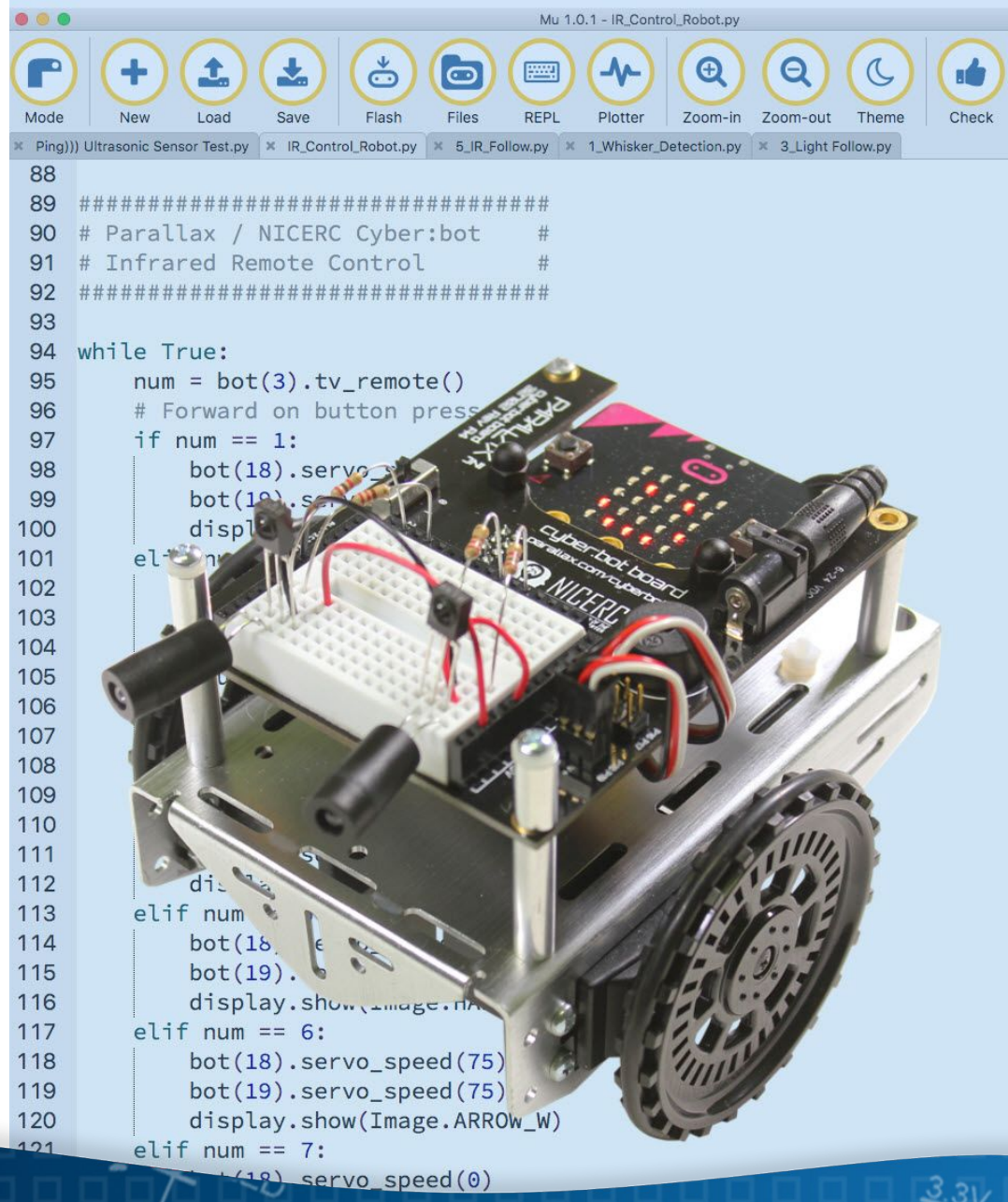
cyber:bot for micro:bit Webinar

January 24, 2019

PARALLAX INC
www.parallax.com

NICERC™
AN ACADEMIC DIVISION OF THE
CYBER INNOVATION CENTER



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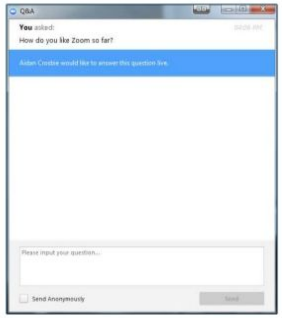
PARALLAX WEBINAR SERIES

Q&A



Have a question you'd like us to answer?
Use the Q&A functionality in Zoom, and
we will do our best to answer them all.
Feel free to leave comments in Chat,
though we may not see questions left there.

Raise Hand

If you'd like to speak during the webinar,
click the "Raise Hand" button and we will
answer you.

Meet Your Hosts

Ken Gracey
CEO
Parallax
kgracey@parallax.com

Dr. Chuck Gardner
Director of Curriculum
NICERC
chuck.gardner@cyber.org

Tommy Gober
Curriculum Development Specialist
NICERC
tommy.gober@cyber.org

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cyber:bot Webinar Agenda

- Introductions and team *(5 mins)*
- Cyber:bot goals *(2 mins)*
- Micro:bit *(2 mins)*
- Python *(5 mins)*
- `parallax.py` code library *(5 mins)*
- Cyber:bot robot hardware *(10 mins)*
- Curriculum *(10 mins)*
- Demonstrations/code *(15 minutes)*
- Price and availability *(5 mins)*
- Comments and questions *(any)*

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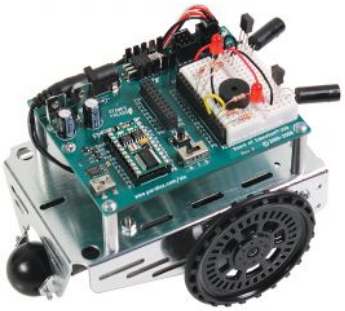
Parallax Small Robots



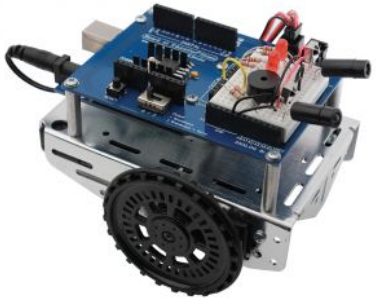
Boe-Bot with BASIC Stamp

- Program in PBASIC (text)
- Easy language with very direct code/hardware cause and effect for learning embedded systems

AB360° with multicore Propeller

- Program in Blockly (visual) or C (text)
- Easy start yet simplifies building capable projects and real-world prototypes

possible conversion



possible conversion

Shield-Bot with Arduino

- Program in C variant (text)
- Best for schools with Arduino-based tech programs

cyber:bot with micro:bit (Propeller co-processor)

- Program in microPython (text)
- Best for schools focusing on Python to add a capable hardware dimension

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cyber:bot Expanded Team

www.microbit.org
BBC Foundation Makes the Micro:bit

www.parallax.com
cyber:bot Design and USA Manufacturing

https://www.nicerc.org
Educator Training and Curricula

www.codewith.mu
Code Editor for Windows and Mac

www.micropython.org
MicroPython Code Developer

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cyber:bot Goals

- **For educators:**
  - Be the class they remember!
  - Turnkey system they can trust
  - Scaffold capability
  - Extend the use of micro:bit
  - Support in-class competitions
- **For students:**
  - Inspire STEM careers
  - Build/program one's *own* robot
  - Learn Python language
  - Build electronic circuits
  - Learn troubleshooting
- **For Parallax / NICERC**
  - Sustainable business model
  - Reinvest and add resources
  - Professional Development

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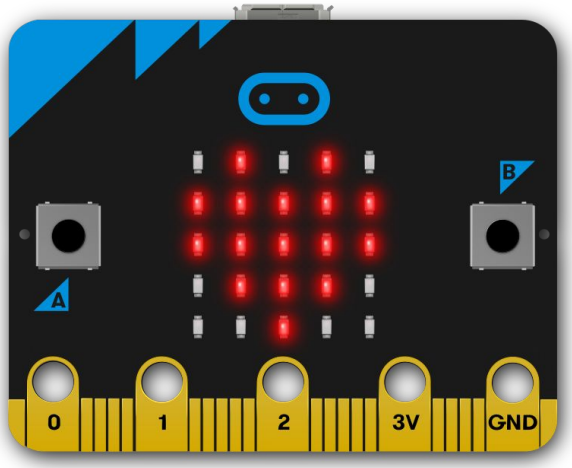
micro:bit



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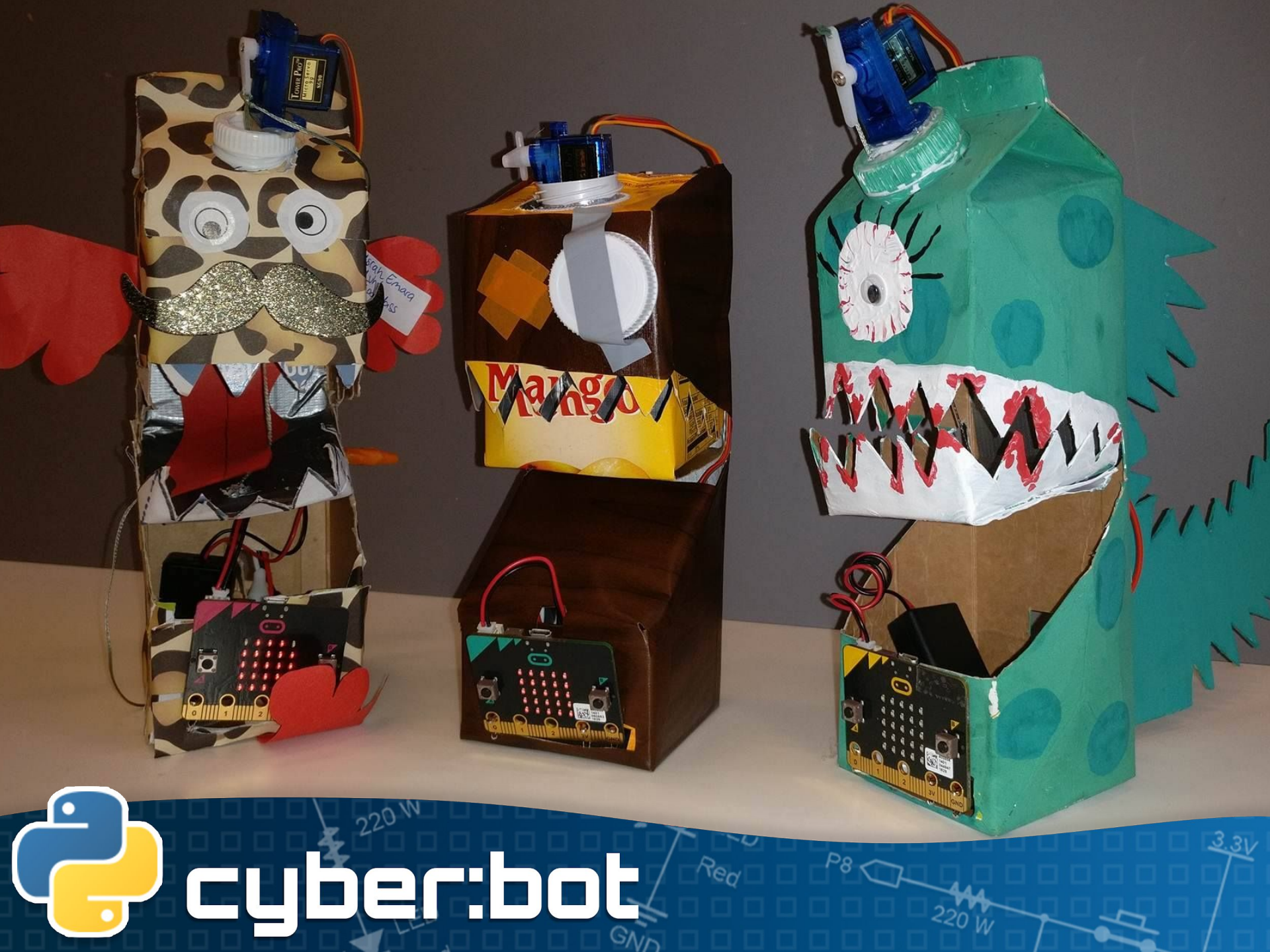
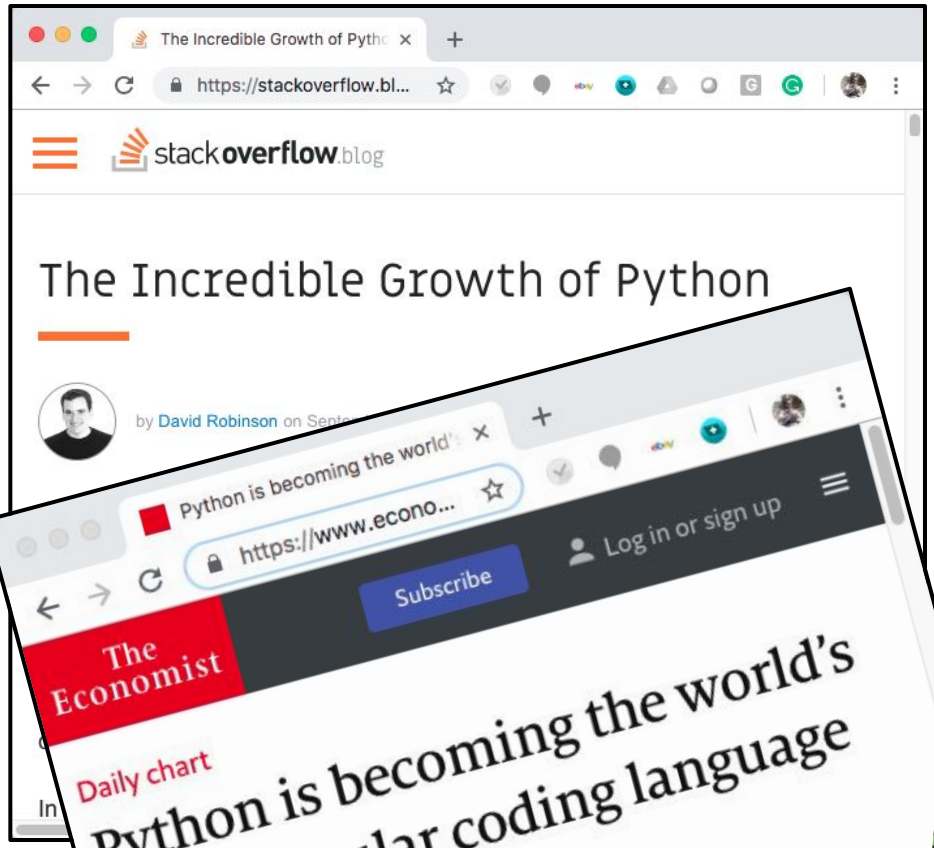
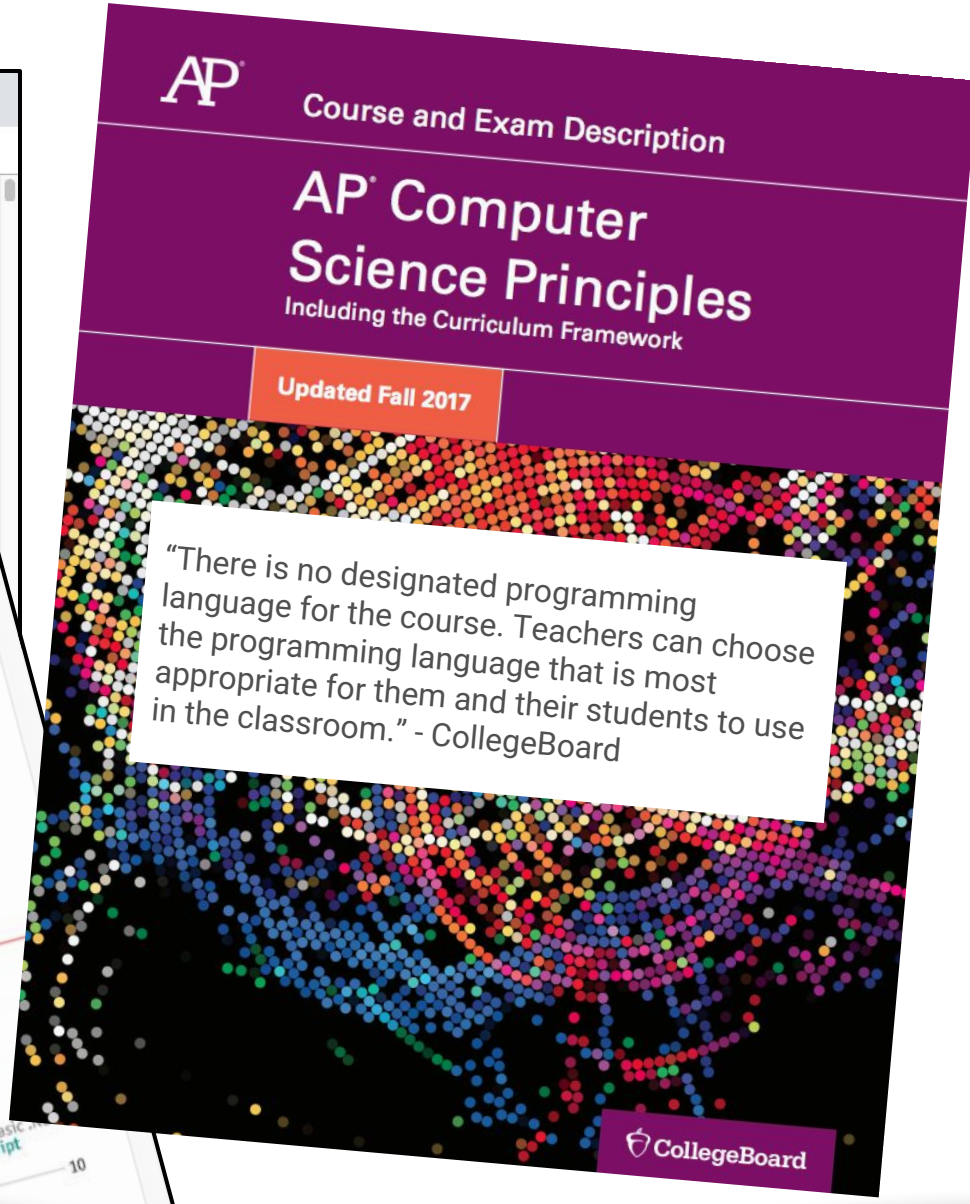

Mango
220 W
Red
GND
P8
220 W
3.3V
cyber:bot


The Incredible Growth of Pytho
https://stackoverflow.bl...
stackoverflow.blog
The Incredible Growth of Python
by David Robinson on Sept

Python is becoming the world's
https://www.econo...
Subscribe
Log in or sign up
The Economist
Daily chart
Python is becoming the world's most popular coding language
But its rivals are unlikely to disappear
Code of conduct
Ranking of programming languages*
98
03
08
13
18
Java (1st)
C
C++
Python
C#
Visual Basic
JavaScript
PHP
Ruby
R
10


AP
Course and Exam Description
AP® Computer Science Principles
Including the Curriculum Framework
Updated Fall 2017
"There is no designated programming language for the course. Teachers can choose the programming language that is most appropriate for them and their students to use in the classroom." - CollegeBoard
CollegeBoard

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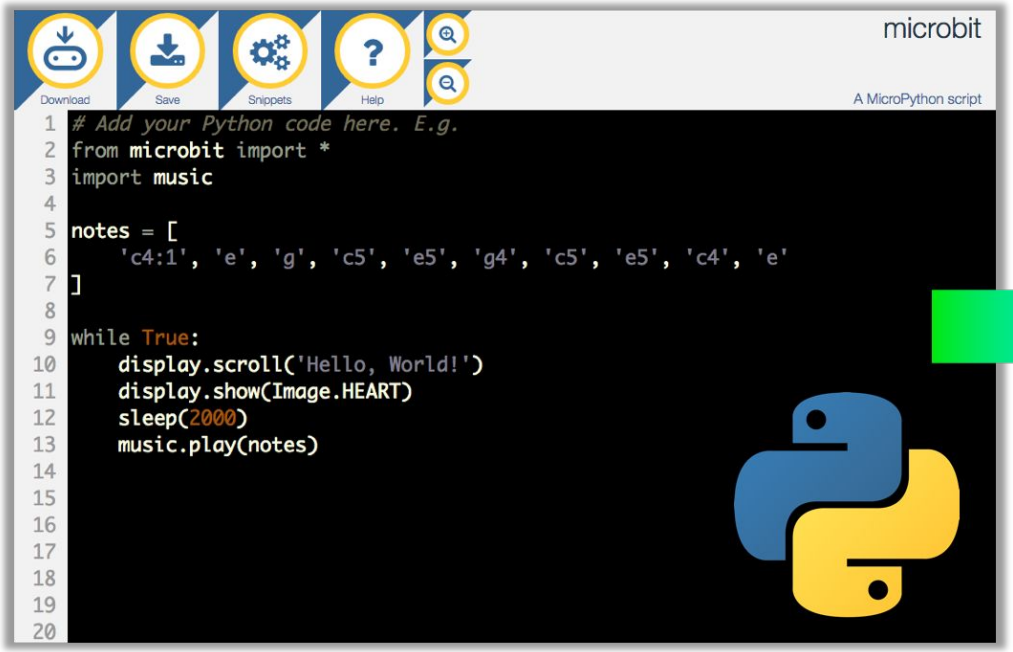
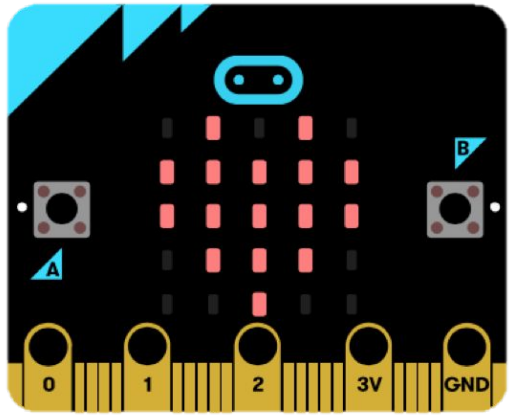
- Beginner-friendly (reads like English - looks BASIC)
- Object-oriented structured language
- Runs on embedded hardware (MicroPython)
- Programming tool support (open source, all OSs, etc.)
- Forces new programmers to use alignment/indentation for legibility (good practice)
- Not overly verbose - easier to "get at the heart" of the concept you're teaching (no wading through a bunch of meaningless syntax rules that obscure the instructional intent.)
- Free / open source (no awkward licensing/copyright)

MicroPython—Python for Microcontrollers





MicroPython is a creation of Damien George

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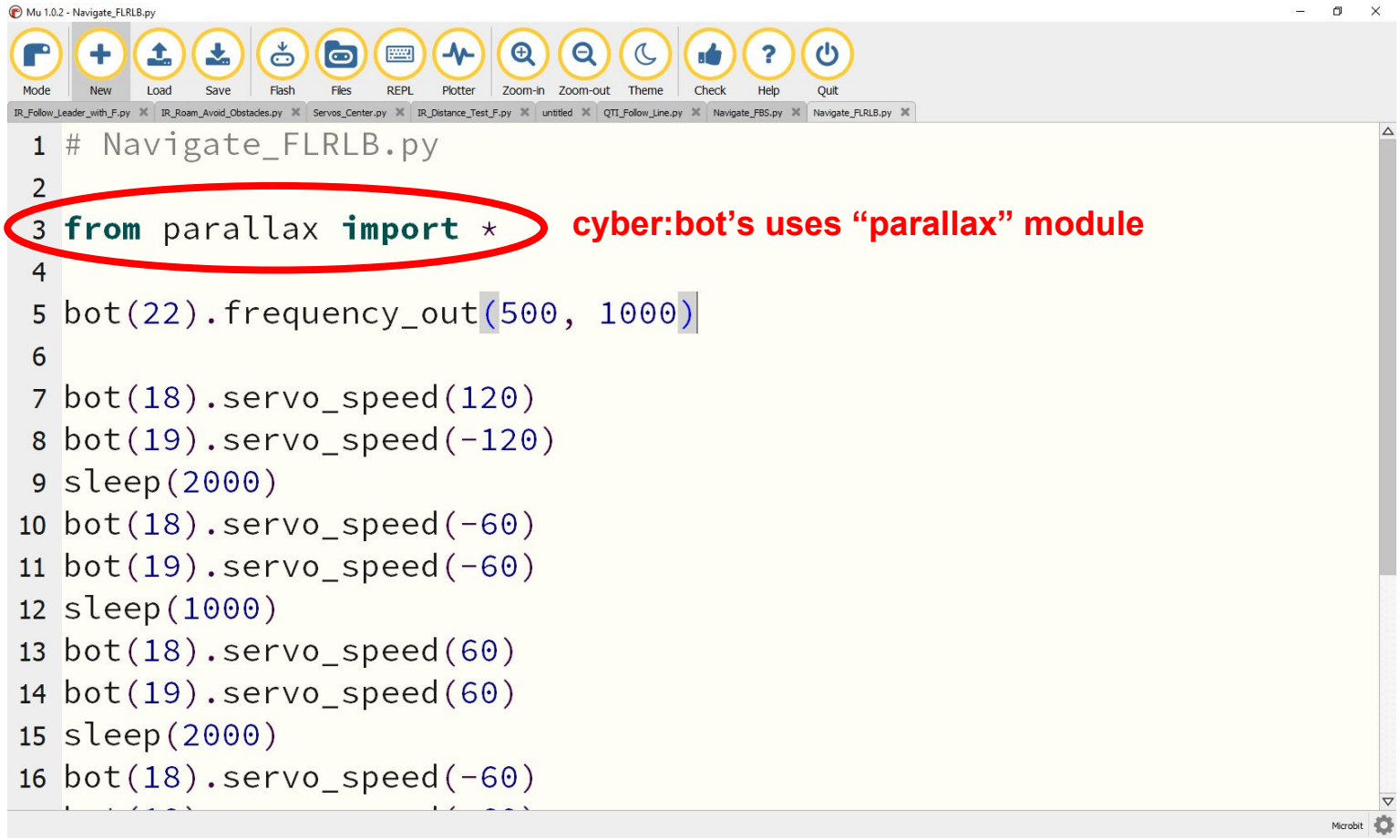
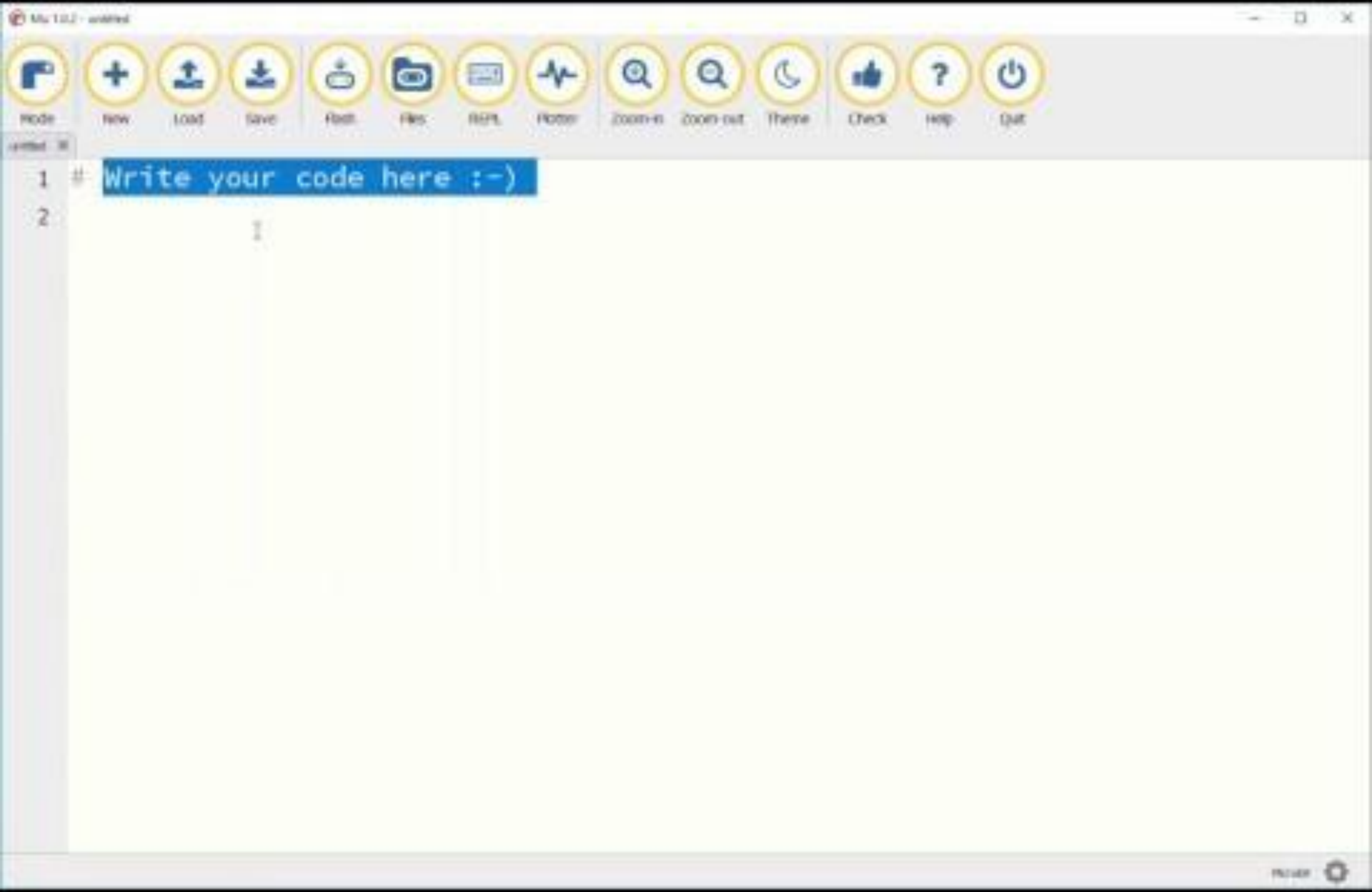
Mu Editor with parallax.py Library

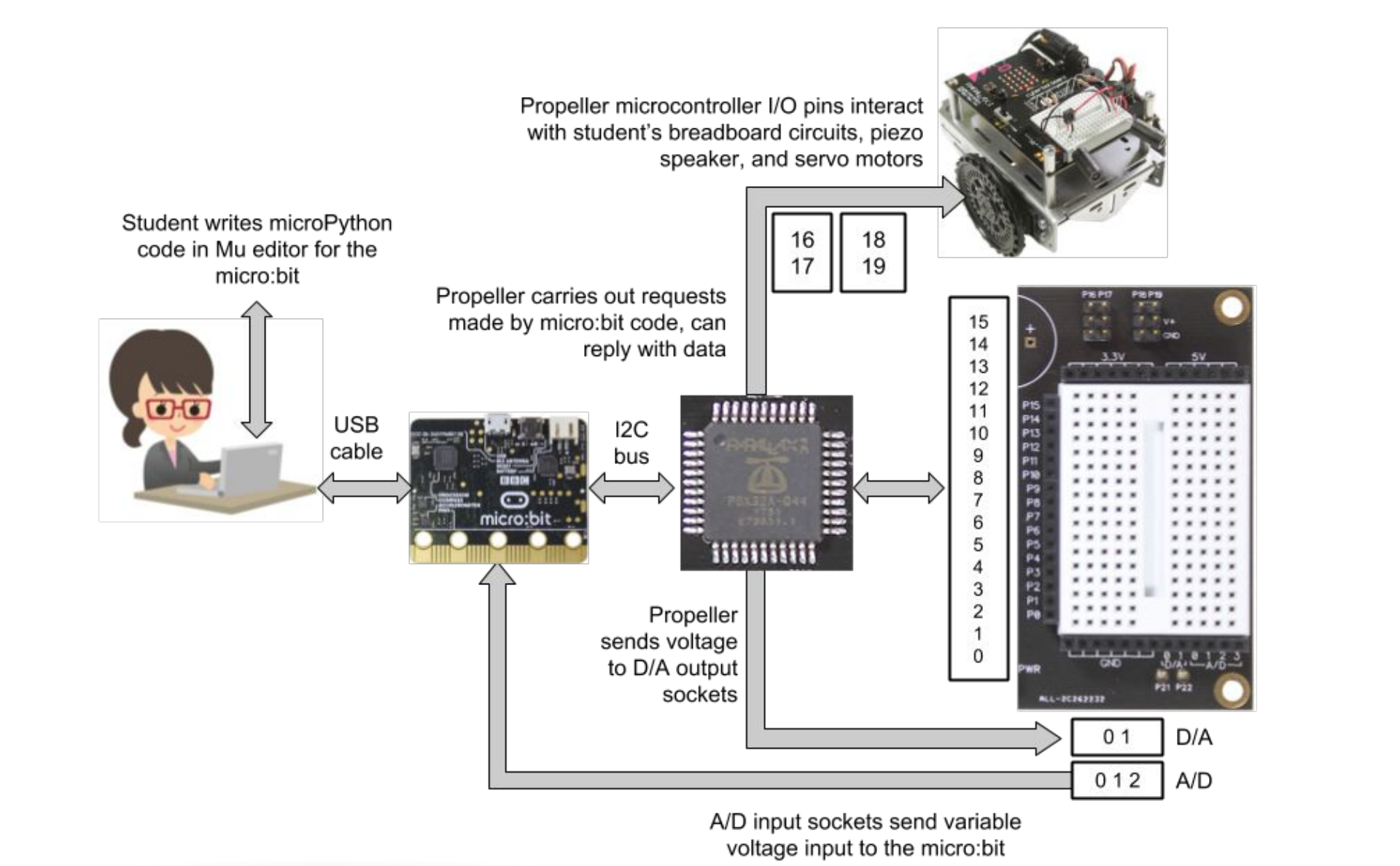


cyber:bot's uses "parallax" module

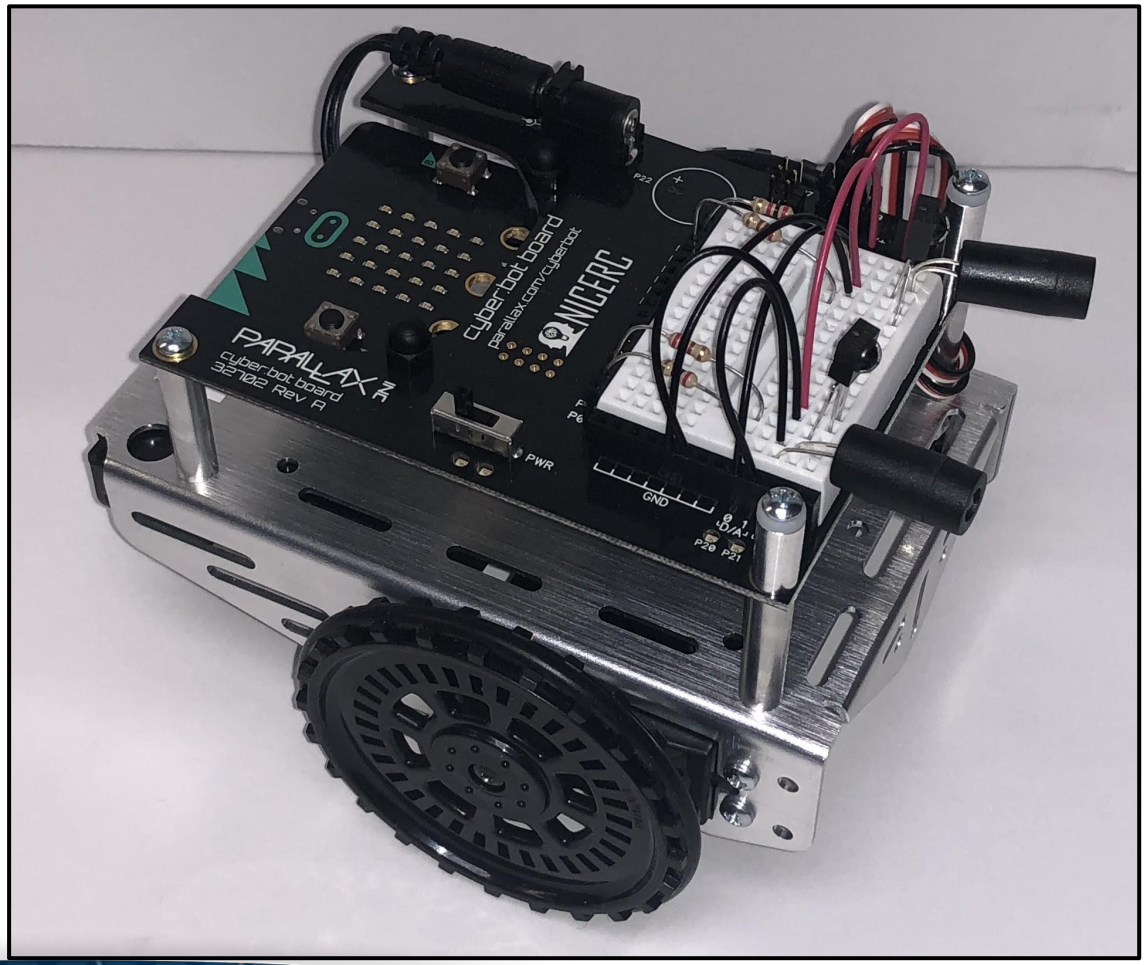

Mode
New
Load
Save
Flash
Files
REPL
Plotter
Zoom-in
Zoom-out
Theme
Check
Help
Quit
1
2
Write your code here :-)

parallax.py Library Module Methods

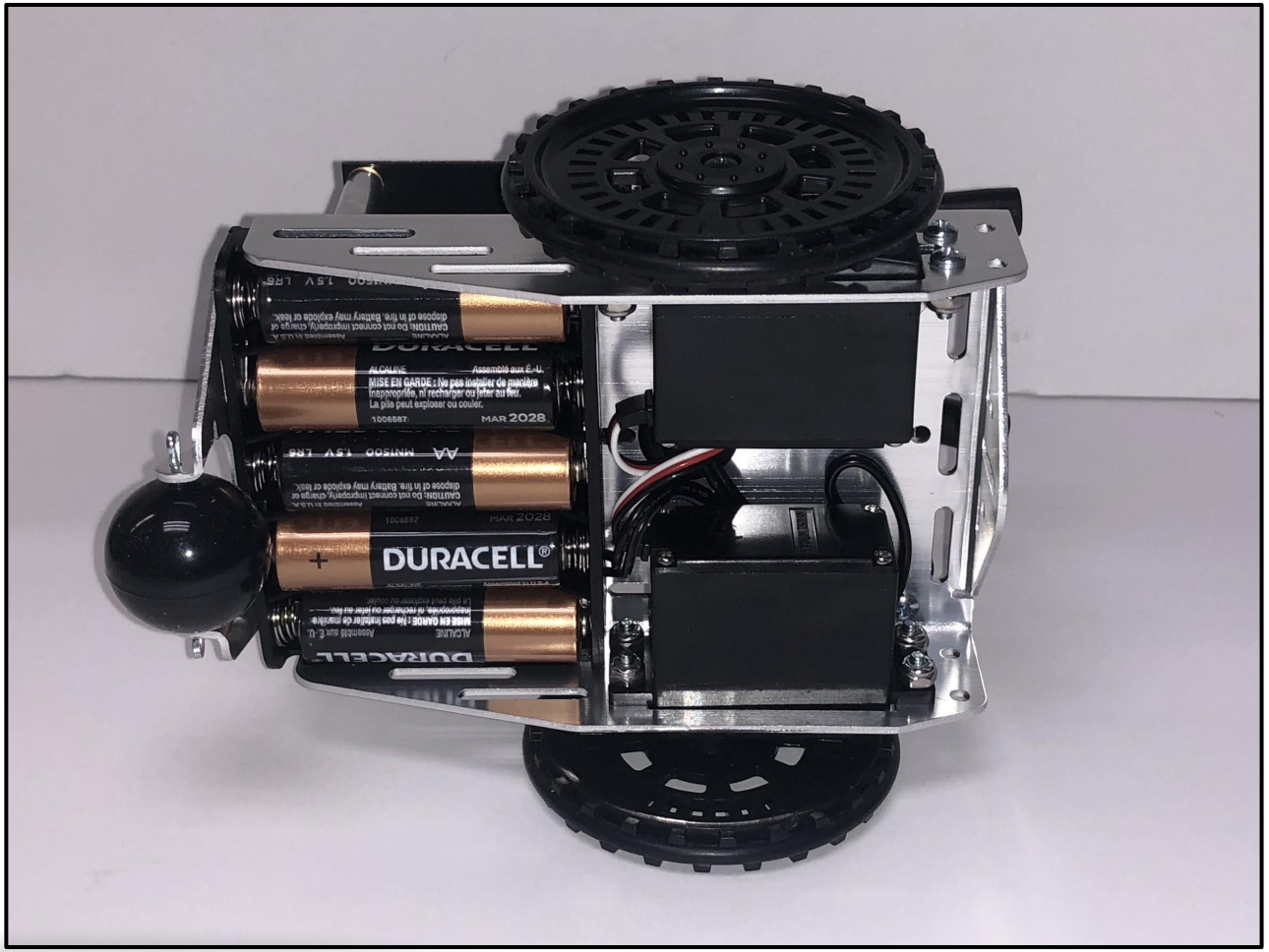
```
bot(pin).read_r(data)                # retrieve returned value via I2C
bot(pin).digital_write(state)        # set I/O pins high or low
bot(pin).analog_write(PWM)           # set duty cycle to four available PWM channels
bot(pin).digital_read(state)         # get I/O pin state high or low
bot(pin).states(states)              # set binary pin states to multiple I/Os
bot(pin).directions(directions)      # set I/O pin directions
bot(pin).qti(QTI values)             # set and read four line follower sensors
bot(pin).pulse_out(pulsewidth)       # set and maintain a pulse
bot(pin).pulse_in(pulsewidth)        # measure pulse on I/O pin (accelerometers)
bot(pin).pulse_count(counts)         # count pulses over duration of time
bot(pin).rc_time(time)               # pseudo-analog R/C charge/discharge time on I/O pin
bot(pin).frequency_out(sound)        # set frequency, duration to I/O pin
bot(pin).ir_detect(frequency)        # generate IR pulse and get receiver value
bot(pin).servo_angle(angle)          # set and hold servo in an angle (up to 14 servos)
bot(pin).servo_speed(speed)          # set and hold servo speed (-100 to 100)
bot(pin).servo_disable(disable)      # disable a servo
bot(pin).ping_distance(distance)     # configure Ultrasonic or Laser Ping, receive distance
bot(pin).tv_remote(button)           # decode pulses from Sony TV remote and return button number
```


Propeller microcontroller I/O pins interact with student's breadboard circuits, piezo speaker, and servo motors
16 17
18 19
Student writes microPython code in Mu editor for the micro:bit
Propeller carries out requests made by micro:bit code, can reply with data
USB cable
I2C bus
micro:bit
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
Propeller sends voltage to D/A output sockets
0 1
D/A
0 1 2
A/D
A/D input sockets send variable voltage input to the micro:bit

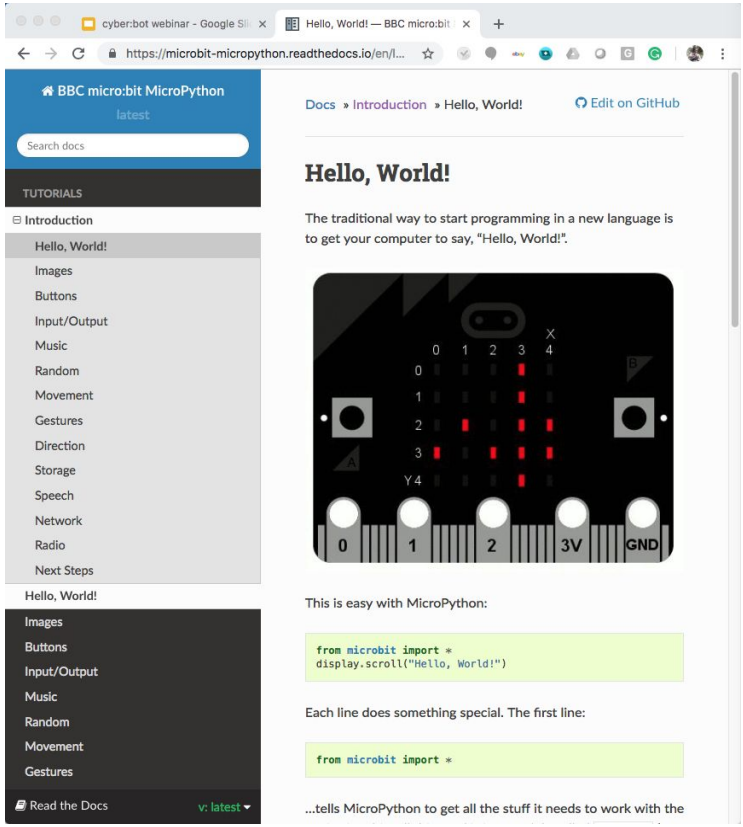
cyber:bot (Top)



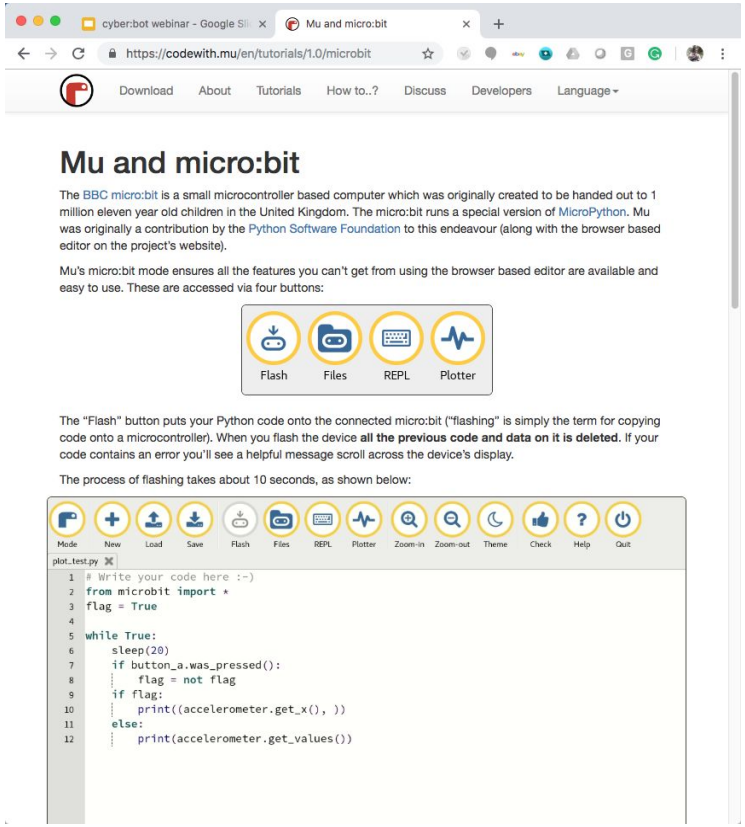
cyber:bot (Bottom)



Key micro:bit Resources



https://microbit.org



https://codewith.mu

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12 micro:bit Tutorials from NICERC

www.parallax.com/product/nicerc-cyber-curriculum

Lesson	Title
00	Graphics
01	Hello World and Scrolling Text
02	Programming with Displays
03	Variables and DIY Images
04	Animation
05	Buttons and Conditionals
06	Compass and Comparisons
07	Binary and Visual Counter
08	Tug-o-War
09	Communications
10	Student Response System
11	Passwords and Security
12	Voltage Measurement
13	Temperature Sensor

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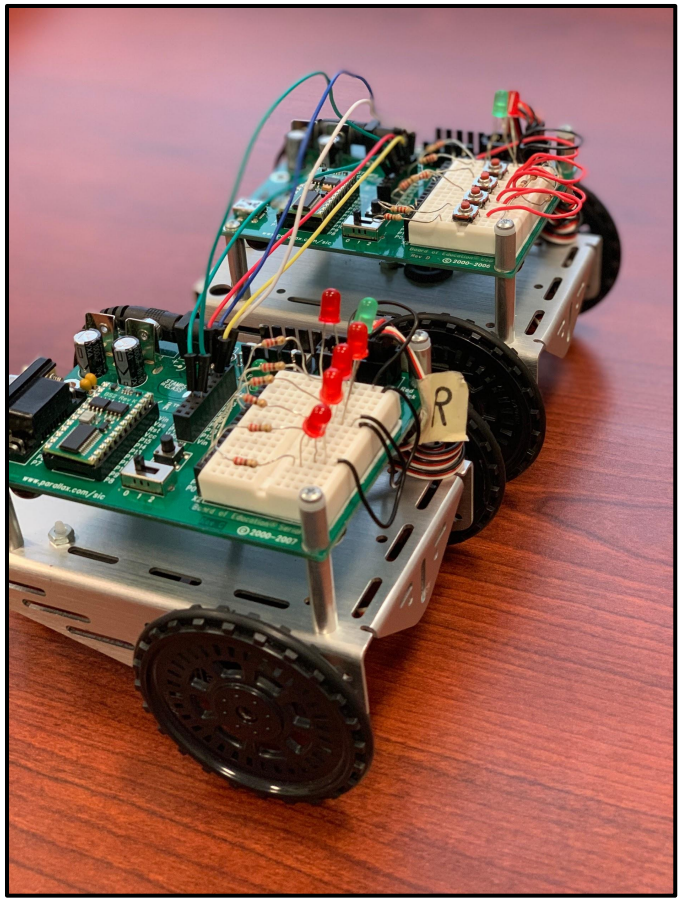
Cybersecurity

- Cyber starts with understanding “how stuff works”
- Knowing how things work, you know how it *doesn’t* work
- You know how adversaries might seek to break it
- Understanding a system helps harden that system



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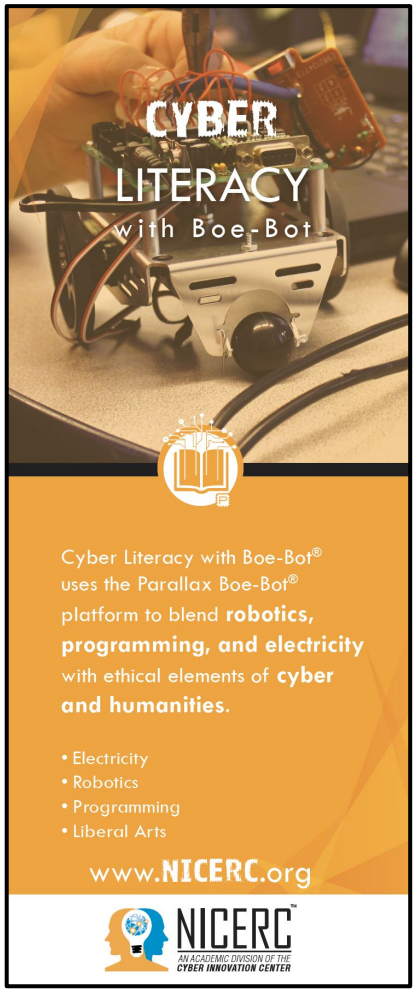
cyber:bot Curriculum

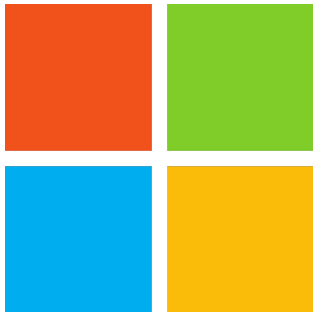
- Tutorials available through
  `learn.parallax.com`
- Free classroom curricula available for US school teachers through NICERC
  - Class-length units
  - Additional resources for teachers
  - Modular content
  - Workshops available for schools



Demonstrations

- Start off with a bang!
- Object Detection
  - Whiskers as a physical button-press sensor
  - Infrared for avoidance
  - Infrared for following
  - Ping))) Ultrasonic Sensor
  - Ping))) Laser Sensor
- Infrared Remote Control
- Light Following with Photoresistors
- Line Following

Programming Operating System Compatibility



Code with Mu
https://codewith.mu
Download and install on your Windows computer.

Code with Mu
https://codewith.mu
Download and install on your Mac computer.

micro:bit's online Python editor
https://python.microbit.org/v/1.1
Copy the parallax.py library
Paste to the top of your program

cyber:bot Purchasing Options

cyber:bot

cyber:bot Available Formats

cyber:bot Robot Kit w/ micro:bit

Stock #32700

$200 ea. (qty 1-9)

$190 ea. (qty 10-19)

$180 ea. (qty 20+)

cyber:bot Robot Kit NO micro:bit

Stock #32705

$190 ea. (qty 1-9)

$180 ea. (qty 10-19)

$170 ea. (qty 20+)

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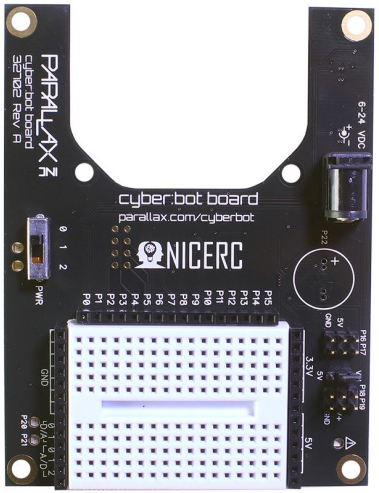
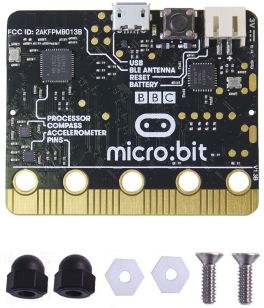
cyber:bot conversion kit
for Boe-Bot or Shield Bot with Arduino

or

+





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cyber:bot conversion kit
Stock #32707
$79.99 ea. (qty 1-9)
$76.00 ea. (qty 10-19)

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Roundtable Q&A

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Parallax Educator Hotline

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6300 East Texas Street
Bossier City, LA 71111

www.nicerc.org
Main: (318) 759-1600