Proto Buffers

Google's protocol buffers are a method of storing /serializing information in an ordered way. It is similar to JSON, pickling, and XML.

Proto File

The first step is to create a structured proto file, which is essentially a .proto text file that lists out the structure.

Compiling

Once you've specified the proto buffer file, you have to compile, typically using protoc.

Importing

Once you've compiled the proto buffer library, you can import to respective code.

CARIS Proto Buffer Structure

```
syntax = 'proto3';

message frameUnit{
    optional double time_stamp=1;

    enum Sensor {
        IMU_9 = 0;
        IMU_6 = 1;
        USS_DOWN = 2;
        USS_FORW = 3;
        PI_CAM = 4;
    }

    optional Sensor sensorType = 2;

    optional float acc_x = 3;
    optional float acc_y = 4;
    optional float acc_z = 5;
    optional float angular_x = 6;
    optional float angular_y = 7;
    optional float angular_z = 8;
    optional float mag_x = 9;
    optional float mag_y = 10;
    optional float mag_z = 11;

    optional float heading = 12;
    optional float pitch = 13;
    optional float roll = 14;

    optional float USensorForward = 15;
    optional float USensorDownward = 16;

    optional bytes piCamImage = 17;
    optional int32 imageHeight = 18;
    optional int32 imageWidth = 19;
}
```

Running Compiler

```
1. cd to the folder containing protoc.exe.

2. Run protoc.exe through the cmd line for python and C++
protoc -I=$SRC_DIR --python_out=$DST_DIR $SRC_DIR/addressbook.proto
protoc -I=$SRC_DIR --cpp_out=$DST_DIR $SRC_DIR/addressbook.proto

if $SRC_DIR or $DST_DIR are not specified,
use the folder protoc.exe is in.
(In which case you'll need to have proto file in same directory)

Libraries have now been created for C++ and python for you to import.

For the Teensy, see below to get a smaller-sized file.
```

Converting PB to nanoPB for Teensy

```
Once you have your pb file, you have to generate nanopb files.

Use the following code to generate the appropriate header and c file.

protoc -omessage.pb message.proto
python nanopb/generator/nanopb_generator.py {$message.pb}
The resulting output files can then be included onto the Teensy wheel

module code so that you can interpret proto buffer messages across
the different code platforms.
```