Agenda

- Project Description
- Design Criteria
- Design Overview
- Design Components
  - Background
  - Design Implementation
- Schedule
- Testing Criteria
Project Description

- Asante Solutions, Inc. and RCPD
- Blind user focused insulin pump
  - 40% of diabetics are visually impaired
Project Description

Customers:
- Asante Solutions, Inc.
- Medical Community
  - Resource Center for Persons with Disabilities
Asante Solutions, Inc.

- **Requirements**
  - Separate unit

- **Information**
  - Serial port with UART connection (ASCII 8-bit)
  - Microcontroller
  - Software model
Medical Community Feedback

- **Doctors and Nurses**
  - ‘Simply that [insulin pumps] are not designed with [blind users] in mind’

- **Blind Users**
  - **Buttons**
    - Distinguishable
    - Description on pump
  - **iPhone**
    - VoiceOver

![VoiceOver screenshot on an iPhone](image)
Design Criteria

- Essential
  - Safety
  - Cost
  - Materials

- Aesthetics
  - Product Design
  - Intuitive Controls
  - Size
Initial Speech Concept

1) Text-to-Speech:

- **Pros**
  - Less Programming
  - Easy Word Addition
  - Low Cost

- **Cons**
  - Robotic Voice
  - Mispronunciations
  - Large IC
  - Requires External Microcontroller
2) Digital Speech:

- **Pros**: Better Sound Quality, More Speech Options, More Language Options

- **Cons**: Requires Additional Programming, Data Loss
Design Overview

- LCD Screen
- Microcontroller
- Digital Speech Chip
- Haptic Feedback
- Buttons
- Capacitive Touch
- Headphones
- Speaker
Design Components

- Digital Speech Chip
  - V-Stamp

- Button Feedback Response
  - Capacitive Touch
  - Haptic Technology
  - Microcontroller (MSP430)

- Audio System
  - External Speaker
  - Headphone Jack

- External Power Supply
V-Stam

- Voice and Sound Synthesizer and Recorder
- Digital Speech and Text-to-Speech Capabilities
- Associate Incoming ASCII Code with Auditory Response
- V-Pod Development Board
  - Docking Station
  - RS232 Connection
  - Audio Subsystem
  - Microphone
  - I/O pins
V-Stamp

- RCStudio
  - V-Stamp Programming
  - Simulation
  - Control Panel
  - Recorded Memory Library
  - Exception Dictionaries
Capacitive Touch

**Background:**
- Change in Capacitance Used as Input
- Indirectly Measured Through Change in Voltage
- Surface Capacitance
  - Uniform electrostatic field
- Projected Capacitance
  - Electrostatic grid
Capacitive Touch

**Implementation:**
- Button Feedback
- Conductive Tape Attached to Buttons
  - Non-Invasive
- MSP430 controlled
Haptic Technology

**Background:**

- Recreates Sense of Touch in Electronic Devices through Vibrations
- Microcontroller
- Haptic Driver
- Haptic Actuator
  - Linear Resonant Actuator
  - Eccentric Rotating Mass
  - Piezo
Haptic Technology

**Implementation:**

- Tactical Button Feedback
- Motor Vibrations: Button Notification
- Components:
  - MSP430
  - DRV2605 Driver
  - Linear Resonant Actuator
- Time Permitting
Haptic Technology

Complete Design:
MSP430

**Background:**
- Ultra Low Power Microcontroller
- Mixed Signal
- 16 Bit CPU
- 16 KB Flash Memory
- Universal Serial Communication Interface
- 16 General Purpose Input/Output Pins
  - 8 Channel Comparator
  - 8 Channel ADC
Implementation:

- Inputs:
  - Capacitive Touch

- Outputs:
  - Haptic Driver
  - V-Stamp: Read Portion of ASCII Code for Selected Button

- Testing: Touch Pro Tool
Power Supply

- External Battery Source
- Need: 5V (Audio Components) and 3.3V (MSP430 & V-Stamp)
- Two CR2032 Lithium Coin Cell batteries
- Two Voltage Relators (LT323A & LM39401T)
Schedule

- Gather Parts
  - October 27th
  - Breadboard Creation
  - Program
  - Test

- Hardware and Software Connection
  - Create in Eagle
  - Translate Output
  - Create Algorithm

- Testing
  - November 21st
  - Create Algorithm
  - Code Debugging
  - Hardware Troubleshooting

- Case Design
  - November 30th
  - Print Case
  - Integrate Components in Final Design
Recent Milestones

- **V-Stamp**
  - Speaking ASCII Characters via Text-to-Speech
  - V-Pod Replicated on Breadboard
  - Words/Phrases Recorded in Memory Bank
Recent Milestones

- Capacitive Touch
  - Programmed with Energia
  - Wires Output Different Speaker Tones
Testing Criteria

- Unobtrusive
  - For User
    - Temperature
    - Size/Weight
  - For Insulin Pump
    - Non-interfering

- Intuitive
  - Response Priorities
  - Understandable

- Power Consumption
Questions?