Heart Buddy Overview

The Heart Buddy is a low-profile, portable armband specialized in getting help to individuals before or as soon as an accident occurs via sensors such as heart beat, body orientation, and acceleration. The Heart Buddy keeps track of many human vitals, allows doctors to get real time statistics on their patience, track sleep cycle, and overall secure the well-being of the user.
The HB Development Team

- Andrew Pagan: The BIG FALL, Heart Rate Sensor, LCD Touch Screen
- Andrew Villagomez: GPS, WIFI
- Jairo Hernandez: Bluetooth, The Triple Threat (Accelerometer & Gyroscope)
- Jose Reyes: Pedometer Algorithm, Temperature Sensor
Block Diagram

- Bluetooth
- LCD Touch Screen
- GPS
- WiFi
- UART
- PC
- Heart Rate Sensor
- Heart Buddy
- NXPLPC4088 CORTEX M4 Processor
- App
- Temperature Sensor
- Analog
- Pedometer Algorithm
- IMU Breakout aka The Triple Threat
- Accelerometer
- Gyroscope
Parts - Processor

● NXP Semiconductors LPC4088FBD208,551
  ○ Max clock speed: 120 MHz
  ○ Operates between 2.4V and 3.6V

● Serial Interfaces
  ○ 5 UART, 3 I2C, 3 SPI, 1 I2S

● 512 kB of flash memory and 96kB of RAM

● Price: $12.92
The Big Fall

- gyroscope
- accelerometer
- compass, barometric pressure/temperature

“Help! I’ve fallen and can’t get up.”
Parts - Heart Rate Sensor

- SparkFun Single Lead Heart Rate Monitor - AD8232
- Interface:
- The Perks
  - 3.5 mm jack for biomedical pad connection (extra $)
    - Also extra: sticky pads
  - Analog Output
  - Exactly what we need!
- Operating voltage: 3.3 V
- Price: $19.95
Parts - LCD Touch Screen

- NHD-5.0-80040TF
- 5 inch display
- Capacitive TouchScreen with aspect ratio of 800 x 480 pixels
- 3.3 V LCD
- Operating Temperature
  - -20C to +70C
- Cost: $60
Parts - GPS Module

- Maestro Wireless GPS Receiver With Integrated Antenna: A2035-H
- Fast, responsive location experience
  - High-sensitivity navigation engine with tracking down to -163dBm
  - 48 track verification channels
- Micro power technology
  - Requires only 50 – 500µA to maintain hot start capability
- Active jammer remover
  - Removes in-band jammers up to 80dB/Hz
- Operable at 3.3V / 24mA
- UART Interface
- Cost: $21.90
Parts - WIFI Module

- RN171XVW-I/RM Ultra-low power
  - 4 uA sleep, 35 mA Rx, 185 mA Tx at 12 dBm
  - Tx power configurable from -2 to 12 dBm 2.4GHz IEEE 802.11 b/g transceiver
- Configuration over UART interface using ASCII commands
- Secure WiFi authentication via WEP, WPA, and WPA2
- Embedded Networking Applications
- Cost: Free due to extras
Parts - Bluetooth Module

- Microchip Technology RN41-XVC
- Backwards-compatible with Bluetooth version 2.0, 1.2, and 1.1
- UART interface
- 3.3 V voltage supply
- Low power (30 mA) when connected
- Cost: Free due to extras
Parts - The Triple Threat

- Adafruit 10-Degrees of Freedom IMU Breakout
- Consists of a 3 axes gyroscopic, 3 axes of accelerometer, 3 axes of magnetic (compass), barometric pressure/altitude and temperature
- One I2C
- Component in Big Fall
- Cost: $29.95
Overview:
- Steps Parameter
  - Incorporate a digital filter to smooth the signals coming from the 3-axis accelerometer (The Triple Threat).
  - The system will continuously update the max and min values of the 3-axis acceleration every 50 samples
  - The step counter will calculate the steps from the x-axis, y-axis, or z-axis, depending on which axis acceleration change is the largest one.
  - A time window will be used in order to discard any invalid vibrations
  - At the end a count regulator determines whether the steps are part of a rhythmic pattern that way it can count only the valid steps taken.
Cont. Pedometer Algorithm

● Overview:
  ○ Distance Parameter
    ■ Using the steps counted above every two seconds, the current stride length can be calculated
  ○ Speed Parameter
    ■ The speed, distance over time, will be calculated as steps per 2s multiply by stride per 2s
Parts - Temperature Sensor

• ENV-TMP V1.4
  ○ Wide Temperature Range: -20°C - 133°C
• Analog Interface
• Features High Temperature Accuracy
  ○ Can measure the temperature approximately every 1ms
• 3.1V to 5.5V Operating Range
• Cost: $25.00
Printed Circuit Board
Thanks for listening