- Function Display

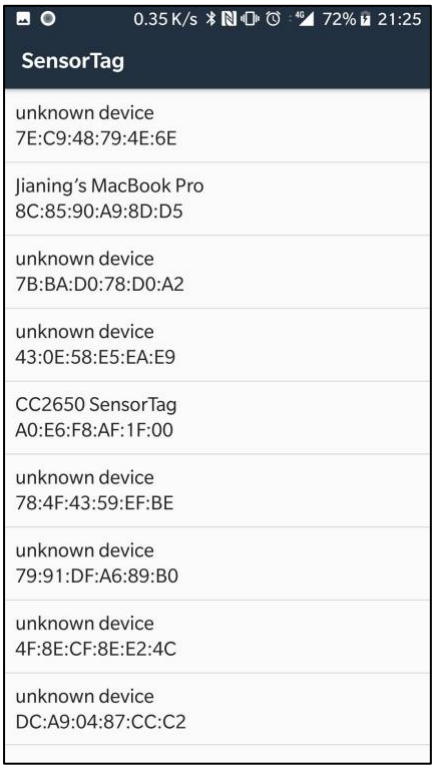


Figure 1

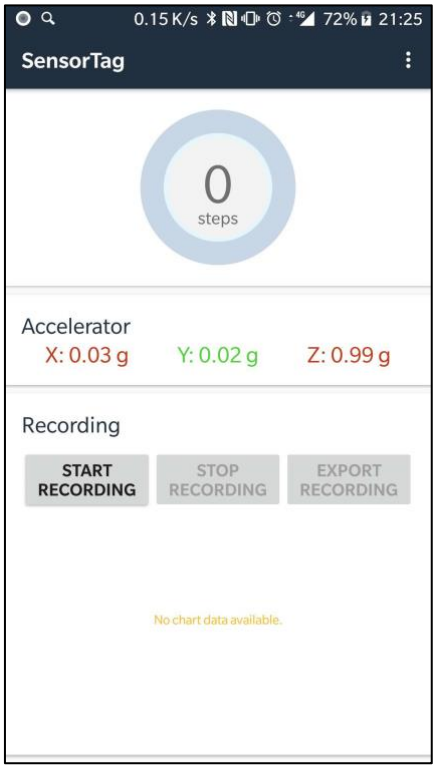


Figure 2

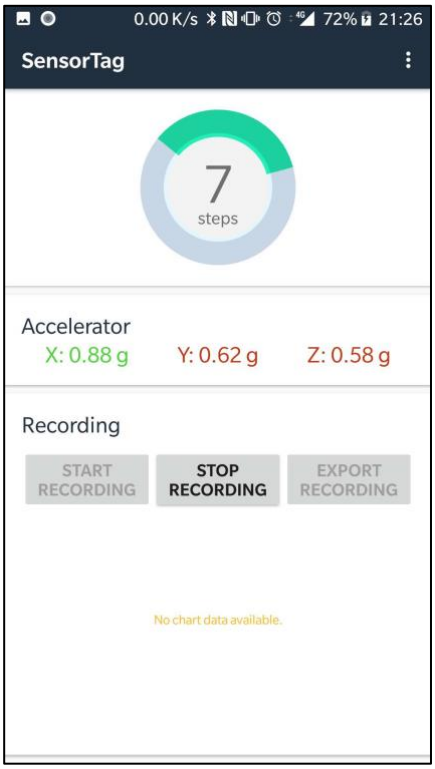


Figure 3

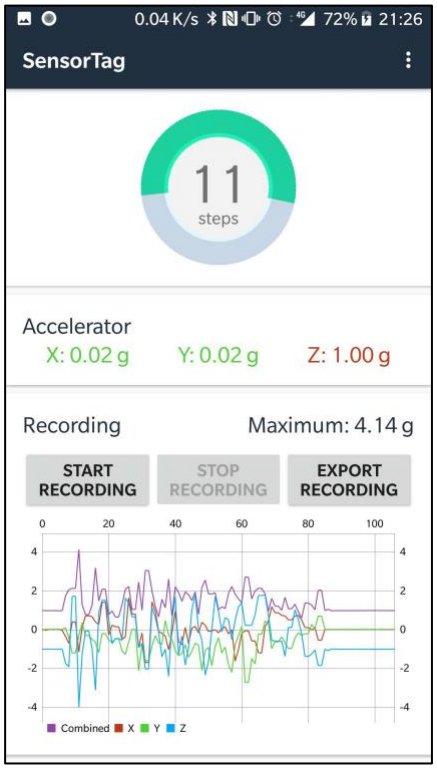


Figure 4

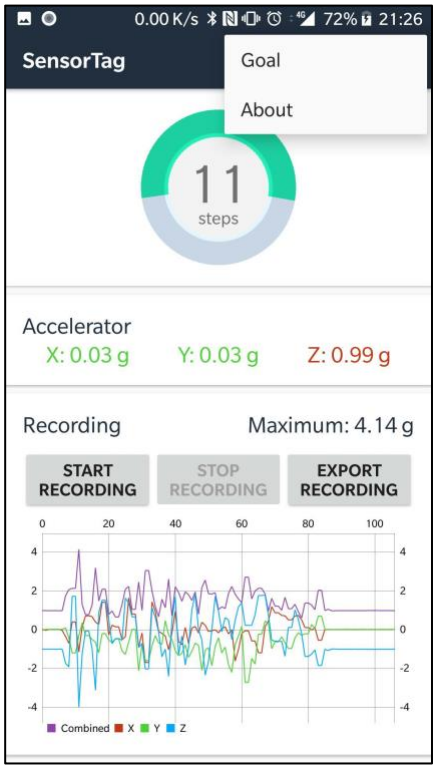


Figure 5

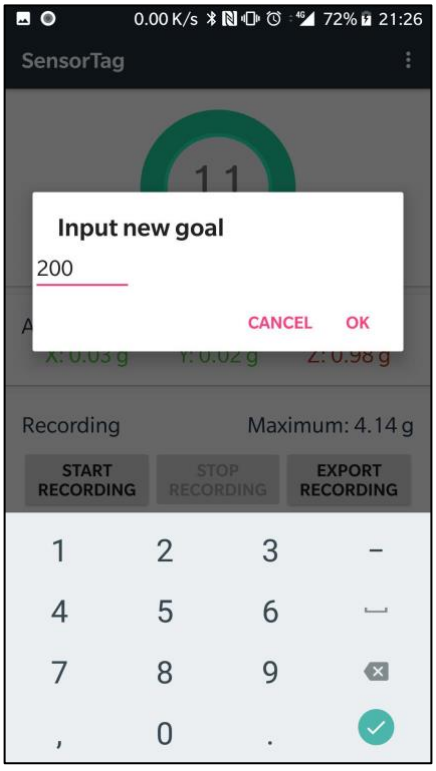


Figure 6

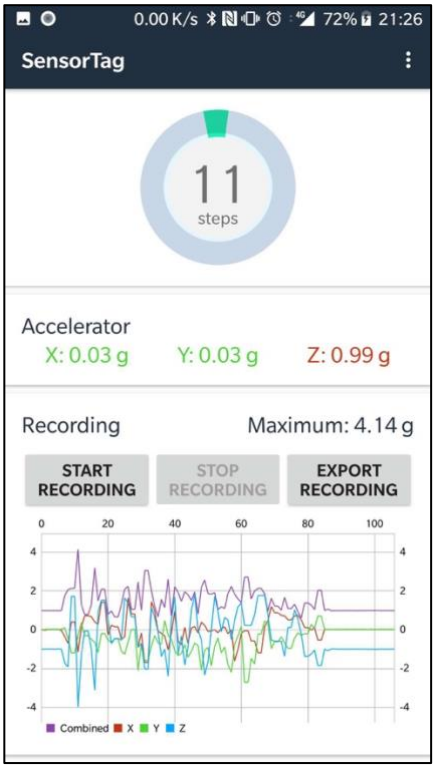


Figure 7

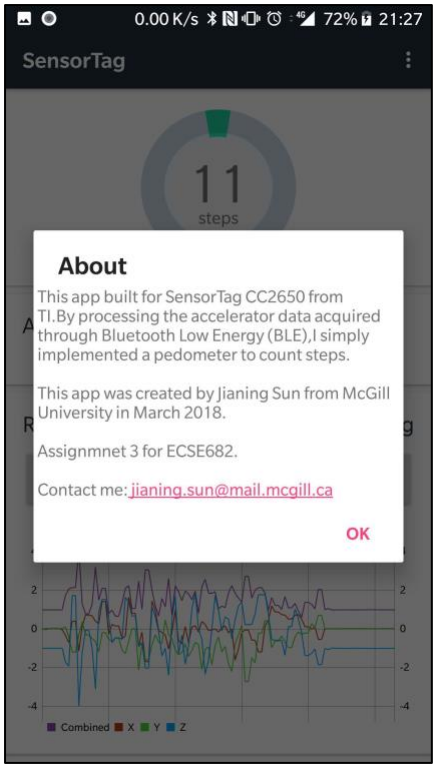


Figure 8

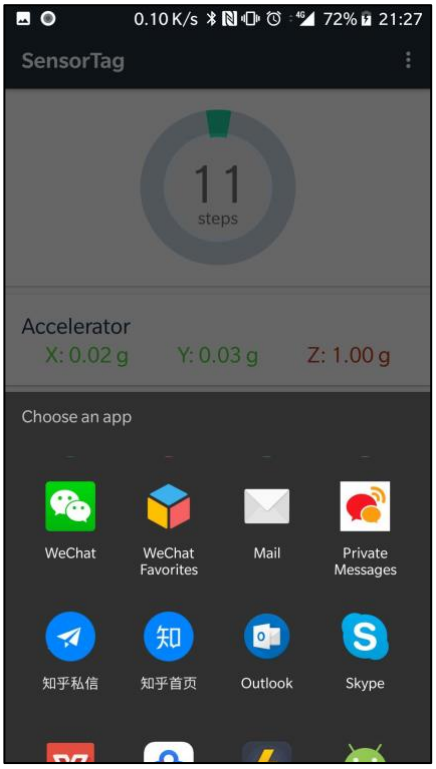


Figure 9

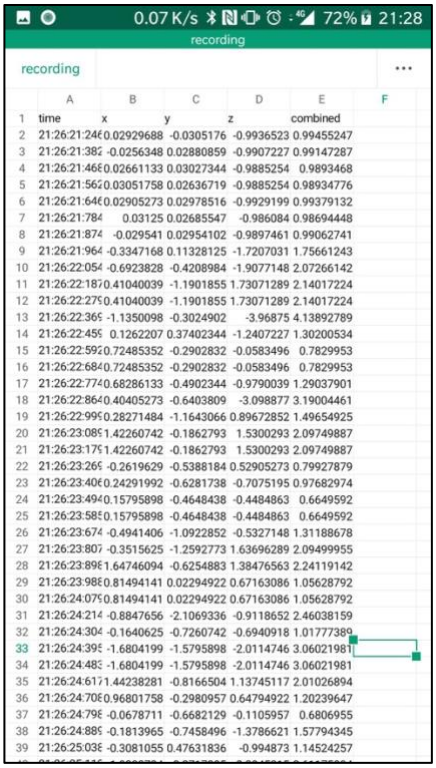


Figure 10

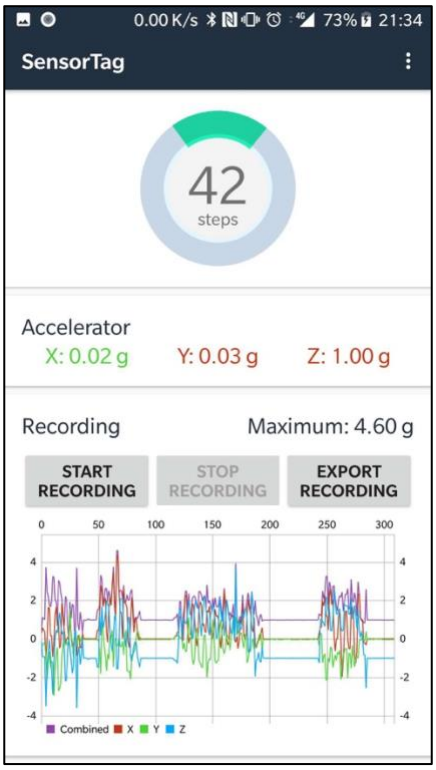
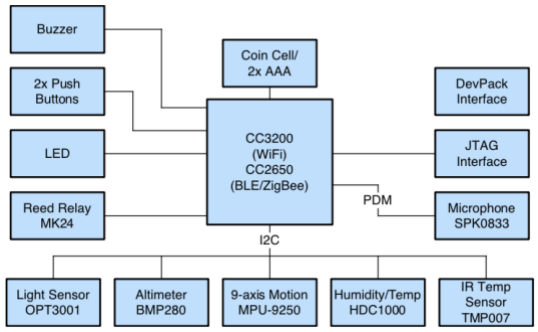
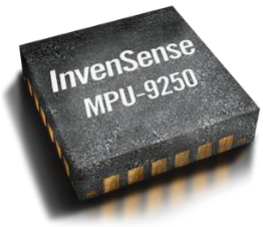


Figure 11

Figure 1: Scan BLE device.
Figure 2: Initial view after successful connecting with BLE.
Figure 3: Press START RECORING and start the step counting.
Figure 4: Press STOP RECORING then display line chart of recorded data (x, y, z axes and their combination).
Figure 5: Two menu items – Goal for modifying the pedometer goal; About for information of this app.
Figure 6: Press menu item Goal. A dialog fragment used to input new goal.
Figure 7: View after input the new goal – the piece of goal in the pie chart has been updated.
Figure 8: Press menu item About.
Figure 9: Press EXPORT RECORDING – display applicable applications in your device to export/transfer the recorded data.
Figure 10: Exported data file.
Figure 11: Overall display.

- 2-column document explanation for the BLE and sensor usage

<table>
<tr>
<td>System Block Diagram</td>
<td> 
</td>
</tr>
<tr>
<td>Bluetooth Low Energy (BLE) chip CC2650
 
</td>
<td>The CC2650 device is a wireless MCU targeting Bluetooth Smart. The device is a member of the CC26xx family of cost-effective, ultra-low power, 2.4-GHz RF devices. The ability to consume very low active RF and MCU currents and low-power mode currents provides excellent battery life for the device. This ability also lets the device operate on small coin cell batteries and in energy-harvesting applications.</td>
</tr>
<tr>
<td>MPU-9250 Nine-Axis (Gyro + Accelerometer + Compass) MEMS MotionTracking™ Device
 
</td>
<td>1) Digital-output X-, Y-, and Z-Axis angular rate sensors (gyroscopes) with a user-programmable full-scale range and integrated 16-bit ADCs
2) Digital-output triple-axis accelerometer with a programmable full-scale range of 2g, 4g, 8g and 16g and integrated 16-bit ADCs
3) 3-axis silicon magnetic sensor with magnetic concentrator</td>
</tr>
<tr>
<td>Sensor Usage Configuration:

mEnable.setValue(0b1000111000,
BluetoothGattCharacteristic.FORMAT_UINT16, 0);
mGatt.writeCharacteristic(mEnable);

GATT Primary Service Declaration:

mMovService =
mGatt.getService(UUID.fromString("F000AA80-0451-4000-B000-000000000000"));
mEnable =</td>
<td>
<table>
<tr><th>Bits</th><th>Usage</th></tr>
<tr><td>0</td><td>Gyroscope z axis enable</td></tr>
<tr><td>1</td><td>Gyroscope y axis enable</td></tr>
<tr><td>2</td><td>Gyroscope x axis enable</td></tr>
<tr><td>3</td><td>Accelerometer z axis enable</td></tr>
<tr><td>4</td><td>Accelerometer y axis enable</td></tr>
<tr><td>5</td><td>Accelerometer x axis enable</td></tr>
<tr><td>6</td><td>Magnetometer enable (all axes)</td></tr>
<tr><td>7</td><td>Wake-On-Motion Enable</td></tr>
<tr><td>8:9</td><td>Accelerometer range (0=2G, 1=4G, 2=8G, 3=16G)</td></tr>
<tr><td>10:15</td><td>Not used</td></tr>
</table>
</td>
</tr>
</table>

`mMovService.getCharacteristic(UUID.fromString("F000AA82-0451-4000-B000-000000000000"));`	

- Efficiency and Robustness

From the Android Profiler monitor we can see when my SensorTag app is running, it only occupy 6% CPU resources and 66.83MB memory no matter if it is recording or not. In contrast to Classic Bluetooth, BLE is designed to provide significantly lower power consumption and after running and recording data for 2 hours, there was only 30% consumptions of my battery energy and most of them comes from the screen.