Accelerometer and Data Logger for Small Animal(Turtle) Research

Webpage Link: https://www.hackster.io/brian-k2/accelerometer-and-data-logger-for-small-animal-research-c877c6

Device Construction Deadline: Mid-February.

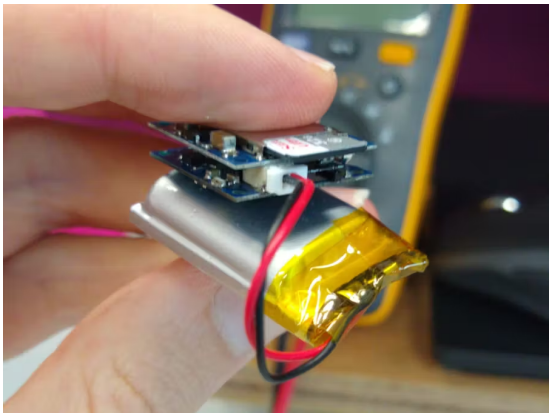
Goal: Design an accelerometer and data logger system that is,

- Safe and non-harmful for turtles.
- Small enough not to interfere with the turtle's movements.
- Lightweight, with a total weight (including battery and case) under 75 grams.
- Long-lasting with a battery life of at least 1 year.

Our Device Setup

Components Needed:

1. TinyZero board (1)
2. Accelerometer TinyShield (1)
3. MicroSD TinyShield (1)
4. UMC 8GB microSD card (1)
5. 3.7V battery (1)



Steps to Assemble:

1. Connect the Accelerometer TinyShield to the TinyZero board.
2. Attach the MicroSD TinyShield on top of the Accelerometer TinyShield.
3. Insert the 8GB microSD card into the MicroSD TinyShield slot.
4. Connect the 3.7V battery to the TinyZero's battery port.

Created CSV Data file link: https://docs.google.com/spreadsheets/d/16Ed9nlG0JpLv2_TDaicflqJQLeuhaCdswSbMQb6SNz8/edit?usp=sharing

Remaining Work:

1. Choose an appropriate battery that meets the power requirements of the device.
2. Modify the file writing process(Arduino IDE Code) to ensure optimal storage and power efficiency.
3. Waterproofing materials

TO DO LIST:

1. Convert epoch to datetime
2. Movement sensing write
3. Movement sensing low power

4. Recharge battery using tiny
5. Battery capacity check
6. Adjust the data collection frequency based on the turtle's movement.

Overview of the Existing Device

Hardware components:

- TinyCircuits TinyZero [processor board with accelerometer] x 1 => 20mm x 20mm board
- TinyCircuits TinyShield MicroSD (64GB) x 1
- TinyCircuits Lithium Ion Polymer Battery x 1
- Generic micro SD card x 1

Software:

- Arduino IDE

Features:

- Weight (without battery or case): < 3grams
- Weight (with 290 mAh battery and case): **10 - 15 g**
- Dimensions (without battery or case): 20mm x 20mm x 8mm
- Battery life: 2 weeks - 1 month (**more than 2 weeks**)
- Cost: < 60 USD

Waterproofing:

- Wrap the device in plastic (zip-close bag or plastic wrap).
- Coat with A+B epoxy for waterproofing and protection.
- Use epoxy to attach the device securely to the turtle shell.

Important Links:

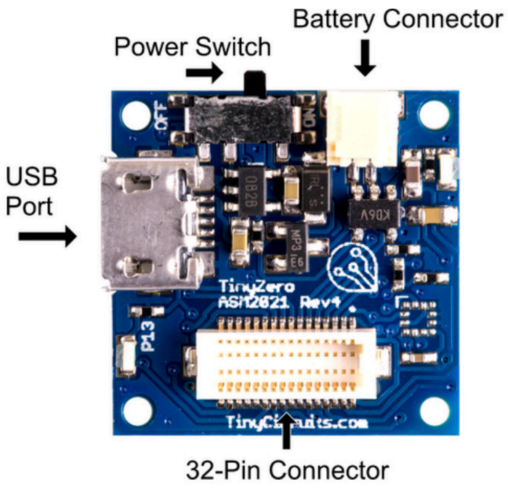
- TinyZero Setup Tutorial

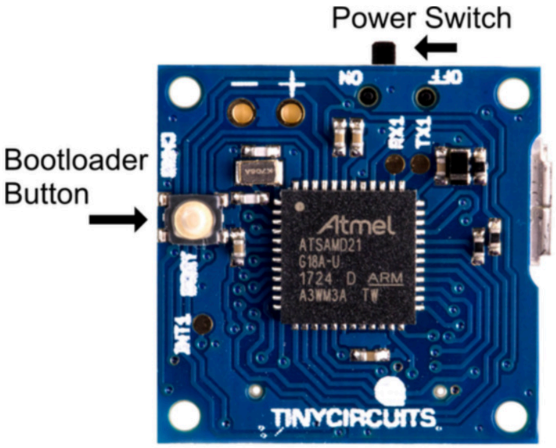
Items in the package:

- 3x TinyDuino processor boards
- 6x microSD TinyShields
- 3x TinyZero processor boards
- 3x Accelerometer TinyShields
- 1x USB TinyShield [It is an expansion board for TinyZero systems that provides USB connectivity - Programming the TinyZero + Power Supply]
- 2x UMC 8GB cards

TinyZero processor board:

- Setup: https://learn.tinycircuits.com/Processors/TinyZero_Setup_Tutorial/#hardware
- The **bootloader button** on the TinyZero board is used to put the board into programming mode. How to use it:





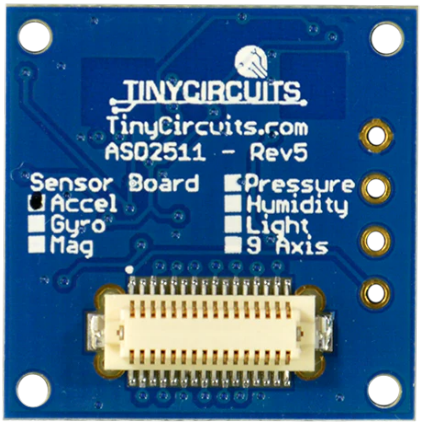
1.Connect the TinyZero board to your computer via USB.

2. Press and hold the bootloader button.
3. Release the button once the board enters bootloader mode (often indicated by an LED blink).
4. Upload the new code using the Arduino IDE.

You only need to use the bootloader button if:

- The board is not being detected by the Arduino IDE.
- The upload process is failing.
- You need to recover from a bad or stuck program.

- **Our TinyZero doesn't have a built-in accelerometer.**



Accelerometer TinyShields:

- Setup: https://learn.tinycircuits.com/Sensors/Accelerometer_TinyShield_Tutorial/
- This TinyShield has a Bosch BMA250 3-axis accelerometer that measures tilt, motion, shock, and vibration. It also includes a temperature sensor.
- **We don't need to connect the Accelerometer TinyShield to a separate power supply.** [When we attach the TinyShield to the TinyZero board, it gets power directly from the TinyZero's 5V pin (or 3.3V, depending on the board's setup).]