Automatic Handshake Contact Information Exchanger

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OVERVIEW

- Introduction & Key Features
- Design & PCB Revisions
- Requirements & Verification
- Project Build
- Successes & Challenges
- Failed Verifications
- Future Work
INTRODUCTION & KEY FEATURES

• Wireless exchange of contact information
• 4 modes — Off, Receive Only, Send Only, Receive & Send
• Stores up to 160 cards
• Low battery indicator
• Low memory indicator
• Received business cards can be uploaded to a personal computer
• Data can also be uploaded to a Smartphone
  – Useful if the other person does not own a bracelet
DESIGN REVISION
HARDWARE OVERVIEW

- Top PCB

Power Supply

User Interface
• Bottom PCB
HOW DOES IT WORK?

• Doesn’t connect to any random device
  – All are undiscoverable when no handshake
  – Before handshake use Switch to set one as Master
  – Upon handshake, Slave becomes discoverable & master connects
  – After data transfer, Master kills connection

• At the end of the day, one can view all business cards by uploading VIEW code to device

• To update one’s own business card, edit and then upload UPDATE code to device
1. **Accelerometer**
   - Detect acceleration due to gravity in x, y & z directions
   - Detect acceleration due to motion
Accelerometer Verifications

Figure: Oscilloscope Output for Accelerometer
2. Bluetooth Module

- Connect & communicate without error within 0.2m – 5m
- Data transfer less than 2 seconds
- Kill connection after transfer completed
Bluetooth Verification

- Simple code to send characters from computer between Bluetooth modules
- After relayed between modules, characters were printed back to the screen to ensure errorless data transfer
3. **External Memory**

- When writing to memory
  - *data should be stored in correct address specified by code*

- When reading from an address
  - *correct data should be printed to serial monitor*
External Memory Verification

- 4 “mock” business cards written to separate memory locations

- Simultaneously read these 4 “mock” cards

- Print data to screen to ensure proper reading and writing functionality
4. **Switches**

- Output logic high when on
- Output logic low when off

**Switch Verification**

- Probe GND and switch inputs (3.3VDC) with oscilloscope.
- When toggled, switch outputs GND or 3.3VDC
Switch Outputs

- **Figure: When switch is ON**
  - 3.3V
  - Gnd

- **Figure: When switch is OFF**
  - Gnd
5. **Low Battery Indicator**

- Turn on LED when \(~15\%\) battery life is remaining

- \(V_T \sim 4.8V\)

Figure: Battery Lifetime (from datasheet)
Low Battery Indicator Verification

• Connect +6V DC power supply to circuit input and sweep
  – Verify that LED is off when V > 4.8V
  – Verify that LED is on when V < 4.8V
6. **Low Memory Indicator**
   - Required to light an LED when ~15% of memory remaining

**Verification**

- Set low threshold (ex. 3 contacts) for testing
- Write “mock” data to memory
- Observe that LED lights up above threshold
7. **Power Supply**

- Outputs +6V to the Arduino RAW input pin
- Arduino $V_{CC}$ outputs regulated +3.3V

**Verification**

- Probe power supply output with the oscilloscope
- Output should be 6V +/- .5V
PROJECT BUILD

1. Handshake Detection
2. Bluetooth Communication
3. Low Battery Indicator
4. Storing Data to External Memory
5. Microcontroller & Low Memory Indicator
Handshake Detection

Arm swing

Handshake
Low Battery Indicator

- Uses op-amp circuit as analog comparator
- Threshold to light up LED is set using
  - Resistor network
  - Zener diode
Storing Data to External Memory

- Received business card is stored in a 200 byte structure after connection is killed

- Number of business cards stored is located in address 0

- Use this number and the number of bytes in a business card to write to the correct memory locations
Microcontroller

- Used to control everything in the circuit
  - Processes data from the accelerometer
  - Tells Bluetooth modules to connect/disconnect
  - Sends/receives data from Bluetooth module
  - Writes and reads data from external memory
  - Indicates when the memory is low
PROJECT SUCCESSES

- Successful data transfer between two devices upon a handshake
- Reasonable battery life (~62.5 hours)
- Stores up to 160 contacts
- Reasonable size and weight
- Successful data transfer to Smartphone if desired
PROJECT CHALLENGES

• Bluetooth Module
  – Automatic connection & communication upon handshake

• Does not detect by false handshake

• PCB
  – Reduce size to fit on user’s wrist
FAILED VERIFICATIONS

• Power Supply failed when connected to entire load
  – Total load of circuit too big for button cells

• Solutions-
  – Step down voltage with buck converter or transformer to increase current supply to load
FUTURE WORK

1. Eliminate Master/Slave Switch

   – Use random delay on each device before attempting to connect

   – Use *GK command* after connection attempt to check (returns ‘1’ if connected, ‘0’ if not connected)

   – If connected, continue with data transfer

   – If not connected, use another random delay and retry connection
2. User interface
   – App for Smartphone
   – Programmer for computers

3. Include contact picture in business card

4. Check for multiple copies of same person in external memory

5. *Sleep mode to decrease power consumption* (BT module, etc.)
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