Smart Hiking Bladder

Group 45

Bobi Shi  Shuchen Song Dufei Wu
Introduction

Water bladder is a necessary and significant hydration component for hiking, camping and cycling fans. Our target is to design a hiking bladder that measures the water consumption through a flow meter inserted between the bladder and the straw. The bladder will then allow the user to check the water amount left through a LCD screen without taking it out of the backpack. The purpose of this design is to help traveller keep track of the water resource and make better travel plans.
Block Diagram

- Analog Signal
- Power
- Digital Signal

Sensing Unit:
- Water Flow Meter
- Pressure Sensor

Control Unit:
- Microcontroller
- Bluetooth

Display Unit:
- LCD screen

App Unit:
- Smart Phone
Block Description: Force-Sensing Resistor (FSR)

The resistance of a force-sensing resistor (FSR) changes with the force applied to it. And we are going to place two FSR on the bladder to measure the initial water amount in the bladder. By connecting a FSR in series with another resistor with known resistance, applying a fixed voltage and recording the voltage across one resistor, we will be able to get the resistance of the FSR using voltage divider rule. Then we can map it to find out the applied force as well as the mass of the water.
Circuit Schematic & Calculation: FSR

\[ V_{out} = \frac{V \times R_M}{R_M + FSR} \]
Plots: FSR

Resistance vs. Force

Resistances (kΩ) vs. Force (g)

100
10
1
0.1
10
100
1000
10000

Resistance vs. Force
<table>
<thead>
<tr>
<th>Requirement</th>
<th>Verification</th>
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| Provide weight of liquid with the accuracy of ±5% | i. Set up the sensors as described in schematic
|  | ii. Apply 5V voltage to the sensor
|  | iii. Use a beaker to measure 1L of water and pour all the water into the bladder
|  | iv. Record the voltage and calculate resistance of the FSR
|  | v. Use the resistance to calculate the estimated amount of water (the actual relationship between the volume and R will be determined during tests in set up.
|  | vi. Verify if the two results are consistent.
|  | vii. Without pouring out the water, add 200 mL more water into the bladder and repeat the test. Repeat the step vi for five times.
Safety Statement

- One of the safety issues may caused by our device is the contamination of the water. We need to check the material used in parts, which have directly contact with water, will not generate pollution to water which are against drinking safety.

- Another safety issue may occur is the leak of electricity, potentially causing people drinking the water get shocked. We will check the voltage level between the water and a person.
Reference
