' and Type is <class 'str'>).

Result (State after 1st cycle): 'state_c' (<class 'str'>)

Expectation (State after 1st cycle): result = 'state_c' (<class 'str'>)

B.1.8 This State

Description

The Module shall have a method for getting the current state.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least one returned state fits to the expectation.

Testresult

This test was passed with the state: **Success**.

Info Initialising the state machine with state_c

```
StateMachine: State change ('__init__'): None -> 'state_c'
```

Success Returnvalue of this_state() is correct (Content 'state_c' and Type is <class 'str'>).

```
Result (Returnvalue of this_state()): 'state_c' (<class 'str'>)
```

```
Expectation (Returnvalue of this_state()): result = 'state_c' (<class 'str'>)
```

B.1.9 This State is

Description

The Module shall have a method for checking if the given state is currently active.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least two calls with different return values fit to the expectation.

Testresult

This test was passed with the state: **Success**.

Info Initialising the state machine with state_c

```
StateMachine: State change ('__init__'): None -> 'state_c'
```

Success Returnvalue of this_state_is(state_c) is correct (Content True and Type is <class 'bool'>).

```
Result (Returnvalue of this_state_is(state_c)): True (<class 'bool'>)
```

```
Expectation (Returnvalue of this_state_is(state_c)): result = True (<class 'bool'>)
```

Success Returnvalue of this_state_is(state_b) is correct (Content False and Type is <class 'bool'>).

```
Result (Returnvalue of this_state_is(state_b)): False (<class 'bool'>)
```

```
Expectation (Returnvalue of this_state_is(state_b)): result = False (<class 'bool'>)
```

B.1.10 This State Duration

Description

The Module shall have a method for getting the time since the last state change appears.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least one returned duration fits to the current state duration ($\pm 0.05s$).

Testresult

This test was passed with the state: **Success**.

Info Running state machine test sequence.

```
StateMachine: State change ('__init__'): None -> 'state_a'
```

```
StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'
```

```
Waiting for 0.25s
```

Success Return Value of this_state_duration() is correct (Content 0.2508413791656494 in [0.2 ... 0.3] and Type is <class 'float'>).

```
Result (Return Value of this_state_duration()): 0.2508413791656494 (<class 'float'>)
```

```
Expectation (Return Value of this_state_duration()): 0.2 <= result <= 0.3
```

B.1.11 Last Transition Condition

Description

The Module shall have a method for getting the last transition condition.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least one returned transition condition fits to the expectation.

Testresult

This test was passed with the state: **Success**.

Info Running state machine test sequence.

```
StateMachine: State change ('__init__'): None -> 'state_a'
```

```
StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'
```

Success Returnvalue of last_transition_condition() is correct (Content 'condition_a' and Type is <class 'str'>).

```
Result (Returnvalue of last_transition_condition()): 'condition_a' (<class 'str'>)
```

```
Expectation (Returnvalue of last_transition_condition()): result = 'condition_a' (<class  
↪ 'str'>)
```

B.1.12 Last Transition Condition was

Description

The Module shall have a method for checking if the given condition was the last transition condition.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least two calls with different return values fit to the expectation.

Testresult

This test was passed with the state: **Success**.

Info Running state machine test sequence.

```
StateMachine: State change ('__init__'): None -> 'state_a'
```

```
StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'
```

Success Returnvalue of last_transition_condition(condition_a) is correct (Content True and Type is <class 'bool'>).

```
Result (Returnvalue of last_transition_condition(condition_a)): True (<class 'bool'>)
```

```
Expectation (Returnvalue of last_transition_condition(condition_a)): result = True (<class  
↪ 'bool'>)
```

Success Returnvalue of last_transition_condition(condition_c) is correct (Content False and Type is <class 'bool'>).

```
Result (Returnvalue of last_transition_condition(condition_c)): False (<class 'bool'>)
```

```
Expectation (Returnvalue of last_transition_condition(condition_c)): result = False (<class  
↪ 'bool'>)
```

B.1.13 Previous State

Description

The Module shall have a method for getting the previous state.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least one returned state fits to the expectation.

Testresult

This test was passed with the state: **Success**.

Info Running state machine test sequence.

```
StateMachine: State change ('__init__'): None -> 'state_a'
```

```
StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'
```

Success Returnvalue of previous_state() is correct (Content 'state_a' and Type is <class 'str'>).

```
Result (Returnvalue of previous_state()): 'state_a' (<class 'str'>)
```

```
Expectation (Returnvalue of previous_state()): result = 'state_a' (<class 'str'>)
```

B.1.14 Previous State was

Description

The Module shall have a method for checking if the given state was the previous state.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least two calls with different return values fit to the expectation.

Testresult

This test was passed with the state: **Success**.

Info Running state machine test sequence.

```
StateMachine: State change ('__init__'): None -> 'state_a'
```

```
StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'
```

Success Returnvalue of previous_state_was(state_a) is correct (Content True and Type is <class 'bool'>).

```
Result (Returnvalue of previous_state_was(state_a)): True (<class 'bool'>)
```

```
Expectation (Returnvalue of previous_state_was(state_a)): result = True (<class 'bool'>)
```

Success Returnvalue of previous_state_was(state.b) is correct (Content False and Type is <class 'bool'>).

```
Result (Returnvalue of previous_state_was(state_b)): False (<class 'bool'>)
```

```
Expectation (Returnvalue of previous_state_was(state_b)): result = False (<class 'bool'>)
```

B.1.15 Previous State Duration

Description

The Module shall have a method for getting active time for the previous state.

Reason for the implementation

Comfortable user interface.

Fitcriterion

At least one returned duration fits to the previous state duration ($\pm 0.05s$).

Testresult

This test was passed with the state: **Success**.

Info Running state machine test sequence.

```
StateMachine: State change ('__init__'): None -> 'state_a'
```

```
StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'
```

```
Waiting for 0.75s
```

```
StateMachine: State change ('condition_b'): 'state_b' -> 'state_a'
```

Success Return Value of previous_state_duration() is correct (Content 0.7511894702911377 in [0.7 ... 0.8] and Type is <class 'float'>).

```
Result (Return Value of previous_state_duration()): 0.7511894702911377 (<class 'float'>)
```

```
Expectation (Return Value of previous_state_duration()): 0.7 <= result <= 0.8
```

B.1.16 State change callback for a defined transition and targetstate

Description

The state machine shall call all registered methods in the same order like the registration with all user given arguments for a defined set of *transition_condition* and *target_state*.

Reason for the implementation

Triggering state change actions for a specific transition condition and targetstate.

Fitcriterion

Methods are called in the registration order after state change with all user given arguments for the defined transition condition and targetstate and at least for one other condition not.

Testresult

This test was passed with the state: **Success**.

Info Running state machine sequence and storing sequence number for each callback

```

StateMachine: State change ('__init__'): None -> 'state_a'
Increasing sequence number to 1 caused by sequence progress
StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'
Executing callback 0 - tests.test_callbacks.exec_with_counter
Increasing sequence number to 2 caused by callback_execution
Executing callback 1 - tests.test_callbacks.exec_with_counter
Increasing sequence number to 3 caused by callback_execution
Increasing sequence number to 4 caused by sequence progress
StateMachine: State change ('condition_b'): 'state_b' -> 'state_a'
Increasing sequence number to 5 caused by sequence progress
StateMachine: State change ('condition_b'): 'state_a' -> 'state_b'
Increasing sequence number to 6 caused by sequence progress
StateMachine: State change ('condition_c'): 'state_b' -> 'state_c'
    
```

Success Execution of state machine callback (1) (state_b, condition_a) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.

```

Result (Execution of state machine callback (1) (state_b, condition_a) identified by a
↳ sequence number): [ 1 ] (<class 'list'>)
Expectation (Execution of state machine callback (1) (state_b, condition_a) identified by a
↳ sequence number): result = [ 1 ] (<class 'list'>)
Result (Submitted value number 1): 1 (<class 'int'>)
Expectation (Submitted value number 1): result = 1 (<class 'int'>)
Submitted value number 1 is correct (Content 1 and Type is <class 'int'>).
    
```

Success Execution of state machine callback (2) (state_b, condition_a) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.

```

Result (Execution of state machine callback (2) (state_b, condition_a) identified by a
↳ sequence number): [ 2 ] (<class 'list'>)
Expectation (Execution of state machine callback (2) (state_b, condition_a) identified by a
↳ sequence number): result = [ 2 ] (<class 'list'>)
Result (Submitted value number 1): 2 (<class 'int'>)
Expectation (Submitted value number 1): result = 2 (<class 'int'>)
Submitted value number 1 is correct (Content 2 and Type is <class 'int'>).
    
```


B.1.17 State change callback for a defined transition

Description

The state machine shall call all registered methods in the same order like the registration with all user given arguments for a defined *transition_condition* and all *target_states*.

Reason for the implementation

Triggering state change actions for a specific transition condition.

Fitcriterion

Methods are called in the registration order after state change with all user given arguments for the defined transition condition and at least for one other transition condition not.

Testresult

This test was passed with the state: **Success**.

Info	Running state machine sequence and storing sequence number for each callback
	StateMachine: State change ('__init__'): None -> 'state_a'
	Increasing sequence number to 1 caused by sequence progress
	StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'
	Increasing sequence number to 2 caused by sequence progress
	StateMachine: State change ('condition_b'): 'state_b' -> 'state_a'
	Executing callback 0 - tests.test_callbacks.exec_with_counter
	Increasing sequence number to 3 caused by callback_execution
	Executing callback 1 - tests.test_callbacks.exec_with_counter
	Increasing sequence number to 4 caused by callback_execution
	Increasing sequence number to 5 caused by sequence progress
	StateMachine: State change ('condition_b'): 'state_a' -> 'state_b'
	Executing callback 0 - tests.test_callbacks.exec_with_counter
	Increasing sequence number to 6 caused by callback_execution
	Executing callback 1 - tests.test_callbacks.exec_with_counter
	Increasing sequence number to 7 caused by callback_execution
	Increasing sequence number to 8 caused by sequence progress
	StateMachine: State change ('condition_c'): 'state_b' -> 'state_c'
Success	Execution of state machine callback (1) (all_transitions, condition_b) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.

```
Result (Execution of state machine callback (1) (all_transitions, condition_b) identified by
↳ a sequence number): [ 2, 5 ] (<class 'list'>)
```

```
Expectation (Execution of state machine callback (1) (all_transitions, condition_b)
↳ identified by a sequence number): result = [ 2, 5 ] (<class 'list'>)
```

```
Result (Submitted value number 1): 2 (<class 'int'>)
```

```
Expectation (Submitted value number 1): result = 2 (<class 'int'>)
```

```
Submitted value number 1 is correct (Content 2 and Type is <class 'int'>).
```

```
Result (Submitted value number 2): 5 (<class 'int'>)
```

```
Expectation (Submitted value number 2): result = 5 (<class 'int'>)
```

```
Submitted value number 2 is correct (Content 5 and Type is <class 'int'>).
```

Success Execution of state machine callback (2) (all_transitions, condition_b) identified by a sequence number:
Values and number of submitted values is correct. See detailed log for more information.

```
Result (Execution of state machine callback (2) (all_transitions, condition_b) identified by
↳ a sequence number): [ 3, 6 ] (<class 'list'>)
```

```
Expectation (Execution of state machine callback (2) (all_transitions, condition_b)
↳ identified by a sequence number): result = [ 3, 6 ] (<class 'list'>)
```

```
Result (Submitted value number 1): 3 (<class 'int'>)
```

```
Expectation (Submitted value number 1): result = 3 (<class 'int'>)
```

```
Submitted value number 1 is correct (Content 3 and Type is <class 'int'>).
```

```
Result (Submitted value number 2): 6 (<class 'int'>)
```

```
Expectation (Submitted value number 2): result = 6 (<class 'int'>)
```

```
Submitted value number 2 is correct (Content 6 and Type is <class 'int'>).
```

B.1.18 State change callback for a defined targetstate

Description

The state machine shall call all registered methods in the same order like the registration with all user given arguments for all *transition_conditions* and a defined *target_state*.

Reason for the implementation

Triggering state change actions for a specific targetstate.

Fitcriterion

Methods are called in the registration order after state change with the defined targetstate and at least for one other targetstate not.

Testresult

This test was passed with the state: **Success**.

Info Running state machine sequence and storing sequence number for each callback

```

StateMachine: State change ('__init__'): None -> 'state_a'
Increasing sequence number to 1 caused by sequence progress
StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'
Executing callback 0 - tests.test_callbacks.exec_with_counter
Increasing sequence number to 2 caused by callback_execution
Executing callback 1 - tests.test_callbacks.exec_with_counter
Increasing sequence number to 3 caused by callback_execution
Increasing sequence number to 4 caused by sequence progress
StateMachine: State change ('condition_b'): 'state_b' -> 'state_a'
Increasing sequence number to 5 caused by sequence progress
StateMachine: State change ('condition_b'): 'state_a' -> 'state_b'
Executing callback 0 - tests.test_callbacks.exec_with_counter
Increasing sequence number to 6 caused by callback_execution
Executing callback 1 - tests.test_callbacks.exec_with_counter
Increasing sequence number to 7 caused by callback_execution
Increasing sequence number to 8 caused by sequence progress
StateMachine: State change ('condition_c'): 'state_b' -> 'state_c'
    
```

Success Execution of state machine callback (1) (state_b, all_conditions) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.

```

Result (Execution of state machine callback (1) (state_b, all_conditions) identified by a
↪ sequence number): [ 1, 5 ] (<class 'list'>)
Expectation (Execution of state machine callback (1) (state_b, all_conditions) identified by
↪ a sequence number): result = [ 1, 5 ] (<class 'list'>)
Result (Submitted value number 1): 1 (<class 'int'>)
Expectation (Submitted value number 1): result = 1 (<class 'int'>)
Submitted value number 1 is correct (Content 1 and Type is <class 'int'>).
Result (Submitted value number 2): 5 (<class 'int'>)
Expectation (Submitted value number 2): result = 5 (<class 'int'>)
Submitted value number 2 is correct (Content 5 and Type is <class 'int'>).
    
```

Success Execution of state machine callback (2) (state_b, all_conditions) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.

```

Result (Execution of state machine callback (2) (state_b, all_conditions) identified by a
↪ sequence number): [ 2, 6 ] (<class 'list'>)
Expectation (Execution of state machine callback (2) (state_b, all_conditions) identified by
↪ a sequence number): result = [ 2, 6 ] (<class 'list'>)
Result (Submitted value number 1): 2 (<class 'int'>)
Expectation (Submitted value number 1): result = 2 (<class 'int'>)
Submitted value number 1 is correct (Content 2 and Type is <class 'int'>).
Result (Submitted value number 2): 6 (<class 'int'>)
Expectation (Submitted value number 2): result = 6 (<class 'int'>)
Submitted value number 2 is correct (Content 6 and Type is <class 'int'>).
    
```

B.1.19 State change callback for all kind of state changes

Description

The state machine shall call all registered methods in the same order like the registration with all user given arguments for all transitions.

Reason for the implementation

Triggering state change actions for all transition conditions and targetstates.

Fitcriterion

Methods are called in the registration order after state change.

Testresult

This test was passed with the state: **Success**.

Info Running state machine sequence and storing sequence number for each callback

```

StateMachine: State change ('__init__'): None -> 'state_a'
Increasing sequence number to 1 caused by sequence progress
StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'
Executing callback 0 - tests.test_callbacks.exec_with_counter
Increasing sequence number to 2 caused by callback_execution
Executing callback 1 - tests.test_callbacks.exec_with_counter
Increasing sequence number to 3 caused by callback_execution
Increasing sequence number to 4 caused by sequence progress
StateMachine: State change ('condition_b'): 'state_b' -> 'state_a'
Executing callback 0 - tests.test_callbacks.exec_with_counter
Increasing sequence number to 5 caused by callback_execution
Executing callback 1 - tests.test_callbacks.exec_with_counter
Increasing sequence number to 6 caused by callback_execution
Increasing sequence number to 7 caused by sequence progress
StateMachine: State change ('condition_b'): 'state_a' -> 'state_b'
Executing callback 0 - tests.test_callbacks.exec_with_counter
Increasing sequence number to 8 caused by callback_execution
Executing callback 1 - tests.test_callbacks.exec_with_counter
Increasing sequence number to 9 caused by callback_execution
Increasing sequence number to 10 caused by sequence progress
StateMachine: State change ('condition_c'): 'state_b' -> 'state_c'
Executing callback 0 - tests.test_callbacks.exec_with_counter
Increasing sequence number to 11 caused by callback_execution
Executing callback 1 - tests.test_callbacks.exec_with_counter
Increasing sequence number to 12 caused by callback_execution
    
```

Success Execution of state machine callback (1) (all_transitions, all_conditions) identified by a sequence number: Values and number of submitted values is correct. See detailed log for more information.

```

Result (Execution of state machine callback (1) (all_transitions, all_conditions) identified
↳ by a sequence number): [ 1, 4, 7, 10 ] (<class 'list'>)
Expectation (Execution of state machine callback (1) (all_transitions, all_conditions)
↳ identified by a sequence number): result = [ 1, 4, 7, 10 ] (<class 'list'>)
Result (Submitted value number 1): 1 (<class 'int'>)
Expectation (Submitted value number 1): result = 1 (<class 'int'>)
Submitted value number 1 is correct (Content 1 and Type is <class 'int'>).
Result (Submitted value number 2): 4 (<class 'int'>)
Expectation (Submitted value number 2): result = 4 (<class 'int'>)
Submitted value number 2 is correct (Content 4 and Type is <class 'int'>).
Result (Submitted value number 3): 7 (<class 'int'>)
Expectation (Submitted value number 3): result = 7 (<class 'int'>)
Submitted value number 3 is correct (Content 7 and Type is <class 'int'>).
Result (Submitted value number 4): 10 (<class 'int'>)
Expectation (Submitted value number 4): result = 10 (<class 'int'>)
Submitted value number 4 is correct (Content 10 and Type is <class 'int'>).

```

Success Execution of state machine callback (2) (all_transitions, all_conditions) identified by a sequence number:
Values and number of submitted values is correct. See detailed log for more information.

```

Result (Execution of state machine callback (2) (all_transitions, all_conditions) identified
↳ by a sequence number): [ 2, 5, 8, 11 ] (<class 'list'>)
Expectation (Execution of state machine callback (2) (all_transitions, all_conditions)
↳ identified by a sequence number): result = [ 2, 5, 8, 11 ] (<class 'list'>)
Result (Submitted value number 1): 2 (<class 'int'>)
Expectation (Submitted value number 1): result = 2 (<class 'int'>)
Submitted value number 1 is correct (Content 2 and Type is <class 'int'>).
Result (Submitted value number 2): 5 (<class 'int'>)
Expectation (Submitted value number 2): result = 5 (<class 'int'>)
Submitted value number 2 is correct (Content 5 and Type is <class 'int'>).
Result (Submitted value number 3): 8 (<class 'int'>)
Expectation (Submitted value number 3): result = 8 (<class 'int'>)
Submitted value number 3 is correct (Content 8 and Type is <class 'int'>).
Result (Submitted value number 4): 11 (<class 'int'>)
Expectation (Submitted value number 4): result = 11 (<class 'int'>)
Submitted value number 4 is correct (Content 11 and Type is <class 'int'>).

```

B.1.20 Execution order of Callbacks

Description

The callbacks shall be executed in the same order as they had been registered.

Reason for the implementation

User shall have the control about the execution order.

Fitcriterion

A callback with specific targetstate and condition will be executed before a non specific callback if the specific one had been registered first.

Testresult

This test was passed with the state: **Success**.

Success Callback execution order: Values and number of submitted values is correct. See detailed log for more information.

```

StateMachine: State change ('__init__'): None -> 'state_a'
StateMachine: State change ('condition_a'): 'state_a' -> 'state_b'
Executing callback 0 - unittest.test.report_value
Executing callback 2 - unittest.test.report_value
StateMachine: State change ('condition_b'): 'state_b' -> 'state_a'
Executing callback 1 - unittest.test.report_value
Executing callback 2 - unittest.test.report_value
Result (Callback execution order): [ 'specific callback for reaching state_b', 'nonspecific
↳ callback', 'specific callback for reaching state_a', 'nonspecific callback' ] (<class
↳ 'list'>)
Expectation (Callback execution order): result = [ 'specific callback for reaching state_b',
↳ 'nonspecific callback', 'specific callback for reaching state_a', 'nonspecific callback'
↳ ] (<class 'list'>)
Result (Submitted value number 1): 'specific callback for reaching state_b' (<class 'str'>)
Expectation (Submitted value number 1): result = 'specific callback for reaching state_b'
↳ (<class 'str'>)
Submitted value number 1 is correct (Content 'specific callback for reaching state_b' and
↳ Type is <class 'str'>).
Result (Submitted value number 2): 'nonspecific callback' (<class 'str'>)
Expectation (Submitted value number 2): result = 'nonspecific callback' (<class 'str'>)
Submitted value number 2 is correct (Content 'nonspecific callback' and Type is <class
↳ 'str'>).
Result (Submitted value number 3): 'specific callback for reaching state_a' (<class 'str'>)
Expectation (Submitted value number 3): result = 'specific callback for reaching state_a'
↳ (<class 'str'>)
Submitted value number 3 is correct (Content 'specific callback for reaching state_a' and
↳ Type is <class 'str'>).
Result (Submitted value number 4): 'nonspecific callback' (<class 'str'>)
Expectation (Submitted value number 4): result = 'nonspecific callback' (<class 'str'>)
Submitted value number 4 is correct (Content 'nonspecific callback' and Type is <class
↳ 'str'>).

```

C Test-Coverage

C.1 state_machine

The line coverage for state_machine was 100.0%

The branch coverage for state_machine was 100.0%

C.1.1 state_machine.__init__.py

The line coverage for state_machine.__init__.py was 100.0%

The branch coverage for state_machine.__init__.py was 100.0%

```

1 #!/usr/bin/env python
2 # -*- coding: utf-8 -*-
3 #
4 """
5 state_machine (State Machine)
6 =====
7
8 **Author:**
9
10 * Dirk Alders <sudo-dirk@mount-mockery.de>
11
12 **Description:**
13
14     This Module helps implementing state machines.
15
16 **Submodules:**
17
18 * :class:`state_machine.state_machine`
19
20 **Unittest:**
21
22     See also the :download:`unittest <state_machine/_testresults_/unittest.pdf>` documentation.
23
24 **Module Documentation:**
25
26 """
27 __DEPENDENCIES__ = []
28
29 import logging
30 import time
31
32
33 try:
34     from config import APP_NAME as ROOT_LOGGER_NAME
35 except ImportError:
36     ROOT_LOGGER_NAME = 'root'
37 logger = logging.getLogger(ROOT_LOGGER_NAME).getChild(__name__)
38
39
40 __INTERPRETER__ = (2, 3)
41 """The supported Interpreter-Versions"""
42 __DESCRIPTION__ = """This Module helps implementing state machines."""
43 """The Module description"""
44
45
46 class state_machine(object):

```

Unittest for state_machine

```
47 """
48 :param default_state: The default state which is set on initialisation.
49 :param log_lvl: The log level, this Module logs to (see Logging—Levels of Module :mod:`logging`
50 ``)
51 .. note:: Additional keyword parameters will be stored as variables of the instance (e.g. to
52 give variables or methods for transition condition calculation).
53
54 A state machine class can be created by deriving it from this class. The transitions are
55 defined by overriding the variable `TRANSITIONS`.
56 This Variable is a dictionary, where the key is the start-state and the content is a tuple or
57 list of transitions. Each transition is a tuple or list
58 including the following information: (condition-method (str), transition-time (number),
59 target_state (str)).
60
61 .. note:: The condition-method needs to be implemented as part of the new class.
62 .. note:: It is usefull to define the states as variables of this class.
63
64 **Example:**
65
66 .. literalinclude:: ../examples/example.py
67 .. literalinclude:: ../examples/example.log
68 """
69 TRANSITIONS = {}
70 LOG_PREFIX = 'StateMachine:'
71
72 def __init__(self, default_state, log_lvl, **kwargs):
73     self.__state__ = None
74     self.__last_transition_condition__ = None
75     self.__conditions_start_time__ = {}
76     self.__state_change_callbacks__ = {}
77     self.__log_lvl__ = log_lvl
78     self.__set_state__(default_state, '__init__')
79     self.__callback_id__ = 0
80     for key in kwargs:
81         setattr(self, key, kwargs.get(key))
82
83 def register_state_change_callback(self, state, condition, callback, *args, **kwargs):
84     """
85     :param state: The target state. The callback will be executed, if the state machine
86     changes to this state. None means all states.
87     :type state: str
88     :param condition: The transition condition. The callback will be executed, if this
89     condition is responsible for the state change. None means all conditions.
90     :type condition: str
91     :param callback: The callback to be executed.
92
93     .. note:: Additional arguments and keyword parameters are supported. These arguments and
94     parameters will be used as arguments and parameters for the callback execution.
95
96     This methods allows to register callbacks which will be executed on state changes.
97     """
98     if state not in self.__state_change_callbacks__:
99         self.__state_change_callbacks__[state] = {}
100     if condition not in self.__state_change_callbacks__[state]:
101         self.__state_change_callbacks__[state][condition] = []
102     self.__state_change_callbacks__[state][condition].append((self.__callback_id__, callback,
103     args, kwargs))
104     self.__callback_id__ += 1
```


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```
100
101 def this_state(self):
102     """
103     :return: The current state.
104
105     This method returns the current state of the state machine.
106     """
107     return self.__state__
108
109 def this_state_is(self, state):
110     """
111     :param state: The state to be checked
112     :type state: str
113     :return: True if the given state is currently active, else False.
114     :rtype: bool
115
116     This methods returns the boolean information if the state machine is currently in the
117     given state.
118     """
119     return self.__state__ == state
120
121 def this_state_duration(self):
122     """
123     :return: The time how long the current state is active.
124     :rtype: float
125
126     This method returns the time how long the current state is active.
127     """
128     return time.time() - self.__time_stamp_state_change__
129
130 def last_transition_condition(self):
131     """
132     :return: The last transition condition.
133     :rtype: str
134
135     This method returns the last transition condition.
136     """
137     return self.__last_transition_condition__
138
139 def last_transition_condition_was(self, condition):
140     """
141     :param condition: The condition to be checked
142     :type condition: str
143     :return: True if the given condition was the last transition condition, else False.
144     :rtype: bool
145
146     This methods returns the boolean information if the last transition condition is
147     equivalent to the given condition.
148     """
149     return self.__last_transition_condition__ == condition
150
151 def previous_state(self):
152     """
153     :return: The previous state.
154     :rtype: str
155
156     This method returns the previous state of the state machine.
157     """
158     return self.__prev_state__
159
160 def previous_state_was(self, state):
```

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```

159     """
160     :param state: The state to be checked
161     :type state: str
162     :return: True if the given state was previously active, else False.
163     :rtype: bool
164
165     This methods returns the boolean information if the state machine was previously in the
166     given state.
167     """
168     return self.__prev_state__ == state
169
170 def previous_state_duration(self):
171     """
172     :return: The time how long the previous state was active.
173     :rtype: float
174
175     This method returns the time how long the previous state was active.
176     """
177     return self.__prev_state_dt__
178
179 def __set_state__(self, target_state, condition):
180     logger.log(self.__log_lvl__, "%s State change (%s): %s -> %s", self.LOG_PREFIX, repr(
181     condition), repr(self.__state__), repr(target_state))
182     timestamp = time.time()
183     self.__prev_state__ = self.__state__
184     if self.__prev_state__ is None:
185         self.__prev_state_dt__ = 0.
186     else:
187         self.__prev_state_dt__ = timestamp - self.__time_stamp_state_change__
188         self.__state__ = target_state
189         self.__last_transition_condition__ = condition
190         self.__time_stamp_state_change__ = timestamp
191         self.__conditions_start_time__ = {}
192     # Callback collect
193     this_state_change_callbacks = []
194     this_state_change_callbacks.extend(self.__state_change_callbacks__.get(None, {}).get(None
195     , []))
196     this_state_change_callbacks.extend(self.__state_change_callbacks__.get(target_state, {}).
197     get(None, []))
198     this_state_change_callbacks.extend(self.__state_change_callbacks__.get(None, {}).get(
199     condition, []))
200     this_state_change_callbacks.extend(self.__state_change_callbacks__.get(target_state, {}).
201     get(condition, []))
202     # Callback sorting
203     this_state_change_callbacks.sort()
204     # Callback execution
205     for cid, callback, args, kwargs in this_state_change_callbacks:
206         logger.debug('Executing callback %d - %s.%s', cid, callback.__module__, callback.
207         __name__)
208         callback(*args, **kwargs)
209
210 def work(self):
211     """
212     This Method needs to be executed cyclicly to enable the state machine.
213     """
214     tm = time.time()
215     transitions = self.TRANSITIONS.get(self.this_state())
216     if transitions is not None:
217         active_transitions = []
218         cnt = 0
219         for method_name, transition_delay, target_state in transitions:
220             method = getattr(self, method_name)

```

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```
214         if method():
215             if method_name not in self.__conditions_start_time__:
216                 self.__conditions_start_time__[method_name] = tm
217             if tm - self.__conditions_start_time__[method_name] >= transition_delay:
218                 active_transitions.append((transition_delay - tm + self.
219                 __conditions_start_time__[method_name], cnt, target_state, method_name))
219         else:
220             self.__conditions_start_time__[method_name] = tm
221             cnt += 1
222         if len(active_transitions) > 0:
223             active_transitions.sort()
224             self.__set_state__(active_transitions[0][2], active_transitions[0][3])
```