Piklet Software Documentation

John Board, 26/07/2015

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# Software Overview

The Piklet software is a package that links physical hardware sensors to the Scratch programming environment. It operates in the background of a Raspberry Pi, and connects automatically to Scratch when Scratch is started.

The Piklet software is bi-directional – it can both send and receive messages from Scratch. You send messages by creating an editing variables with specific names. You receive messages from scratch using broadcasts, and sensor blocks from the Sensing panel.

Currently there are 4 sensor drivers written for the Piklet. These include Light/Line, Sound, RFID, and Tilt/G-Force (Accelerometer).

Please be aware of the network settings of the pi, ensuring that they are correct. If the pi tries to connect to WiFi network that isn’t there, it’ll take a significant time trying to at boot. Review the network files at **/etc/network/interfaces**

## Installing

This section will guide you through installing the Piklet software, and it’s dependencies.

### Dependencies

<http://sourceforge.net/projects/raspberry-gpio-python/files/latest/download>

The Piklet software requires I2C and SPI are enabled. Follow the following two tutorials to enable them.

[Enabling I2C](https://learn.adafruit.com/adafruits-raspberry-pi-lesson-4-gpio-setup/configuring-i2c)

[Enabling SPI](https://learn.adafruit.com/adafruits-raspberry-pi-lesson-4-gpio-setup/configuring-spi)

The RPi automatically enables a “serial terminal” – meaning you can talk to the Raspberry Pi using a USB cable. Unfortunately keeping this serial terminal enabled effects sensors connected using the Serial (UART) port. The serial terminal needs to be disabled. Follow the following tutorial to do so:

[Disabling UART Terminal](http://www.hobbytronics.co.uk/raspberry-pi-serial-port)

The smbus library for python also needs to be installed, use the following command to do that:

|  |
| --- |
| **sudo apt-get install python3-smbus python3-serial** |

To download the Piklet code, you’ll need git and screen – which you can install using:

|  |
| --- |
| **sudo apt-get install git screen** |

### Downloading Piklet Software

To download the actual piklket software, type in:

|  |
| --- |
| **cd /opt/**  **git clone** [**https://github.com/Baralabite/Piklet**](https://github.com/Baralabite/Piklet)  **chmod -R 777 /opt/Piklet** |

**Please note** that chmod 777 /opt/Pikletg is bad practice. For the sake of getting things working, we’ve done this. In the future we’ll find a work around.

### Run as background process

Once you’ve downloaded the code, run install.sh. Install.sh downloads a few dependancies, as well as creates run, stop, and restart server scripts. Finally, it installs a script that runs the server when the pi boots.

Once install.sh has been run, all the scripts it generates and the startup hook it creates is set to whatever directory you ran it in. You cannot move the folder, once install.sh has been run.

The script also assumes the user is “pi”.

### ***Piklet\_01 Install Location Note:***

This software is currently installed on Piklet\_01 in **/opt/Piklet!**

#### ServoBlaster

The piklet software uses the servoblaster open source library to control servo motors, and drive the motors. It’s a software implementation of PWM.

<https://github.com/theedgeqld/PiBits>

|  |
| --- |
| **cd ~/**  **git clone** [**https://github.com/theedgeqld/PiBits**](https://github.com/theedgeqld/PiBits)  **cd PiBits/ServoBlaster/user**  **make**  **cd ../..**  **sudo cp -r ServoBlaster /opt/Piklet/drivers/ServoBlaster** |

## Crashing

If the Piklet software crashes (a likely occurance), you need to start it again by navigating to the Piklet’s software folder, and running “sudo ./run\_server.sh”.

## Licensing

The core Piklet software is open source, under the <INSERT LICENSE HERE>. This allows you to <LICENSE ABILITIES>.

## Modifying

Because the Piklet software was released as Open Source, you are able to modify and redistribute it as desired. The Piklet was written in Python, and structured so with the intention that you’d be able to add your own sensor code, if desired.

<https://github.com/Baralabite/Piklet>

All python files (except \_\_init\_\_.py) in the sensors folder are interpreted as sensor drivers.

A template sensor file can be found here:

<https://github.com/Baralabite/Piklet/blob/master/sensors/template.py>

For more information, continue checking the README file of the repository. Any further queries, please send an email to [johnrobboard@gmail.com](mailto:johnrobboard@gmail.com)

# Sensor

Before the Piklet software can connect to Scratch, remote sensor connections have to be enabled in scratch. You need to do this each time you start a new scratch program. Follow this tutorial to do that:

[Enabling Remote Sensor Connections in Scratch](https://wiki.scratch.mit.edu/wiki/Remote_Sensor_Connections)

Before use, sensors need to be plugged in to the Piklet, and then turned on in the Scratch code. To turn on a sensor in the on program, add a variable with a name with the following format.

***piklet\_<sensorType>\_<sensorID>\_enabled***

Then set the value of the variable to ***1.*** To Turn the sensor off, set the value of the variable to ***0.*** To turn on the RFID sensor, for example, create a variable with the name:

***piklet\_RFID\_uart\_enabled***

Then set that variable to ***1.***

## Overview

### Commands

As seen earlier (to turn on the sensor), there are commands that can tell sensors things (for example, turn on or off the sensor). Each command has 3 parts:

piklet\_<sensorType>\_<sensorID>\_<register>

|  |  |
| --- | --- |
| **sensorType** | This lets piklet’s code what type of sensor to be talking to. If you have created your own sensor drivers in the piklet’s sensor folder, then you can talk to it by replacing sensorType with the exactly same name as the sensor file. For example, if you have color.py, then you’d access it by going piklet\_color\_... |
| **sensorID** | Sensor ID is used to tell piklet’s code what sensor port the specified sensor is plugged in to. For example, GPIO 24, Analog 3, UART, or I2C. |
| **register** | Each sensor driver as a number of settings that can be changed, for example whether it’s enabled or not. This setting is called a register, and by editing the variable, you change the value of that specific register. |

Here’s a list of valid inputs for sensorType and sensorID. Consult the specific sensor’s documentation to find a list of registers:

|  |  |  |
| --- | --- | --- |
| **sensorType** | **sensorID** | **Description** |
| RFID | uart | RFID sensor, plugged into the UART plug |
| light | <Any valid GPIO pin, that the light sensor is plugged in to. For example “24”> | Light sensor. Example turning light sensor on could be piklet\_light\_24\_enabled |
| accelerometer | i2c | Accelerometer. Measures G-Force. |
| sound | <Any valid analog pin. From a1 to a3> | Sound sensor. piklet\_light\_a3\_enabled |

## RFID

The RFID sensor can read RFID cards/tags, such as student ID cards, go cards, etc.

**Physical Setup**

|  |  |
| --- | --- |
| 5V | Plugged into RPi 5v |
| GND | Plugged into RPi GND |
| TX | Plugged into RPi Serial RX (UART) |
| RX | Plugged into RPi Serial TX (UART) |

**Registers**

|  |  |  |
| --- | --- | --- |
| **Register** | **Inputs** | **Description** |
| enabled | 0/1 | Turns the sensor on/off |

**Example Usage**

1. Create variable to piklet\_RFID\_uart\_enabled
2. Set variable to 1
3. Wait until you receive a broadcast “rfid-updated”
4. Read values from sensor rfid

**Known Bugs**

Each scan is 1 card behind. For example, if I scan card 1, it won’t read. If I scan card 2, it’ll read as card 1. If I scan card 1 again, it’ll read card 2, etc.

**Troubleshooting**

## Light (QTI Sensor)

The RFID sensor can read RFID cards/tags, such as student ID cards, go cards, etc.

**Physical Setup**

|  |  |
| --- | --- |
| R(ed) | Plugged into RPi 5v |
| B(lack) | Plugged into RPi GND |
| W(hite) | Plug into RPi GPIO |

**Registers**

|  |  |  |
| --- | --- | --- |
| **Register** | **Inputs** | **Description** |
| enabled | 0/1 | Turns the sensor on/off |
| threshold | Integer | Amount of change required before an updated value is sent to Scratch – for example if the number keeps moving between 88 and 89, you don’t want it to keep messaging Scratch. Set the threshold 2 so the value would have to move from 88 to 90 before it’d alert Scratch |

**Example Usage**

1. Create variable to piklet\_light\_<gpioPin>\_enabled
2. Set variable to 1
3. Wait until you receive a broadcast “light-updated”
4. Read values from sensor light

**Known Bugs**

## Sound

The RFID sensor can read RFID cards/tags, such as student ID cards, go cards, etc.

**Physical Setup**

|  |  |
| --- | --- |
| AO | Plug into RPi Analog Input |
| G | Plug into RPi GND |
| + | Plug into RPi 5V |
| DO (Doesn’t need to be connected) | Plug into RPi GPIO |

**Registers**

|  |  |  |
| --- | --- | --- |
| **Register** | **Inputs** | **Description** |
| enabled | 0/1 | Turns the sensor on/off |
| threshold | Integer | Amount of change required before an updated value is sent to Scratch – for example if the number keeps moving between 88 and 89, you don’t want it to keep messaging Scratch. Set the threshold 2 so the value would have to move from 88 to 90 before it’d alert Scratch |

**Example Usage**

1. Create variable to piklet\_sound\_<analogPin>\_enabled
2. Set variable to 1
3. Wait until you receive a broadcast “sound-updated”
4. Read values from sensor sound

**Known Bugs**

You have to be very close to the sensor for it to work.

## Accelerometer

The RFID sensor can read RFID cards/tags, such as student ID cards, go cards, etc.

**Physical Setup**

|  |  |
| --- | --- |
| VCC/5V | Plug into RPi 5V |
| SCL | Plug into RPi SCL (I2C) |
| SDA | Plug into RPi SDA (I2C) |
| GND | Plug into RPi GND |

**Registers**

|  |  |  |
| --- | --- | --- |
| **Register** | **Inputs** | **Description** |
| enabled | 0/1 | Turns the sensor on/off |
| threshold | Integer | Amount of change required before an updated value is sent to Scratch – for example if the X axis keeps moving between 88 and 89, you don’t want it to keep messaging Scratch. Set the threshold 2 so the value would have to move from 88 to 90 before it’d alert Scratch |

**Example Usage**

1. Create variable to piklet\_accelerometer\_i2c\_enabled
2. Set variable to 1
3. Wait until you receive a broadcast “accelerometer-updated”
4. Read values from accelerometer-x/y/z sensor

## Ultrasonic Sensor

The RFID sensor can read RFID cards/tags, such as student ID cards, go cards, etc.

**Physical Setup**

**Registers**

|  |  |  |
| --- | --- | --- |
| **Register** | **Inputs** | **Description** |
| enabled | 0/1 | Turns the sensor on/off |

**Example Usage**

1. Create variable to piklet\_ultrasonic\_<port>\_enabled
2. Set variable to 1
3. Wait until you receive a broadcast “ultrasonic-updated”
4. Read values from ultrasonic

## Motors

The RFID sensor can read RFID cards/tags, such as student ID cards, go cards, etc.

**Physical Setup**

|  |  |
| --- | --- |
| One Wire | Plugged into HVO |
| Other Wire | Plugged into other HVO |

**Registers**

|  |  |  |
| --- | --- | --- |
| **Register** | **Inputs** | **Description** |
| enabled | 0/1 | Turns the sensor on/off |
| speed | Integer | Speed to turn motor at |

**Example Usage**

1. Create variable piklet\_motor\_<gpioPin>\_enabled
2. Set variable to 1
3. Create variable piklet\_motor\_<gpioPin>\_speed
4. Set variable to 50
5. Motor starts turning

**Known Bugs**

# Wi-Fi & VNC Setup

Network Name: Piklet\_01v

Network Password: Piklet\_01

Web GUI Username: root

Web GUI Password: qwerty

VNC Host: <ip>:1 (Port 1!)

VNC Password: qwerty

To find pi’s IP:

sudo ifconfig