TeenScience Platform

Columbia University Zuckerman Mind Brain Behavior Institute (ZMBBI) and the Advanced Instrumentation Core (AIC) presents TeenScience, a hardware and software platform for science research involving behavioral neuroscience, robotics, sound analysis, and more.

BEHAVIORAL NEUROSCIENCE

Driving for optogenetics, servos, valves, and pumps.
Analog and digital I/Os for sensors including instrumental, bridge sensing. Connector with 3 capacitive touch sensing interfaces.

ROBOT KINEMATICS

Driving for Stepper and DC motors with quadrature encoding. Current sensing feedback to measure external forces.

SOUND STIMULUS AND ANALYSIS

Wide band I/O audio interface including ultrasound. Up to 192KHz sampling supported. High sensitivity wideband microphone on board, and 1W output amplifier.
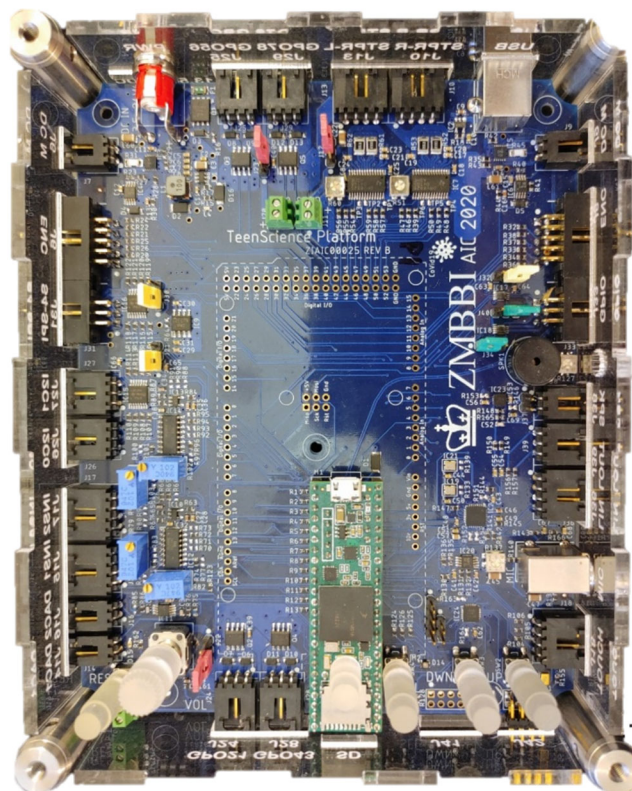
- Teensy 3.6 CPU ARM M4 at 180MHz with overclock up to 240MHz. 1MB of Flash, 256 KB RAM, 4KB EEPROM. All 58 I/O pins are accessible.

- Easy programming and compatibility directly with Arduino IDE and adaptable to Arduino hardware shields or prototype boards to ad functionality

- Use Teensy libraries for advanced hardware and programming including multi-threaded, real time solutions.

A basic knowledge in Arduino and C programming is all is needed to start using the TeenScience platform. At the core, the Teensy 3.6 CPU uses Teensyduino that is a piece of software that is installed after the Arduino IDE and allows to program the board as any Arduino board.

TeenScience provides several hardware interfaces (see block diagram below) for common science applications with the Teensy 3.6 CPU that can execute code around 60 times faster than an Arduino Mega in comparison. Find TeenScience archives at: https://github.com/Columbia-University-ZMBBI-AIC/Teenscience. Also with the Teensy libraries you can access to an extended number or hardware peripherals or real time multi-threaded programming. More information on Teensy and Teensyduino at: https://www.pjrc.com/teensy/.

Also at the AIC we keep creating test software, and specific research libraries by lab request. Contact Rick Hormigo r.hormigo@columbia.edu for more information.

BLOCK DIAGRAM

PWR GPO 1-4 PWR GPO 5-8   13 bit Inst In X2   12 bit DAC X2   1.5A Stepper X2

5V

8-24VDC
to 5V

PWR

x4   x4

INA125
Ins. Amp.
X2

Stepper
DRV8825
X2

USB

Arduino Mega Shield Ex.

uSD

Teensy 3.6

ARM Cortex M4 180 MHz

3.3V

Arduino Mega Shield Ex.

5 to
3.3V

Quad
Enc. X2

Reset

POT

Green

16 I/O
SX1509
Expander

AK4558
Codec
M/S

MAX
14870
X2

1.7A DC
Motor
X2

RGB

Select

Up

Down

16 I/O

PWR   PWR to
12V   12V

Touch
13bit ADC
X3

SSM2211
1W Amp

LSF
0204

LSF
0204

74LV
C2T45

Mic   Line In / out   Speaker   2X I2C   SPI/Serial   GPIO/Buzzer