Embedded Software for the Internet of Things Project

FALL DETECTOR

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Index

1. Problem Statement

The idea behind the project was to develop a system campable to detect falls or drops of an individual, the main features are:

1. Detect Falls
2. Ask if the individual got injured
3. Respond to the answer

2. Basic Working Scheme

Sensor used:

1. Main Sensor: . 3-Axis Analog Accelerometer
    1. To detect movement and drops wich is the main feature
2. Buttons: 2 User Push Button
    1. User interact with the system by pushing the buttons, afterwards the device responds differently to each button
3. WiFi: CC3100
    1. It sends messages if user request after a fall

3. Software Architecture

1. Software core blocks:
2. C program devided in different libraries for hardware initialization and testing and data collection
3. Interrupts used:
    1. ADC14, default clocksource (5MHz) with clock devider 8
    2. display orientation
4. Timers:
    1. Timer_A0_BASE used for buzzer
5. Fall detection function and algorithm decided to be used into main while loop
    1. To avoid detection bugs
6. Buttons and user interecation:
    1. If fall is detected, display pop user interactions display
7. Main data structure:
    1. 3-axis accelerometer data collection every 50ms+hardware time
    2. Check if real time value have significant changes in short time

4. Testing

1. User interface testing:
    1. A lot of web-research
    2. Mainly hardware testing
    3. Used joystick as fall trigger, to avoid accelerometer related bugs before proper data analysis
2. Data analysis:
    1. Data collection via UART
    2. Plotting data via Python
    3. C program to work the data and check any mean +- var correlation possibilities
    4. Hardware testing of the accelerometer

5. Conclusions and Future Work

1. Conclusion:
    1. The device has an implementation of 4 different sensor
    2. It works properly on normal falls and drops
    3. It has a working user interface
2. Future works:
    1. Always in need of debugging
    2. Better detection of falls and drops
    3. Main ideas could be:
        1. Airbag for bikes, motocycles or skis
        2. Wearables for elder people