Team 6 Reintroduction

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Outline

I. Project Introduction

II. The Solution
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   II. Progress
   III. Catastrophe

III. The Alternative Solution
   I. Progress

IV. Conclusion

V. Acknowledgements

VI. Questions
Mechanical Stethoscopes
- Chestpiece: metal casing with diaphragm
- Earpiece: hollow tubing with spring

Electrical Stethoscopes
- Preserve look
- Bulky and Heavy
- IR data Transfer
An electronic stethoscope that will:
- Aid in auscultation
- Perform frequency filtering
- Record digital audio data from the patient
- Store the audio files on the device
- Transfer the audio files to a computer via USB
- Contain these features in a convenient media-player like form-factor
- Provide a wireless chestpiece
The Solution

Introduction

The Solution

Alternative Solution

Conclusion
Main Criteria:
- USB Device functionality
- DSP Functionality (Hardware Multiply)
- Power consumption
- Clock Speed
- RoHS compliance

Minor Considerations
- Available memory, removable media interface, GPIO, ADC, price, dev kit

Choice: Freescale MCF5275
## Design Decision – Operating System

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**Introduction**

**The Solution**

**Alternative Solution**

**Conclusion**
Design Decision - Wireless

- Considerations
  - Range
  - Reliability
  - Development Time

- Choice: F2M03MLA:
  - Benefits:
    - Made for Streaming 16bit Audio
    - Small Efficient Package
    - Full FCC Qualification
    - Built in Firmware
  - Deterrents:
    - Cost
Design Decision – Chestpiece Power Supply

• **Choices:**
  • **Battery – Li-ion**
    • Greater energy density
    • More common
  • **Supercapacitor**
    • Higher risk - unique
    • Quicker charge time

• **Choice:**
  • **Two 10F 2.7 Volt supercapacitors in series**
    • Estimated Typical Runtime = 13 minutes at 22mA (observed current)
    • Estimated Minimum Runtime = 4 minutes at 75mA (datasheet max.)
Progress – Chestpiece Design
• Firmware in flash
• Bootloader is complete
• Breadboard prototyping
  • LCD functional
  • CODEC control functional
  • Bluetooth control functional, streaming non-functional
• Filter algorithms complete
• WAV encoding/decoding software complete
• Chestpiece prototype in testing
• I2C, SPI, UART, EPMOD drivers (mostly) complete
Catastrophe

• During debug, microprocessor board shorted out
• Board no longer boots
• Replacement board not available until May 15

Dramatization
The Alternative Solution

• Embedded platform emulated on PC running Ubuntu Linux and Qt graphics
• Beltpack is replaced by computer, chestpiece design unchanged
The Alternative Solution - Progress

- Wired audio streaming functional
- Digital filtering, recording, and playback complete
- Qt GUI design complete
- Wireless audio streaming non-functional
- Power supply testing complete
The Alternative Solution - Progress

Introduction

The Solution

Alternative Solution

Conclusion
• What we have learned
  • Deceptive marketing and poor product support are big problems
  • Device interfaces are very important
  • Open-source software is not always functional

• What we would do differently
  • Microprocessor selection
  • Add 5th team member – mechanical
  • Wireless design
Resources

• Francis Andries – Andries Auscultation
• Dr. Rob “The Bossman” Bossemeyer
• David Dunayczan – Freescale Semiconductor
• David Josephson – Josephson Engineering
• Dr. Srinivas Janardan – Grand River Gastroenterology
• uClinux-dev, uClinux-coldfire, uClinux.org, uCdot.org, CLUG, u-boot-users
• DornerWorks Embedded Systems Engineering
• CodeSourcery
• Prof. Randall Brouwer
• Prof. Steven VanderLeest
• Professor Joel Adams
• Kyle Schlansker
• Zach Luchies
• Matthew Fetke – Videon Central
• Liew Tsi Chung – Freescale Semiconductor
Rhythm Reloaded supports GNU Linux