

BitScope PiLab

An open source science lab for bitscope and raspberry pi.

PiLab is an easy to understand and use open source programming environment for BitScope using nothing but Python. It's designed to enable novice coders to build arbitrary test, measurement, process control and data acquisition solutions for use in education, science, engineering and industry, all based on Raspberry Pi.

BitScope PiLab conceived and outlined motivation (EE29D)

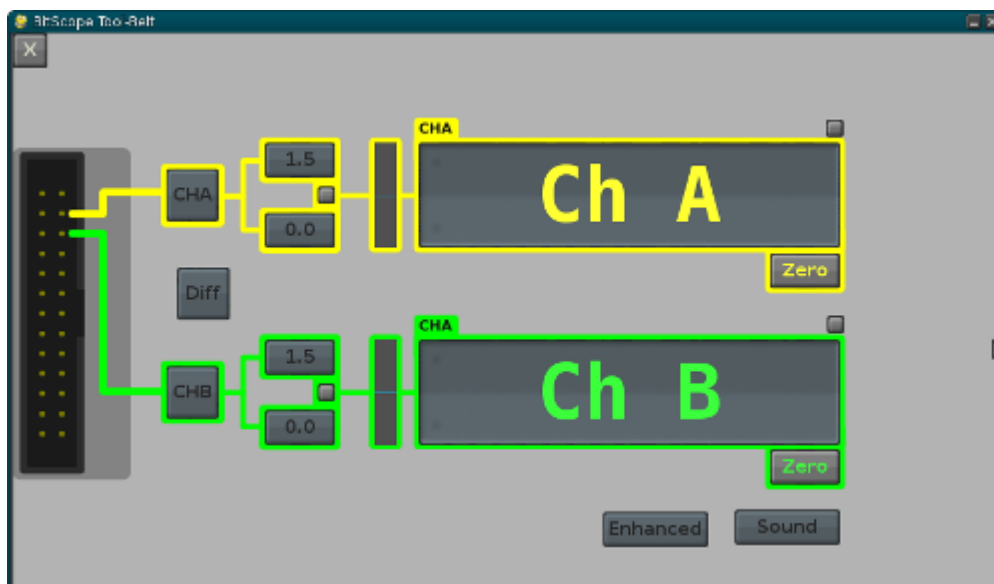
In principle, BitScope and Raspberry Pi “can do anything” and programming both is easy (when you know how). However, understanding the **BitScope VM** and creating attractive and easy to use applications in Python can be a challenge. PiLab aims to solve these problems by abstracting VM programming into a state machine model that works within a simple PNG based **MVC framework** with a UI paradigm similar to the original **hypercard**:

HyperCard is based on the concept of a "stack" of virtual "cards". Cards hold data, just as they would in a Rolodex card-filing device. Each card contains a number of interactive objects, including text fields, check boxes, buttons, and similar common GUI elements. Users "browse" the stack by navigating from card to card, using built-in navigation features, a powerful search mechanism, or through user-created scripts. Users build new stacks or modify existing ones by adding new cards. They place GUI objects on the cards using an interactive layout engine based on a simple drag-and-drop interface. Additionally, HyperCard also included prototype or template cards known as "backgrounds"; when new cards are created they can refer to one of these background cards, which causes all of the objects on the background to be copied onto the new card. This way a stack of cards with a common layout and functionality can be created. The layout engine is similar in concept to a "form" as used in most rapid application development (RAD) environments (such as Borland Delphi, Visual Basic and Visual Studio).

PiLab is designed to make creating applications for the touch screen **PiTFT** (in a **PiBow** with **BitScope Micro**) straightforward but it can run on any platform that runs *Python, PyGame and PySerial* (i.e. almost everything).

It works exactly the same way regardless of the host platform so it is truly *write once, run anywhere*.

An example of the UI is this prototype dual channel differential voltmeter:



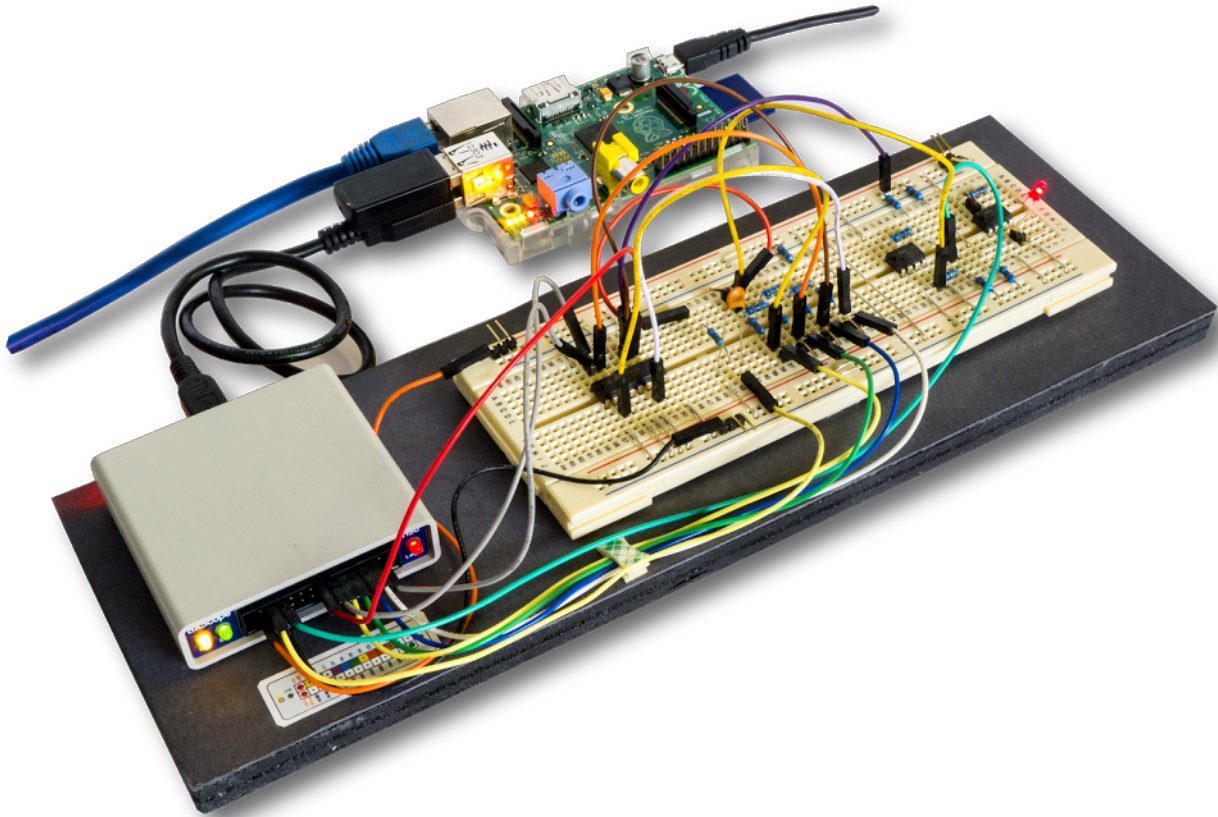
A key design goal is to simplify UI design and promote the use of many “single purpose” apps rather than fewer complex ones. Each app is designed to “do one thing well” whether it’s a multimeter, oscilloscope, waveform generator, logic or spectrum analyzer or anything else. Further, the MVC model need to not be driven by a UI; it can use a machine interface for automated testing, data acquisition, system diagnostics and process monitoring.

The framework is designed to be simple enough that intermediate coders seeking to learn more about **physical computing** can use it but powerful enough that advanced coders can create sophisticated real-world solutions.

A PiLab prototype (non-MVC) is currently **hosted on BitBucket**. The MVC version will be published open source on GitHub. The intended audience is education (Primary to Tertiary), makers, engineers, scientists and others.

BitScope PyLab conceived and outlined (EE30C)

The **PyLab Project** is an extension of **PiLab** but with goals similar **SciPy PyLab**. It shares the core BitScope VM programming and I/O but is intended to leverage things such as **SciPy**, **Bokeh** or **Anaconda**. PyLab is intended to be a more sophisticated platform for professional programmers and engineers but it is based on the same core APIs and code base as PiLab.

**BitScope PiLab Remote** (EF17A)

BitScope PiLab offers [server based networked solutions](#) for access via standard IP networks. This facilitates shared remote access with any type of device; ideal for [online & interactive use in education](#) and engineering.

