

---

# **pyavrutils Documentation**

***Release 0.0.7***

**ponty**

February 07, 2012

# CONTENTS

<b>1</b>	<b>Basic usage</b>	<b>2</b>
<b>2</b>	<b>Installation</b>	<b>3</b>
2.1	General . . . . .	3
2.2	Ubuntu . . . . .	3
2.3	Uninstall . . . . .	3
<b>3</b>	<b>Usage</b>	<b>4</b>
3.1	AVR . . . . .	4
3.2	arduino . . . . .	4
<b>4</b>	<b>Examples</b>	<b>6</b>
4.1	Simple example . . . . .	6
4.2	Test size with unused code . . . . .	7
4.3	Test size with delay.h . . . . .	8
4.4	Test size with program space . . . . .	9
4.5	Test minimum size . . . . .	10
<b>5</b>	<b>Arduino build tests</b>	<b>15</b>
<b>6</b>	<b>API</b>	<b>19</b>
<b>7</b>	<b>Development</b>	<b>21</b>
7.1	Tools . . . . .	21
7.2	Install on ubuntu . . . . .	21
7.3	Tasks . . . . .	21
<b>8</b>	<b>Indices and tables</b>	<b>23</b>
	<b>Index</b>	<b>24</b>



## pyavrutils

**Date** February 07, 2012

**PDF** [pyavrutils.pdf](#)

Contents:

pyavrutils can build [AVR](#) and [arduino](#) code from [python](#)

### Links:

- home: <https://github.com/ponty/pyavrutils>
- documentation: <http://ponty.github.com/pyavrutils>

### Features:

- python wrapper for avr-gcc, avr-size, [arscons](#)
- build files or strings (strings are saved as temp files)
- MCU list
- get code size using avr-size
- avr-gcc default is optimized for size

### Known problems:

- Python 3 is not supported
- temp files are not removed
- [arscons](#) has some problems:
  - it builds bigger programs
  - compile error in some cases

### Possible usage:

- experimenting with flags
- building from [paver](#)
- unit tests
- building [arduino](#) code without GUI

# BASIC USAGE

```
>>> from pyavrutils import AvrGcc
>>> cc = AvrGcc()
>>> cc.build('int main(){}')
>>> cc.size().program_bytes
66

>>> from pyavrutils import Arduino
>>> cc = Arduino()
>>> cc.mcu = 'atmega8'
>>> cc.build('void setup(){};void loop(){}')
>>> cc.size().program_bytes
1612
```

# INSTALLATION

## 2.1 General

- `arscons` is already included in the library
- install `pip`
- install `gcc-avr`
- install `scons` (only for `arscons`)
- install `arduino` (only for `arscons`)
- install the program:

if you have `setuptools` installed:

```
# as root
pip install pyavrutils
```

## 2.2 Ubuntu

```
sudo apt-get install python-pip
sudo apt-get install binutils-avr
sudo apt-get install gcc-avr
sudo apt-get install scons
sudo apt-get install arduino
sudo pip install pyavrutils
```

## 2.3 Uninstall

using `pip`:

```
# as root
pip uninstall pyavrutils
```

# USAGE

## 3.1 AVR

```
>>> from pyavrutils import AvrGcc
>>> cc = AvrGcc(mcu='atmega48')
>>> cc.targets
[u'avr1', u'avr2', u'avr25', u'avr3', u'avr31', u'avr35', u'avr4', u'avr5', u'avr51', u'avr6', u'avr7', u'avr8', u'avr10', u'avr11', u'avr12', u'avr13', u'avr15', u'avr16', u'avr18', u'avr20', u'avr23', u'avr24', u'avr28', u'avr30', u'avr32', u'avr33', u'avr34', u'avr36', u'avr38', u'avr40', u'avr44', u'avr45', u'avr48', u'avr50', u'avr52', u'avr54', u'avr55', u'avr56', u'avr58', u'avr59', u'avr60', u'avr62', u'avr64', u'avr66', u'avr68', u'avr70', u'avr72', u'avr74', u'avr76', u'avr78', u'avr80', u'avr85', u'avr88', u'avr90', u'avr96', u'avr100', u'avr103', u'avr104', u'avr105', u'avr106', u'avr108', u'avr110', u'avr112', u'avr114', u'avr115', u'avr116', u'avr118', u'avr120', u'avr128', u'avr129', u'avr130', u'avr132', u'avr135', u'avr136', u'avr138', u'avr140', u'avr144', u'avr145', u'avr146', u'avr148', u'avr150', u'avr152', u'avr154', u'avr156', u'avr158', u'avr160', u'avr162', u'avr164', u'avr166', u'avr168', u'avr170', u'avr172', u'avr174', u'avr176', u'avr178', u'avr180', u'avr185', u'avr188', u'avr190', u'avr192', u'avr194', u'avr196', u'avr198', u'avr200', u'avr203', u'avr204', u'avr205', u'avr206', u'avr208', u'avr210', u'avr212', u'avr214', u'avr215', u'avr216', u'avr218', u'avr220', u'avr224', u'avr225', u'avr228', u'avr230', u'avr232', u'avr235', u'avr236', u'avr238', u'avr240', u'avr244', u'avr245', u'avr246', u'avr248', u'avr250', u'avr252', u'avr254', u'avr256', u'avr258', u'avr260', u'avr262', u'avr264', u'avr266', u'avr268', u'avr270', u'avr272', u'avr274', u'avr276', u'avr278', u'avr280', u'avr285', u'avr288', u'avr290', u'avr292', u'avr294', u'avr296', u'avr298', u'avr300', u'avr303', u'avr304', u'avr305', u'avr306', u'avr308', u'avr310', u'avr312', u'avr314', u'avr315', u'avr316', u'avr318', u'avr320', u'avr324', u'avr325', u'avr328', u'avr330', u'avr332', u'avr335', u'avr336', u'avr338', u'avr340', u'avr344', u'avr345', u'avr346', u'avr348', u'avr350', u'avr352', u'avr354', u'avr356', u'avr358', u'avr360', u'avr362', u'avr364', u'avr366', u'avr368', u'avr370', u'avr372', u'avr374', u'avr376', u'avr378', u'avr380', u'avr385', u'avr388', u'avr390', u'avr392', u'avr394', u'avr396', u'avr398', u'avr400', u'avr403', u'avr404', u'avr405', u'avr406', u'avr408', u'avr410', u'avr412', u'avr414', u'avr415', u'avr416', u'avr418', u'avr420', u'avr424', u'avr425', u'avr428', u'avr430', u'avr432', u'avr435', u'avr436', u'avr438', u'avr440', u'avr444', u'avr445', u'avr446', u'avr448', u'avr450', u'avr452', u'avr454', u'avr456', u'avr458', u'avr460', u'avr462', u'avr464', u'avr466', u'avr468', u'avr470', u'avr472', u'avr474', u'avr476', u'avr478', u'avr480', u'avr485', u'avr488', u'avr490', u'avr492', u'avr494', u'avr496', u'avr498', u'avr500', u'avr503', u'avr504', u'avr505', u'avr506', u'avr508', u'avr510', u'avr512', u'avr514', u'avr515', u'avr516', u'avr518', u'avr520', u'avr524', u'avr525', u'avr528', u'avr530', u'avr532', u'avr535', u'avr536', u'avr538', u'avr540', u'avr544', u'avr545', u'avr546', u'avr548', u'avr550', u'avr552', u'avr554', u'avr556', u'avr558', u'avr560', u'avr562', u'avr564', u'avr566', u'avr568', u'avr570', u'avr572', u'avr574', u'avr576', u'avr578', u'avr580', u'avr585', u'avr588', u'avr590', u'avr592', u'avr594', u'avr596', u'avr598', u'avr600', u'avr603', u'avr604', u'avr605', u'avr606', u'avr608', u'avr610', u'avr612', u'avr614', u'avr615', u'avr616', u'avr618', u'avr620', u'avr624', u'avr625', u'avr628', u'avr630', u'avr632', u'avr635', u'avr636', u'avr638', u'avr640', u'avr644', u'avr645', u'avr646', u'avr648', u'avr650', u'avr652', u'avr654', u'avr656', u'avr658', u'avr660', u'avr662', u'avr664', u'avr666', u'avr668', u'avr670', u'avr672', u'avr674', u'avr676', u'avr678', u'avr680', u'avr685', u'avr688', u'avr690', u'avr692', u'avr694', u'avr696', u'avr698', u'avr700', u'avr703', u'avr704', u'avr705', u'avr706', u'avr708', u'avr710', u'avr712', u'avr714', u'avr715', u'avr716', u'avr718', u'avr720', u'avr724', u'avr725', u'avr728', u'avr730', u'avr732', u'avr735', u'avr736', u'avr738', u'avr740', u'avr744', u'avr745', u'avr746', u'avr748', u'avr750', u'avr752', u'avr754', u'avr756', u'avr758', u'avr760', u'avr762', u'avr764', u'avr766', u'avr768', u'avr770', u'avr772', u'avr774', u'avr776', u'avr778', u'avr780', u'avr785', u'avr788', u'avr790', u'avr792', u'avr794', u'avr796', u'avr798', u'avr800', u'avr803', u'avr804', u'avr805', u'avr806', u'avr808', u'avr810', u'avr812', u'avr814', u'avr815', u'avr816', u'avr818', u'avr820', u'avr824', u'avr825', u'avr828', u'avr830', u'avr832', u'avr835', u'avr836', u'avr838', u'avr840', u'avr844', u'avr845', u'avr846', u'avr848', u'avr850', u'avr852', u'avr854', u'avr856', u'avr858', u'avr860', u'avr862', u'avr864', u'avr866', u'avr868', u'avr870', u'avr872', u'avr874', u'avr876', u'avr878', u'avr880', u'avr885', u'avr888', u'avr890', u'avr892', u'avr894', u'avr896', u'avr898', u'avr900', u'avr903', u'avr904', u'avr905', u'avr906', u'avr908', u'avr910', u'avr912', u'avr914', u'avr915', u'avr916', u'avr918', u'avr920', u'avr924', u'avr925', u'avr928', u'avr930', u'avr932', u'avr935', u'avr936', u'avr938', u'avr940', u'avr944', u'avr945', u'avr946', u'avr948', u'avr950', u'avr952', u'avr954', u'avr956', u'avr958', u'avr960', u'avr962', u'avr964', u'avr966', u'avr968', u'avr970', u'avr972', u'avr974', u'avr976', u'avr978', u'avr980', u'avr985', u'avr988', u'avr990', u'avr992', u'avr994', u'avr996', u'avr998', u'avr1000']
>>> cc.options_generated()
['avr-gcc', '-Df_cpu=4000000', '-mmcu=atmega48', '--std=gnu99', '-Wl,--relax', '-Wl,--gc-sections']
>>> cc.build('int main(){}')
>>> cc.output
/tmp/pyavrutils_7JaARM.elf
>>> cc.size()
AvrSize <prog:80 bytes 2.0% mem:0 bytes 0.0% >
>>> cc.size().program_bytes
80
>>> cc.mcu='atmega168'
>>> cc.options_generated()
['avr-gcc', '-Df_cpu=4000000', '-mmcu=atmega168', '--std=gnu99', '-Wl,--relax', '-Wl,--gc-sections']
>>> cc.build('int main(){}')
>>> cc.output
/tmp/pyavrutils_7JaARM.elf
>>> cc.size().program_bytes
132
```

## 3.2 arduino

```
>>> from pyavrutils import Arduino
>>> cc = Arduino(board='mini')
>>> cc.build('void setup(){};void loop(){}')
>>> cc.output
path('/tmp/pyavrutils_4lIppS/pyavrutils_MzA3ci/pyavrutils_MzA3ci.elf')
>>> cc.size()
AvrSize <prog:1856 bytes 11.3% mem:191 bytes 18.7% >
>>> cc.size().program_bytes
1856
>>> cc.board='pro'
>>> cc.build('void setup(){};void loop(){}')
>>> cc.output
path('/tmp/pyavrutils_S7fK6_/pyavrutils_oJxwou/pyavrutils_oJxwou.elf')
>>> cc.size().program_bytes
1880
>>> cc.warnings
[u'/usr/lib/gcc/avr/4.5.3/../../../../avr/include/avr/delay.h:36:2: warning: #warning "This file has
```

display warnings on console:

```
$ python -m pyavrutils.cli.arduino_warnings /usr/share/arduino/examples/Communication/Dimmer/Dimmer.ino
Traceback (most recent call last):
  File "/usr/lib/python2.7/runpy.py", line 162, in _run_module_as_main
    "__main__", fname, loader, pkg_name)
  File "/usr/lib/python2.7/runpy.py", line 72, in _run_code
    exec code in run_globals
  File "/home/titi/aha/workspace/pyavrutils/pyavrutils/cli/arduino_warnings.py", line 6, in <module>
    @entrypoint
  File "/home/titi/pythonpath/entrypoint2/__init__.py", line 396, in entrypoint
    return func(**kwargs)
  File "/home/titi/aha/workspace/pyavrutils/pyavrutils/cli/arduino_warnings.py", line 12, in warn
    cc.build(filename)
  File "pyavrutils/arduino.py", line 141, in build
    return self.build_arscons(sources=sources)
  File "pyavrutils/arduino.py", line 168, in build_arscons
    allfiles = self.setup_sources(tempdir, sources)
  File "pyavrutils/arduino.py", line 119, in setup_sources
    for y in x.parent.files():
  File "/usr/local/lib/python2.7/dist-packages/path.py", line 357, in files
    return [p for p in self.listdir(pattern) if p.isfile()]
  File "/usr/local/lib/python2.7/dist-packages/path.py", line 328, in listdir
    names = os.listdir(self)
OSError: [Errno 2] No such file or directory: '/usr/share/arduino/examples/Communication/Dimmer'
```



# EXAMPLES

## 4.1 Simple example

Example program:

```
'''
test minimum program size with different optimizations
'''

from pyavrutils import AvrGcc
from entrypoint2 import entrypoint

cc = AvrGcc()
code = 'int main(){}'

def test():
    print '    compiler option:', ' '.join(cc.options_generated())
    cc.build(code)
    print '    program size =', cc.size().program_bytes

@entrypoint
def main():
    print 'compiler version:', cc.version()
    print 'code:', code
    print
    print 'no optimizations::'
    print
    cc.optimize_no()
    test()
    print
    print 'optimize for size::'
    print
    cc.optimize_for_size()
    test()
```

Output:

```
$ python -m pyavrutils.examples.simple
compiler version: 4.5.3
code: int main(){}

no optimizations::

    compiler option: avr-gcc -Df_cpu=4000000 -mmcu=atmega168 --std=gnu99
    program size = 150

optimize for size::
```

```
compiler option: avr-gcc -Df_cpu=4000000 -mmcu=atmega168 --std=gnu99 -Wl,--relax -Wl,--gc-sections
program size = 132
```

## 4.2 Test size with unused code

Example program:

```
from pyavrutils.avrgcc import AvrGcc
from entrypoint2 import entrypoint

cc = AvrGcc()

def test_option(sources, optimization, gc_sections=0, ffunction_sections=0):
    print 'optimization =', optimization,
    print 'gc_sections =', gc_sections,
    print 'ffunction_sections =', ffunction_sections,
    print

    cc.optimization = optimization
    cc.gc_sections = gc_sections
    cc.ffunction_sections = ffunction_sections
    try:
        cc.build(sources)
        size = cc.size()
        print 'program, data =', str(size.program_bytes).rjust(8) , ',', str(size.data_bytes).rjust(8)
    except:
        print 'compile error'

def test(sources):
    print 'sources:', sources
    test_option(sources, 0)
    test_option(sources, 's', 0)
    test_option(sources, 's', 1)
    test_option(sources, 's', 1, 1)

@entrypoint
def main():
    cc.optimize_no()
    print 'compiler version:', cc.version()
    print 'compiler options:', ' '.join(cc.options_generated())
    print
    print 'minimum size'
    print 20 * '='
    test(['int main(){}'])

    print
    print 'unused function in separate file'
    print 40 * '='
    test(['int main(){}', 'int f(){return 2;}'])

    print
    print 'unused function in the same file'
    print 40 * '='
    test(['int main(){}; int f(){return 2;}'])
```

Output:

```
$ python -m pyavrutils.examples.deadcode
compiler version: 4.5.3
compiler options: avr-gcc -Df_cpu=4000000 -mmcu=atmega168 --std=gnu99
```

```
minimum size
=====
sources: ['int main(){}']
optimization = 0 gc_sections = 0 ffunction_sections = 0
program, data = 150 , 0
optimization = s gc_sections = 0 ffunction_sections = 0
program, data = 138 , 0
optimization = s gc_sections = 1 ffunction_sections = 0
program, data = 138 , 0
optimization = s gc_sections = 1 ffunction_sections = 1
program, data = 138 , 0

unused function in separate file
=====
sources: ['int main(){}', 'int f(){return 2;}']
optimization = 0 gc_sections = 0 ffunction_sections = 0
program, data = 168 , 0
optimization = s gc_sections = 0 ffunction_sections = 0
program, data = 144 , 0
optimization = s gc_sections = 1 ffunction_sections = 0
program, data = 138 , 0
optimization = s gc_sections = 1 ffunction_sections = 1
program, data = 138 , 0

unused function in the same file
=====
sources: ['int main(){}; int f(){return 2;}']
optimization = 0 gc_sections = 0 ffunction_sections = 0
program, data = 168 , 0
optimization = s gc_sections = 0 ffunction_sections = 0
program, data = 144 , 0
optimization = s gc_sections = 1 ffunction_sections = 0
program, data = 144 , 0
optimization = s gc_sections = 1 ffunction_sections = 1
program, data = 138 , 0
```

#### Conclusions:

- both `gc_sections` and `ffunction_sections` should be used

## 4.3 Test size with delay.h

Example program:

```
from entrypoint2 import entrypoint
from pyavrutils.avrgcc import AvrGcc, AvrGccCompileError

templ = '''
#include <avr/io.h>
#include <util/delay.h>
int main()
{
    %s;
    return 0;
}
'''

cc = AvrGcc()
cc.optimize_no()
print 'compiler version:', cc.version()
print
```

```

def test(snippet, option=''):
    print snippet.ljust(33) ,
    cc.options_extra = option.split()
    print 'compiler option:', option, '\t',
    try:
        cc.build([templ % snippet])
        size = cc.size()
        print 'program, data =', str(size.program_bytes).rjust(8) , ',', str(size.data_bytes).rjust(8)
    except AvrGccCompileError as e:
        print 'compile error'

@entrypoint
def main():
    cc.optimization = 0

    test('_delay_ms(4)', '-O0')
    test('_delay_ms(4)', '-O1')
    test('_delay_ms(4)', '-O2')
    test('_delay_ms(4)', '-O3')
    test('_delay_ms(4)', '-Os')

    test('volatile int x=3;_delay_ms(x)', '-Os')

```

Output:

```

$ python -m pyavrutils.examples.delaysize
compiler version: 4.5.3

```

_delay_ms(4)	compiler option: -O0	program, data =	3266 ,
_delay_ms(4)	compiler option: -O1	program, data =	150 ,
_delay_ms(4)	compiler option: -O2	program, data =	150 ,
_delay_ms(4)	compiler option: -O3	program, data =	150 ,
_delay_ms(4)	compiler option: -Os	program, data =	150 ,
volatile int x=3;_delay_ms(x)	compiler option: -Os	compile error	

Conclusions:

- parameter should be constant
- optimization should be 1, 2, 3 or s

## 4.4 Test size with program space

Example program:

```

from pyavrutils.avrgcc import AvrGcc
from entrypoint2 import entrypoint

templ = '''
#include <avr/io.h>
#include <avr/pgmspace.h>
int main()
{
    %s;
    return 0;
}
'''

cc = AvrGcc()
cc.optimization=0
print 'compiler version:', cc.version()

```

```

print 'compiler options:', ' '.join(cc.options_generated())
print

def test(snippet):
    print snippet, '\t\t',
    try:
        cc.build([templ % snippet])
        size = cc.size()
        print 'program, data =', str(size.program_bytes).rjust(8), ',', str(size.data_bytes).rjust(8)
    except:
        print 'compile error'

def test_comb(s):
    words='static const PROGMEM'.split()
    def choice(i):
        return [words[i], ' '*len(words[i])]

    for s0 in choice(0):
        for s1 in choice(1):
            for s2 in choice(2):
                #
                for s3 in choice(3):
                    test('%s %s char s[] %s = "%s"' % (s0,s1,s2,s3))

@entrypoint
def main():
    test_comb("12345")
    test_comb("1234512345")

```

Output:

```

$ python -m pyavrutils.examples.pgmspace
compiler version: 4.5.3
compiler options: avr-gcc -Df_cpu=4000000 -mmcu=atmega168 --std=gnu99 -Wl,--relax -Wl,--gc-sections

static const char s[] PROGMEM = "12345"           program, data =      144 ,      0
static const char s[]          = "12345"           program, data =      166 ,      0
static      char s[] PROGMEM = "12345"           program, data =      144 ,      0
static      char s[]          = "12345"           program, data =      166 ,      0
      const char s[] PROGMEM = "12345"           program, data =      220 ,      6
      const char s[]          = "12345"           program, data =      220 ,      6
            char s[] PROGMEM = "12345"           program, data =      220 ,      6
            char s[]          = "12345"           program, data =      220 ,      6
static const char s[] PROGMEM = "1234512345"       program, data =      144 ,      0
static const char s[]          = "1234512345"       program, data =      166 ,      0
static      char s[] PROGMEM = "1234512345"       program, data =      144 ,      0
static      char s[]          = "1234512345"       program, data =      166 ,      0
      const char s[] PROGMEM = "1234512345"       program, data =      232 ,     12
      const char s[]          = "1234512345"       program, data =      232 ,     12
            char s[] PROGMEM = "1234512345"       program, data =      232 ,     12
            char s[]          = "1234512345"       program, data =      232 ,     12

```

### Conclusions:

- constant string should be static or global
- const has no effect on size
- PROGMEM should be used

## 4.5 Test minimum size

Example program:

```
'''
test minimum program size with all MCUs
'''

from entrypoint2 import entrypoint
from pyavrutils.avrgcc import AvrGcc, AvrGccCompileError

def test(cc, mcu):
    print 'MCU =', mcu.ljust(20),
    cc.mcu = mcu
    try:
        cc.build(cc.minprog)
        print '    program/data size =', cc.size().program_bytes, ',', cc.size().data_bytes
    except AvrGccCompileError:
        print '    compile error'

@entrypoint
def main():
    cc = AvrGcc()
    print '-----'
    print 'avr-gcc'
    print '-----'

    print 'compiler version:', cc.version()
    cc.optimize_for_size()
    print 'compiler options:', ' '.join(cc.options_generated())
    print 'code:', cc.minprog
    print
    for mcu in cc.targets:
        test(cc, mcu)
```

Output:

```
$ python -m pyavrutils.examples.minsize
-----
avr-gcc
-----
compiler version: 4.5.3
compiler options: avr-gcc -Df_cpu=4000000 -mmcu=atmega168 --std=gnu99 -Wl,--relax -Wl,--gc-sections
code: int main(){};

MCU = avr1                compile error
MCU = avr2                program/data size = 0 , 0
MCU = avr25               program/data size = 0 , 0
MCU = avr3                program/data size = 0 , 0
MCU = avr31               program/data size = 0 , 0
MCU = avr35               program/data size = 0 , 0
MCU = avr4                program/data size = 0 , 0
MCU = avr5                program/data size = 0 , 0
MCU = avr51               program/data size = 0 , 0
MCU = avr6                program/data size = 0 , 0
MCU = avrxmega1           compile error
MCU = avrxmega2           program/data size = 0 , 0
MCU = avrxmega3           compile error
MCU = avrxmega4           program/data size = 0 , 0
MCU = avrxmega5           program/data size = 0 , 0
MCU = avrxmega6           program/data size = 0 , 0
MCU = avrxmega7           program/data size = 0 , 0
MCU = avrtiny10           program/data size = 0 , 0
MCU = at90s1200           compile error
MCU = attiny11            compile error
MCU = attiny12            compile error
MCU = attiny15            compile error
```

MCU = attiny28	compile error
MCU = at90s2313	program/data size = 46 , 0
MCU = at90s2323	program/data size = 30 , 0
MCU = at90s2333	program/data size = 52 , 0
MCU = at90s2343	program/data size = 30 , 0
MCU = attiny22	program/data size = 30 , 0
MCU = attiny26	program/data size = 48 , 0
MCU = at90s4414	program/data size = 54 , 0
MCU = at90s4433	program/data size = 52 , 0
MCU = at90s4434	program/data size = 62 , 0
MCU = at90s8515	program/data size = 54 , 0
MCU = at90c8534	program/data size = 42 , 0
MCU = at90s8535	program/data size = 62 , 0
MCU = attiny13	program/data size = 44 , 0
MCU = attiny13a	program/data size = 44 , 0
MCU = attiny2313	program/data size = 62 , 0
MCU = attiny2313a	program/data size = 66 , 0
MCU = attiny24	program/data size = 58 , 0
MCU = attiny24a	program/data size = 58 , 0
MCU = attiny4313	program/data size = 70 , 0
MCU = attiny44	program/data size = 62 , 0
MCU = attiny44a	program/data size = 62 , 0
MCU = attiny84	program/data size = 62 , 0
MCU = attiny84a	program/data size = 62 , 0
MCU = attiny25	program/data size = 54 , 0
MCU = attiny45	program/data size = 58 , 0
MCU = attiny85	program/data size = 58 , 0
MCU = attiny261	program/data size = 62 , 0
MCU = attiny261a	program/data size = 62 , 0
MCU = attiny461	program/data size = 66 , 0
MCU = attiny461a	program/data size = 66 , 0
MCU = attiny861	program/data size = 66 , 0
MCU = attiny861a	program/data size = 66 , 0
MCU = attiny87	program/data size = 68 , 0
MCU = attiny43u	program/data size = 60 , 0
MCU = attiny48	program/data size = 68 , 0
MCU = attiny88	program/data size = 68 , 0
MCU = at86rf401	program/data size = 40 , 0
MCU = ata6289	program/data size = 82 , 0
MCU = at43usb355	program/data size = 80 , 0
MCU = at76c711	program/data size = 88 , 0
MCU = atmega103	program/data size = 124 , 0
MCU = at43usb320	program/data size = 80 , 0
MCU = attiny167	program/data size = 108 , 0
MCU = at90usb82	program/data size = 144 , 0
MCU = at90usb162	program/data size = 144 , 0
MCU = atmega8u2	program/data size = 180 , 0
MCU = atmega16u2	program/data size = 180 , 0
MCU = atmega32u2	program/data size = 180 , 0
MCU = attiny1634	compile error
MCU = atmega8	program/data size = 66 , 0
MCU = atmega48	program/data size = 80 , 0
MCU = atmega48a	program/data size = 80 , 0
MCU = atmega48pa	compile error
MCU = atmega48p	program/data size = 80 , 0
MCU = atmega88	program/data size = 80 , 0
MCU = atmega88a	program/data size = 80 , 0
MCU = atmega88p	program/data size = 80 , 0
MCU = atmega88pa	program/data size = 80 , 0
MCU = atmega8515	program/data size = 62 , 0
MCU = atmega8535	program/data size = 70 , 0
MCU = atmega8hva	program/data size = 70 , 0
MCU = at90pwm1	program/data size = 92 , 0

MCU = at90pwm2	program/data size = 92 , 0
MCU = at90pwm2b	program/data size = 92 , 0
MCU = at90pwm3	program/data size = 92 , 0
MCU = at90pwm3b	program/data size = 92 , 0
MCU = at90pwm81	program/data size = 68 , 0
MCU = at90pwm161	compile error
MCU = atmega16	program/data size = 112 , 0
MCU = atmega16a	program/data size = 112 , 0
MCU = atmega161	program/data size = 112 , 0
MCU = atmega162	program/data size = 140 , 0
MCU = atmega163	program/data size = 100 , 0
MCU = atmega164a	program/data size = 152 , 0
MCU = atmega164p	program/data size = 152 , 0
MCU = atmega165	program/data size = 116 , 0
MCU = atmega165a	program/data size = 116 , 0
MCU = atmega165p	program/data size = 116 , 0
MCU = atmega168	program/data size = 132 , 0
MCU = atmega168a	program/data size = 132 , 0
MCU = atmega168p	program/data size = 132 , 0
MCU = atmega169	program/data size = 120 , 0
MCU = atmega169a	program/data size = 120 , 0
MCU = atmega169p	program/data size = 120 , 0
MCU = atmega169pa	program/data size = 120 , 0
MCU = atmega32	program/data size = 112 , 0
MCU = atmega323	program/data size = 108 , 0
MCU = atmega324a	program/data size = 152 , 0
MCU = atmega324p	program/data size = 152 , 0
MCU = atmega324pa	program/data size = 152 , 0
MCU = atmega325	program/data size = 120 , 0
MCU = atmega325a	program/data size = 120 , 0
MCU = atmega325p	program/data size = 120 , 0
MCU = atmega325pa	compile error
MCU = atmega3250	program/data size = 128 , 0
MCU = atmega3250a	program/data size = 128 , 0
MCU = atmega3250p	program/data size = 128 , 0
MCU = atmega3250pa	compile error
MCU = atmega328	program/data size = 132 , 0
MCU = atmega328p	program/data size = 132 , 0
MCU = atmega329	program/data size = 120 , 0
MCU = atmega329a	program/data size = 120 , 0
MCU = atmega329p	program/data size = 120 , 0
MCU = atmega329pa	program/data size = 120 , 0
MCU = atmega3290	program/data size = 128 , 0
MCU = atmega3290a	program/data size = 128 , 0
MCU = atmega3290p	program/data size = 128 , 0
MCU = atmega3290pa	compile error
MCU = atmega406	program/data size = 120 , 0
MCU = atmega64	program/data size = 168 , 0
MCU = atmega640	program/data size = 256 , 0
MCU = atmega644	program/data size = 140 , 0
MCU = atmega644a	program/data size = 152 , 0
MCU = atmega644p	program/data size = 152 , 0
MCU = atmega644pa	program/data size = 152 , 0
MCU = atmega645	program/data size = 120 , 0
MCU = atmega645a	program/data size = 120 , 0
MCU = atmega645p	program/data size = 120 , 0
MCU = atmega649	program/data size = 120 , 0
MCU = atmega649p	program/data size = 120 , 0
MCU = atmega649a	program/data size = 120 , 0
MCU = atmega6450	program/data size = 128 , 0
MCU = atmega6450a	program/data size = 128 , 0
MCU = atmega6450p	program/data size = 128 , 0
MCU = atmega6490	program/data size = 128 , 0



MCU = atmega6490a	program/data size = 128 , 0
MCU = atmega6490p	program/data size = 128 , 0
MCU = atmega64hve	program/data size = 128 , 0
MCU = atmega16hva	program/data size = 112 , 0
MCU = atmega16hva2	program/data size = 116 , 0
MCU = atmega16hvb	program/data size = 144 , 0
MCU = atmega16hvbrevb	program/data size = 144 , 0
MCU = atmega32hvb	program/data size = 144 , 0
MCU = atmega32hvbrevb	program/data size = 144 , 0
MCU = at90can32	program/data size = 176 , 0
MCU = at90can64	program/data size = 176 , 0
MCU = at90pwm216	program/data size = 156 , 0
MCU = at90pwm316	program/data size = 156 , 0
MCU = atmega32c1	program/data size = 152 , 0
MCU = atmega64c1	program/data size = 152 , 0
MCU = atmega16m1	program/data size = 152 , 0
MCU = atmega32m1	program/data size = 152 , 0
MCU = atmega64m1	program/data size = 152 , 0
MCU = atmega16u4	program/data size = 200 , 0
MCU = atmega32u4	program/data size = 200 , 0
MCU = atmega32u6	program/data size = 180 , 0
MCU = at90usb646	program/data size = 180 , 0
MCU = at90usb647	program/data size = 180 , 0
MCU = at90scr100	program/data size = 180 , 0
MCU = at94k	program/data size = 172 , 0
MCU = m3000	compile error
MCU = atmega128	program/data size = 168 , 0
MCU = atmega1280	program/data size = 256 , 0
MCU = atmega1281	program/data size = 232 , 0
MCU = atmega1284p	program/data size = 168 , 0
MCU = atmega128rfal	program/data size = 316 , 0
MCU = at90can128	program/data size = 176 , 0
MCU = at90usb1286	program/data size = 180 , 0
MCU = at90usb1287	program/data size = 180 , 0
MCU = atmega2560	program/data size = 260 , 0
MCU = atmega2561	program/data size = 236 , 0
MCU = atxmega16a4	program/data size = 404 , 0
MCU = atxmega16d4	program/data size = 392 , 0
MCU = atxmega16x1	compile error
MCU = atxmega32a4	program/data size = 404 , 0
MCU = atxmega32d4	program/data size = 392 , 0
MCU = atxmega32x1	compile error
MCU = atxmega64a3	program/data size = 516 , 0
MCU = atxmega64d3	program/data size = 484 , 0
MCU = atxmega64a1	program/data size = 536 , 0
MCU = atxmega64a1u	program/data size = 548 , 0
MCU = atxmega128a3	program/data size = 520 , 0
MCU = atxmega128b1	compile error
MCU = atxmega128d3	program/data size = 488 , 0
MCU = atxmega192a3	program/data size = 520 , 0
MCU = atxmega192d3	program/data size = 488 , 0
MCU = atxmega256a3	program/data size = 520 , 0
MCU = atxmega256a3b	program/data size = 520 , 0
MCU = atxmega256a3bu	compile error
MCU = atxmega256d3	program/data size = 488 , 0
MCU = atxmega128a1	program/data size = 540 , 0
MCU = atxmega128a1u	program/data size = 552 , 0
MCU = attiny4	program/data size = 48 , 0
MCU = attiny5	program/data size = 50 , 0
MCU = attiny9	program/data size = 48 , 0
MCU = attiny10	program/data size = 50 , 0
MCU = attiny20	program/data size = 62 , 0
MCU = attiny40	program/data size = 62 , 0

# ARDUINO BUILD TESTS

Code:

```
void setup()
{
}

void loop()
{
}
```

Results:

index	board	min
1	atmega8	OK
2	atmega88	OK
3	bt	OK
4	bt328	OK
5	diecimila	OK
6	fio	OK
7	lilypad	OK
8	lilypad328	OK
9	mega	OK
10	mega2560	OK
11	metaboard	OK
12	mini	OK
13	pro	OK
14	pro328	OK
15	pro5v	OK
16	pro5v328	OK
17	uno	OK
18	arduino_OrangutanSVP1284	OK
19	arduino_amber128	OK
20	arduino_android2561	OK
21	arduino_android2561_16	OK
22	arduino_at90can128	OK
23	arduino_at90can32	OK
24	arduino_at90can64	OK
25	arduino_at90usb162	OK
26	arduino_at90usb646	OK
27	arduino_at90usb647	OK
28	arduino_at90usbkey	OK
29	arduino_atmega16	OK
30	arduino_atmega165	OK

Continued on next page

Table 5.1 – continued from previous page

index	board	min
31	arduino_atmega3290p	OK
32	arduino_atmega8515	OK
33	arduino_atmega8535	OK
34	arduino_attiny2313	OK
35	arduino_attiny26	OK
36	arduino_attiny45	OK
37	arduino_attiny85	OK
38	arduino_bahbots1284p	OK
39	arduino_butterfly	OK
40	arduino_cerebot_plus	OK
41	arduino_cerebotii	OK
42	arduino_digilent_explorer	OK
43	arduino_duino644	OK
44	arduino_duino644p	OK
45	arduino_gator	OK
46	arduino_illuminato	OK
47	arduino_penguino_avr	OK
48	arduino_teensy2_ser	OK
49	arduino_teensypp2_ser	OK
50	arduino_wiring1281	OK
51	atmega168	OK
52	atmega328	OK
53	atmega48	OK
54	atmega640	OK
55	atmega8	OK
56	atmega88	OK
57	bt	OK
58	bt328	OK
59	diecimila	OK
60	dvk90can1	OK
61	ecavr_atmega32	OK
62	fio	OK
63	lilypad	OK
64	lilypad328	OK
65	mega	OK
66	mega1280stk500v2	OK
67	mega2560stk500v2	OK
68	mini	OK
69	pro	OK
70	pro328	OK
71	pro5v	OK
72	pro5v328	OK
73	stk502	OK
74	stk525	OK
75	stk525_647	OK

Board configuration:

index	package	id	name	MCU
1	arduino	atmega8	Arduino NG or older w/ ATmega8	atmega8
2	arduino	atmega88	atmega88@2000000 programmer:usbasp	atmega8
3	arduino	bt	Arduino BT w/ ATmega168	atmega1
4	arduino	bt328	Arduino BT w/ ATmega328	atmega3

Con

Table 5.2 – continued from previous page

index	package	id	name	MCU
5	arduino	diecimila	Arduino Diecimila, Duemilanove, or Nano w/ ATmega168	atmega168
6	arduino	fio	Arduino Fio	atmega328
7	arduino	lilypad	LilyPad Arduino w/ ATmega168	atmega168
8	arduino	lilypad328	LilyPad Arduino w/ ATmega328	atmega328
9	arduino	mega	Arduino Mega (ATmega1280)	atmega1280
10	arduino	mega2560	Arduino Mega 2560	atmega2560
11	arduino	metaboard	Metaboard	atmega168
12	arduino	mini	Arduino Mini	atmega168
13	arduino	pro	Arduino Pro or Pro Mini (3.3V, 8 MHz) w/ ATmega168	atmega168
14	arduino	pro328	Arduino Pro or Pro Mini (3.3V, 8 MHz) w/ ATmega328	atmega328
15	arduino	pro5v	Arduino Pro or Pro Mini (5V, 16 MHz) w/ ATmega168	atmega168
16	arduino	pro5v328	Arduino Pro or Pro Mini (5V, 16 MHz) w/ ATmega328	atmega328
17	arduino	uno	Arduino Uno	atmega328
18	arduino-extras	arduino_OrangutanSVP1284	Arduino-Orangutan SVP-1284	atmega1284
19	arduino-extras	arduino_amber128	Arduino-Amber 128 14.7456 Mhz	atmega128
20	arduino-extras	arduino_android2561	Arduino-Android 2561 8Mhz	atmega2561
21	arduino-extras	arduino_android2561_16	Arduino-Android 2561 16Mhz	atmega2561
22	arduino-extras	arduino_at90can128	AT90CAN128 development board NHL (arduino core)	at90can128
23	arduino-extras	arduino_at90can32	at90can32 (arduino core)	at90can32
24	arduino-extras	arduino_at90can64	at90can64 (arduino core)	at90can64
25	arduino-extras	arduino_at90usb162	Arduino-at90usb162	at90usb162
26	arduino-extras	arduino_at90usb646	Arduino-at90usb646	at90usb646
27	arduino-extras	arduino_at90usb647	Arduino-at90usb647	at90usb647
28	arduino-extras	arduino_at90usbkey	Arduino-at90usbkey	at90usbkey
29	arduino-extras	arduino_atmega16	Arduino-Atmega16	atmega16
30	arduino-extras	arduino_atmega165	Arduino-Atmega165	atmega165
31	arduino-extras	arduino_atmega3290p	Arduino-Atmega3290p	atmega3290p
32	arduino-extras	arduino_atmega8515	Arduino-ATmega8515	atmega8515
33	arduino-extras	arduino_atmega8535	Arduino-Test-Atmega8535	atmega8535
34	arduino-extras	arduino_attiny2313	Arduino-ATtiny2313	attiny2313
35	arduino-extras	arduino_attiny26	Arduino-ATtiny26	attiny26
36	arduino-extras	arduino_attiny45	Arduino-ATtiny45	attiny45
37	arduino-extras	arduino_attiny85	Arduino-ATtiny85	attiny85
38	arduino-extras	arduino_bahbots1284p	Arduino-BahBots 1284p	atmega1284p
39	arduino-extras	arduino_butterfly	Arduino-Butterfly stk500	atmega168
40	arduino-extras	arduino_cerebot_plus	Arduino-Cerebot Plus	atmega2560
41	arduino-extras	arduino_cerebotii	Arduino-Cerebot II atemga64	atmega64
42	arduino-extras	arduino_digilent_explorer	Arduino-Digilent I/O Explorer USB	atmega168
43	arduino-extras	arduino_duino644	Arduino-Duino 644	atmega644
44	arduino-extras	arduino_duino644p	Arduino-Duino 644P	atmega644p
45	arduino-extras	arduino_gator	Arduino-Rugged Circuits Gator Board	atmega328
46	arduino-extras	arduino_illuminato	Arduino-illuminato	atmega644
47	arduino-extras	arduino_penguino_avr	Arduino-Penguino AVR	atmega328
48	arduino-extras	arduino_teensy2_ser	Arduino-Teensy 2.0 (USB Serial)	atmega328
49	arduino-extras	arduino_teensypp2_ser	Arduino-Teensy++ 2.0 (USB Serial)	at90usb162
50	arduino-extras	arduino_wiring1281	Arduino-Wiring 1281	atmega1281
51	arduino-extras	atmega168	Arduino NG or older w/ ATmega168	atmega168
52	arduino-extras	atmega328	Arduino Duemilanove or Nano w/ ATmega328	atmega328
53	arduino-extras	atmega48	Arduino Atmega48	atmega48
54	arduino-extras	atmega640	Arduino atmega640	atmega640
55	arduino-extras	atmega8	Arduino NG or older w/ ATmega8	atmega8
56	arduino-extras	atmega88	Atmega88	atmega88
57	arduino-extras	bt	Arduino BT w/ ATmega168	atmega168

Con

Table 5.2 – continued from previous page

index	package	id	name	MCU
58	arduino-extras	bt328	Arduino BT w/ ATmega328	atmega328
59	arduino-extras	diecimila	Arduino Diecimila, Duemilanove, or Nano w/ ATmega168	atmega168
60	arduino-extras	dvk90can1	STK500 w/DVK90CAN1 - AT90can128 (Arduino Core)	at90can128
61	arduino-extras	ecavr_atmega32	Embedded market atmega32	atmega32
62	arduino-extras	fio	Arduino Fio	atmega328
63	arduino-extras	lilypad	LilyPad Arduino w/ ATmega168	atmega168
64	arduino-extras	lilypad328	LilyPad Arduino w/ ATmega328	atmega328
65	arduino-extras	mega	Arduino Mega	atmega2560
66	arduino-extras	mega1280stk500v2	Arduino Mega1280 stk500v2	atmega1280
67	arduino-extras	mega2560stk500v2	Arduino Mega2560 stk500v2	atmega2560
68	arduino-extras	mini	Arduino Mini	atmega328
69	arduino-extras	pro	Arduino Pro or Pro Mini (3.3V, 8 MHz) w/ ATmega168	atmega168
70	arduino-extras	pro328	Arduino Pro or Pro Mini (3.3V, 8 MHz) w/ ATmega328	atmega328
71	arduino-extras	pro5v	Arduino Pro or Pro Mini (5V, 16 MHz) w/ ATmega168	atmega168
72	arduino-extras	pro5v328	Arduino Pro or Pro Mini (5V, 16 MHz) w/ ATmega328	atmega328
73	arduino-extras	stk502	STK500 w/STK502 - ATmega169 (Arduino Core)	atmega169
74	arduino-extras	stk525	STK500 w/STK525 - at90usb1287 (Arduino Core)	at90usb1287
75	arduino-extras	stk525_647	STK500 w/STK525 - at90usb647 (Arduino Core)	at90usb647

# API

```
class pyavrutils.AvrGcc (mcu='atmega168')

    build (sources=None, headers=None)
        sources can be file name or code: sources=['x.c','int main(){ }'] or sources='int main(){ }'

    command_list (sources, _opt=False)
        command line as list

    error_text

    minprog = 'int main(){ };'

    ok

    optimize_for_size ()
        http://www.avrfreaks.net/index.php?name=PNphpBB2&file=viewtopic&t=90752
        http://www.avrfreaks.net/index.php?name=PNphpBB2&file=viewtopic&t=69813

    optimize_no ()
        all options set to default

    options_generated ()

    size ()

    targets

    version ()
        avr-gcc version

class pyavrutils.AvrSize
    wrapper for avr-size

    ok

    parse_output (s)
        Example output:

        Device: atmega2561

        Program: 4168 bytes (1.6% Full) (.text + .data + .bootloader)

        Data: 72 bytes (0.9% Full) (.data + .bss + .noinit)

    run (objfile, mcu)

class pyavrutils.Arduino (board='pro', hwpack='arduino', mcu=None, f_cpu=None, extra_lib=None, ver=None, home='auto', backend='arscons')
    wrapper for arscons

    build (sources=None)

    build_arscons (sources=None)
```

**build\_ino** (*sources=None*)  
**command\_list** ()  
**command\_list\_arscons** ()  
    command line as list  
**command\_list\_ino** ()  
**error\_text**  
**guess\_projname** (*allfiles*)  
**mcu\_compiler** ()  
**minprog** = 'void setup(){};void loop(){};'  
**ok**  
**setup\_sources** (*tempdir, sources*)  
**size** ()  
**stderr**  
**warnings**

# DEVELOPMENT

## 7.1 Tools

1. `setuptools`
2. `Paver`
3. `nose`
4. `ghp-import`
5. `pyflakes`
6. `pychecker`
7. `paved fork`
8. `Sphinx`
9. `sphinxcontrib-programsscreenshot`
10. `sphinxcontrib-paverutils`
11. `autorun` from `sphinx-contrib` (there is no simple method, you have to download/unpack/setup)

## 7.2 Install on ubuntu

```
sudo apt-get install python-setuptools
sudo apt-get install python-paver
sudo apt-get install python-nose
sudo easy_install ghp-import
sudo apt-get install pyflakes
sudo apt-get install pychecker
sudo easy_install https://github.com/ponty/paved/zipball/master
sudo apt-get install scrot
sudo apt-get install xvfb
sudo apt-get install xserver-xephyr
sudo apt-get install python-imaging
sudo apt-get install python-sphinx
sudo easy_install sphinxcontrib-programsscreenshot
sudo easy_install sphinxcontrib-programoutput
sudo easy_install sphinxcontrib-paverutils
```

## 7.3 Tasks

`Paver` is used for task management, settings are saved in `pavement.py`. `Sphinx` is used to generate documentation.



print [paver](#) settings:

```
paver printoptions
```

clean generated files:

```
paver clean
```

generate documentation under *docs/\_build/html*:

```
paver cog pdf html
```

upload documentation to [github](#):

```
paver ghpages
```

run unit tests:

```
paver nose  
#or  
nosetests --verbose
```

check python code:

```
paver pyflakes  
paver pychecker
```

generate python distribution:

```
paver sdist
```

upload python distribution to [PyPI](#):

```
paver upload
```

# INDICES AND TABLES

- *genindex*
- *modindex*
- *search*

# INDEX

## A

Arduino (class in pyavrutils), 19  
AvrGcc (class in pyavrutils), 19  
AvrSize (class in pyavrutils), 19

## B

build() (pyavrutils.Arduino method), 19  
build() (pyavrutils.AvrGcc method), 19  
build\_arscons() (pyavrutils.Arduino method), 19  
build\_ino() (pyavrutils.Arduino method), 19

## C

command\_list() (pyavrutils.Arduino method), 20  
command\_list() (pyavrutils.AvrGcc method), 19  
command\_list\_arscons() (pyavrutils.Arduino method), 20  
command\_list\_ino() (pyavrutils.Arduino method), 20

## E

error\_text (pyavrutils.Arduino attribute), 20  
error\_text (pyavrutils.AvrGcc attribute), 19

## G

guess\_projname() (pyavrutils.Arduino method), 20

## M

mcu\_compiler() (pyavrutils.Arduino method), 20  
minprog (pyavrutils.Arduino attribute), 20  
minprog (pyavrutils.AvrGcc attribute), 19

## O

ok (pyavrutils.Arduino attribute), 20  
ok (pyavrutils.AvrGcc attribute), 19  
ok (pyavrutils.AvrSize attribute), 19  
optimize\_for\_size() (pyavrutils.AvrGcc method), 19  
optimize\_no() (pyavrutils.AvrGcc method), 19  
options\_generated() (pyavrutils.AvrGcc method), 19

## P

parse\_output() (pyavrutils.AvrSize method), 19

## R

run() (pyavrutils.AvrSize method), 19

## S

setup\_sources() (pyavrutils.Arduino method), 20  
size() (pyavrutils.Arduino method), 20  
size() (pyavrutils.AvrGcc method), 19  
stderr (pyavrutils.Arduino attribute), 20

## T

targets (pyavrutils.AvrGcc attribute), 19

## V

version() (pyavrutils.AvrGcc method), 19

## W

warnings (pyavrutils.Arduino attribute), 20