# AUTOMATIC HANDSHAKE CONTACT INFO EXCHANGER

By

WILLIAM HANLEY

KUANYSH SAMIGOLLAYEV

AMBIECA SAHA

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TA: Justine Fortier

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# Contents

# 1. Introduction

## 1.1 Title

**Automatic Handshake Contact Info Exchanger**

We selected to design this device in order to improve the way people exchange their contact information with each other. Instead of taking time to exchange information and wasting paper with business cards, you could automatically receive contact information with the shake of a hand. We are excited about doing this project because we believe that it would be useful to a lot of people in the business world.

## 1.2 Objectives

### 1.2.1 Goals

- To create a device that would be able to wirelessly transmit and receive contact information with a handshake
- To make the device as small as possible and be able to be worn by the user
- To make the product marketable if design is successful

### 1.2.2 Functions

- Wirelessly transmit data between two devices on the detection of a handshake
- The device will have 4 modes of operations: On/Off, Transmit Only, Receive Only, Receive & Transmit
- Data can be uploaded to a personal computer

### 1.2.3 Features

- A gyroscope and accelerometer to detect handshake
- Information being transmitted includes name, phone numbers, email, company name, position/title, address and URL
- If basic data transfer is successful then add the ability to transfer a picture along with contact information
- Device is completely wireless for the user

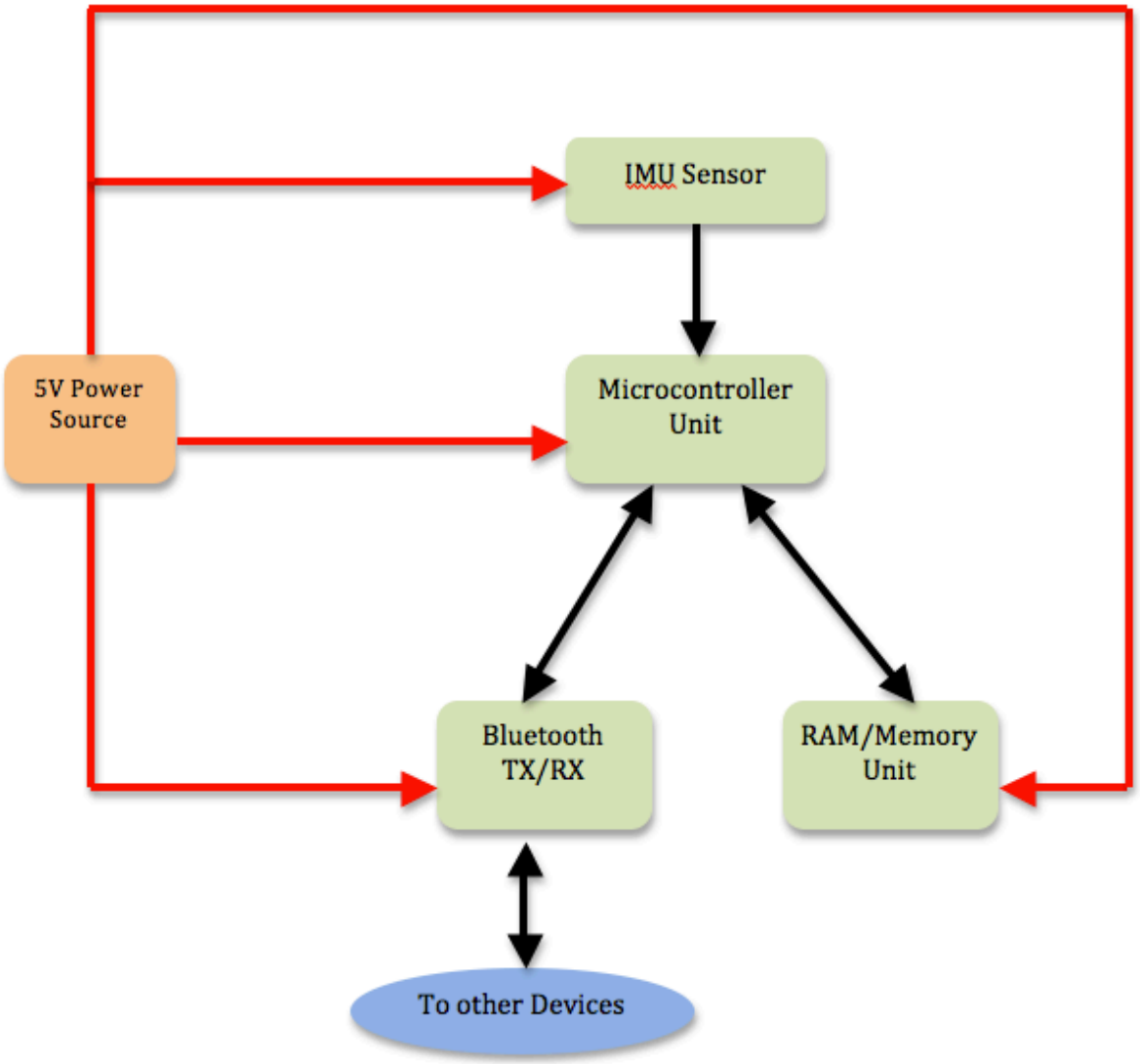
### 1.2.4 Benefits

- Quick exchange of contact information
- Availability of linked photograph allows user to quickly remember the person by face even if the user forgets the name

- Eliminate the need to print new business cards whenever information is updated
- Easy organization and access of contact information (reduces the need to carry around huge numbers of business cards; reduces risk of accidentally losing someone's business card)

## 2. Design

### 2.1 Block Diagram




| | |
|---|---|
| ___ | Power Flow |
| ___ | Data Flow |

## 2.2 Block Descriptions

### 2.1.1 Microcontroller Unit:

The microcontroller will be used to process received and transmitted data and store or fetch the coded data from the RAM/memory. It will also be responsible for controlling the flow of data throughout the device. It will specify the mode of communication between the two devices (Transmit only, receive only, ON/OFF, and swap).

### 2.1.2 IMU Sensor:

The IMU sensor will be the part of the circuit that detects when a handshake between two users is detected. It will be made up of an accelerometer and gyroscope that is able to sense the motion of the user's hand. When a handshake is detected it will send a signal to the microcontroller unit telling it to communicate with the other device.

### 2.1.3 RAM/Memory Unit:

The RAM unit will be in charge of storing the code words that will be transmitted between the two devices. The microcontroller will have direct access to the contents of the RAM. The memory size needs to be large enough to store up to about 100 users information.

### 2.1.4 Bluetooth Tx/Rx:

The Bluetooth transceiver will be used to send and receive the data being transmitted wirelessly between the two devices. The device can be low power because the communication range between two devices will always be less than 1 meter. Since the files being transmitted are generally small duration of communication time will also be low. The transceiver will use the microcontroller as a host to process the data.

### 2.1.5 Power Source:

The power source for the circuit components will be a small 3V button cell batteries. If needed, the cells will be connected in series to make a 6V source and a voltage regulator will be used to step down the voltage to 5V.

# 3. Block Level Requirements And Verification

## 3.1 Requirements

### 3.1.1 Microcontroller Unit:

- Able to properly process and store data when a handshake is detected
- Takes input signal from IMU sensor and outputs data to transceiver to be sent to other device
- Data must be read from memory and processed fast enough (~1 kbps) for complete transmission upon a handshake
- Ability to detect if received data has an error

### 3.1.2 IMU Sensor:

- Able to accurately detect the motion of a handshake
- Outputs a signal to the microcontroller only when a handshake is detected

### 3.1.3 RAM/Memory Unit:

- Must have enough memory to store about 100 business cards
- Read/write capabilities and be error free

### 3.1.4 Bluetooth Tx/Rx:

- Transceiver on each device must be able to exchange data at a range of ~30 cm (max handshake distance)
- Able to transmit and receive data at a rate of ~1kbps for complete data transfer during a handshake

### 3.1.5 Power Source:

- Considerable lifetime (>3 months) with normal usage

## 3.2 Verification

### 3.2.1 Microcontroller Unit:

1. Probe the output of the microcontroller to verify that data is being sent to tx/rx unit upon detection of a handshake.
2. Verify that the microcontroller is correctly reading/writing data to and from memory using debugging software.

### 3.2.2 IMU Sensor:

1. We will view the output of the sensor's accelerometer on the oscilloscope.
2. When the motion of a handshake is detected we will make sure the signal that is sent to the microcontroller goes high with a simple LED driver circuit.

### 3.2.3 RAM/Memory Unit:

1. We will verify that the memory unit is working correctly by writing random data to memory locations and then reading from those locations to ensure proper function.

### 3.2.4 Bluetooth Tx/Rx:

1. We can build the tx/rx unit on a breadboard initially in order to test its reliability for the requirements needed for this project.
2. These tests can be completed by writing software to input data serially to one unit and make sure the other unit is receiving the same data.

## 3.3 Tolerance Analysis

The most important component of our design will be the microcontroller unit. It is used to process the information that is being transmitted between the two devices. Our group will spend a lot of time testing this part of the device.

In order for this project to function the microcontroller must be able to process and transmit data at a fast rate without any errors. Upon detection of a handshake, data needs to be read from the RAM, processed, and sent to the tx/rx unit almost instantly (< 0.5s). We will test a variety of different data rates to see how fast data can be processed by the microcontroller without error and with minimum power consumption. The goal is to find a data rate that is fast enough for the required information to be transferred during a typical handshake without error.

# 4. Cost Analysis & Schedule

## 4.1 Cost Estimate

### 4.1.1 Parts

| Table 1: Parts Costs | | | |
|---|---|---|---|
| **Part** | **Estimated Cost/Unit ($)** | **Quantity** | **Total Cost ($)** |
| IMU Sensor (Accelerometer) | 10.00 | 2 | 20.00 |
| Microcontroller (TI MSP 430) | 10.00 | 2 | 20.00 |
| Bluetooth | 20.00 | 2 | 40.00 |
| RAM (1MB) | 10.00 | 2 | 20.00 |
| Power Supply (Lithium 3V button cells) | 3.00 | 1 | 3.00 |
| Resistors | 0.05 | 60 | 1.20 |
| Capacitors | 0.10 | 60 | 6.00 |
| Inductors | 0.10 | 60 | 6.00 |
| External Manufacturer for PCB | 30.00 | 2 | 60.00 |
| **Total** | | | **$ 176.20** |

### 4.1.2 Labor

| Table 2: Labor Costs | | | | |
|---|---|---|---|---|
| **Name** | **Rate/hour** | **Overhead (x 2.5)** | **Hours *** | **Total ($)** |
| W. Hanley | 50 | 125 | 180 | 22,500 |
| K. Samigollayev | 50 | 125 | 180 | 22,500 |
| A. Saha | 50 | 125 | 180 | 22,500 |
| **Total** | | | | **$ 67,500** |

* Assuming a 15 hour work week for 12 weeks

### 4.1.3 Grand Total

**Table 3: Total Costs**

| Section | Total ($) |
|---|---|
| Parts | 176.20 |
| Labor | 67,500.00 |
| **Total** | **$ 67,676.20** |

## 4.2 Schedule

| Week | Task | Person in-charge |
|---|---|---|
| **February 04** | Looking for components | Kuanysh |
| | Finalizing proposal | Ambieca |
| | Research circuit components | William |
| | NOTE: proposal due, mock DR sign-up | Ambieca |
| **February 11** | Design microcontroller unit | William |
| | IMU testing & verification | Kuanysh |
| | Ordering required parts | Ambieca |
| | | |
| **February 18** | Learn to program microcontroller unit | Ambieca |
| | Testing & verification of microcontroller unit | William |
| | Testing & verification of Bluetooth | Kuanysh |
| | NOTE: DR sign-up | |
| **February 25** | Program microcontroller unit | Ambieca |
| | Testing & verification of memory unit | William |
| | Interface memory with microcontroller; Learn about PCB layout & footprints | Kuanysh |
| | NOTE: Design Reviews | |
| **March 04** | Debug microcontroller & wireless components | William |
| | Interface all components of the circuit | Kuanysh |
| | Create PCB footprints for each hand device | Ambieca |
| | | |
| **March 11** | Debug parts when circuit is put together | Ambieca |
| | Test communication between two devices | William |
| | Submit PCB for manufacture | Kuanysh |
| | *NOTE: Individual progress reports due | |

| | | |
|---|---|---|
| **March 18** | SPRING BREAK | |
| **March 25** | Learn to solder components onto PCB | Kuanysh |
| | Prepare for mock-up demo / presentation | Ambieca |
| | Interface data to computer | William |
| | *NOTE: Mock-up demo, mock-up presentation sign-up | |
| **April 1** | Revise PCB | Ambieca |
| | Continue interfacing data to computer | William |
| | Incorporate picture transfer if text is working | Kuanysh |
| | NOTE: Mock-up presentation, last day for first revision of PCB | |
| **April 8** | Revise PCB | Ambieca |
| | Complete assembly of device | William |
| | Help with PCB board revisions and device assembly | Kuanysh |
| | NOTE: last day for final revision of PCB | |
| **April 15** | Document final paper / Make device wearable | Ambieca |
| | Overall Project Debugging | Kuanysh |
| | Start preparation for final demo and presentation | William |
| | NOTE: demo sign-up & presentation sign-up | |
| **April 22** | Prepare presentation | William |
| | Final Paper work | Ambieca |
| | Prepare and assemble final demo | Kuanysh |
| | NOTE: demos and presentations | |
| **April 29** | Presentation preparation | William |
| | Final paper editing & finishing touches | Ambieca |
| | Finishing touches on overall project | Kuanysh |
| | NOTE: final paper due, lab notebook due, checkout | |