pyavrutils Documentation

Release 0.1.1

ponty

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CONTENTS

pyavrutils

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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

CHAPTER

ONE

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
```

CHAPTER

TWO

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
```

CHAPTER

THREE

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'a
>>> 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_MmQGpR.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_MmQGpR.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_vWgLra/pyavrutils_mEakND/pyavrutils_mEakND.elf')
>>> cc.size()
AvrSize <prog:430 bytes 2.6% mem:9 bytes 0.9% >
>>> cc.size().program_bytes
430
>>> cc.board='pro'
>>> cc.build('void setup(){};void loop(){}')
>>> cc.output
path('/tmp/pyavrutils_jDtsht/pyavrutils_oT3g4E/pyavrutils_oT3g4E.elf')
>>> cc.size().program_bytes
454
>>> cc.warnings
[u'build/core/IPAddress.h:51:55: warning: dereferencing type-punned pointer will break strict-alia
```

display warnings on console:

```
$ python -m pyavrutils.cli.arduino.build /usr/share/arduino/examples/4.Communication/Dimmer/Dimme
backend: arscons
MCU: atmega168
avr-gcc: 4.5.3

============================================
SIZE
============================================
program: 2400
data: 192

============================================
WARNINGS
============================================

core
-------------------
build/core/IPAddress.h:51:55: warning: dereferencing type-punned pointer will break strict-aliasi
build/core/IPAddress.h:52:108: warning: dereferencing type-punned pointer will break strict-alias
build/core/IPAddress.h:52:75: warning: dereferencing type-punned pointer will break strict-aliasi
build/core/Tone.cpp:108:45: warning: only initialized variables can be placed into program memory

lib
-------------------


sketch
-------------------
```

CHAPTER

FOUR

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-sect
    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).rjus
    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).rjus
    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).rjus
    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,s))
@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-sectio

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-sectio
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 = atmega128rfa1            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
```

CHAPTER

FIVE

ARDUINO BUILD TESTS

Code:

```
void setup()
{
}

void loop()
{
}
```

5.1 Results

5.1.1 Arduino version 0022

index	board	min
1	atmega8	OK (P:312 D:9)
2	atmega48	OK (P:380 D:9)
3	atmega168	OK (P:440 D:9)
4	atmega328p	OK (P:440 D:9)
5	atmega640	OK (P:642 D:9)
6	atmega1280	OK (P:642 D:9)
7	atmega2560	OK (P:646 D:9)

5.1.2 Arduino version 1.0

index	board	min
8	atmega8	OK (P:324 D:9)
9	atmega48	OK (P:392 D:9)
10	atmega168	OK (P:454 D:9)
11	atmega328p	OK (P:454 D:9)
12	atmega640	OK (P:656 D:9)
13	atmega1280	OK (P:656 D:9)
14	atmega2560	OK (P:660 D:9)

CHAPTER

SIX

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*, *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

CHAPTER

SEVEN

DEVELOPMENT

7.1 Tools

1. setuptools
2. Paver
3. nose
4. ghp-import
5. pyflakes
6. pychecker
7. paved fork
8. Sphinx
9. sphinxcontrib-programscreenshot
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-programscreenshot
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
```

CHAPTER

EIGHT

INDICES AND TABLES

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

INDEX