Project Presentation
ENSC 305/440
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Automated Attendance System

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Outline

1. Introduction
2. Project overview
3. Project specification
4. Testing
5. Project management
6. Future work
7. Acknowledgement

INTRODUCTION

Team members

Motivation

Team members

Five engineering student with different backgrounds in software and hardware deisgn.

- **Tahani Trigui – CTO**
- **Oldooz Pooyanfar – CTO**
- **Daniel Dai – COO**
- **Dong Guen Shin – CFO**
- **Omar Khlif – CEO**

Motivation

Exam experience: Time consuming

"It was horrible, I hated it. It took me twice the time it requires for just checking IDs "

Bamdad Hosseini – MACM 316 Teaching assistant

"I found the paper based identification very time consuming, we had 4 photos per page and around 60 in a book, so there was lots of flicking back and forth to find the correct student."

Dr. Emily Walsh – MACM 316 Professor

Motivation

Exam experience: Inefficient

"The main issue with the paper books is they need to be collated for every exam and are pretty much useless once the exam is over."

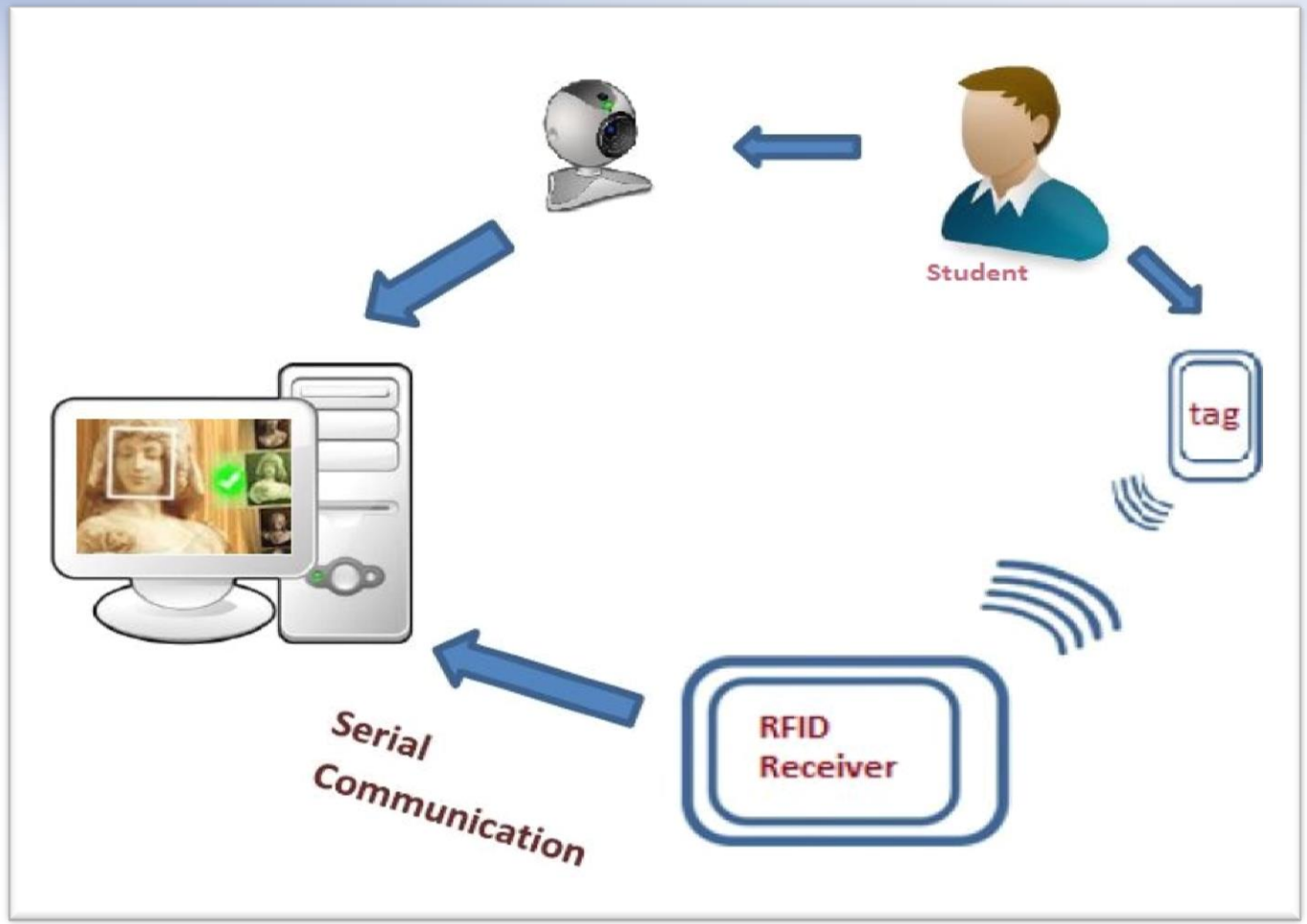
Dr. Emily Walsh – MACM 316 Professor

PROJECT OVERVIEW

System block diagram

Solution

System block diagram



Solution

- Our Automated attendance system is..
  - Easy to use
  - Time efficient
  - Reusable
  - Affordable and reliable

PROJECT SPECIFICATION

Hardware

Software

Hardware

RFID (Radio Frequency Identification)

- The use of Radio Frequency to transfer data
- RFID Reader consists of transmitter and receiver working in the Radio Frequency range (120–150 kHz unregulated)
- Tags have unique Ids and respond to the emitted signal
- RFID reader picks up the response from the tag and analyses the signal to identify each unique tag

Hardware

The Microcontroller (PIC 16F88)

- Converting the analog signal to digital
- Detecting the unique ID
- Transferring data to computer

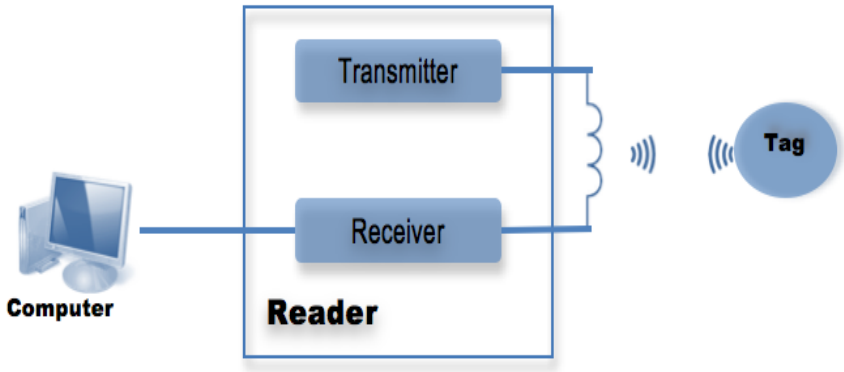
The programmer

- MPLAB
- PicKit2 Debugger

The circuit

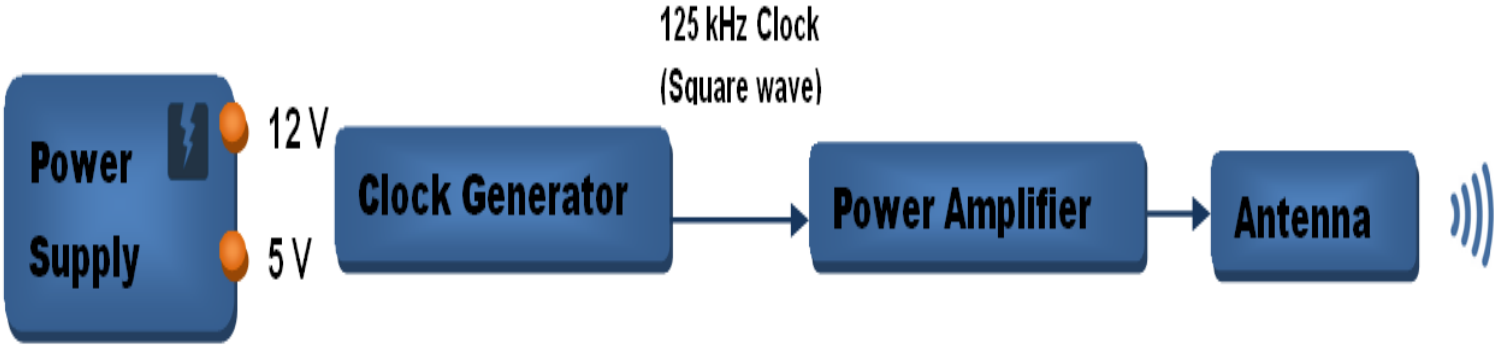
The hardware was divided into three modules

- Transmitter
  - 125 kHz
  - Antenna
- Receiver
  - Antenna
  - Filters
- Tag



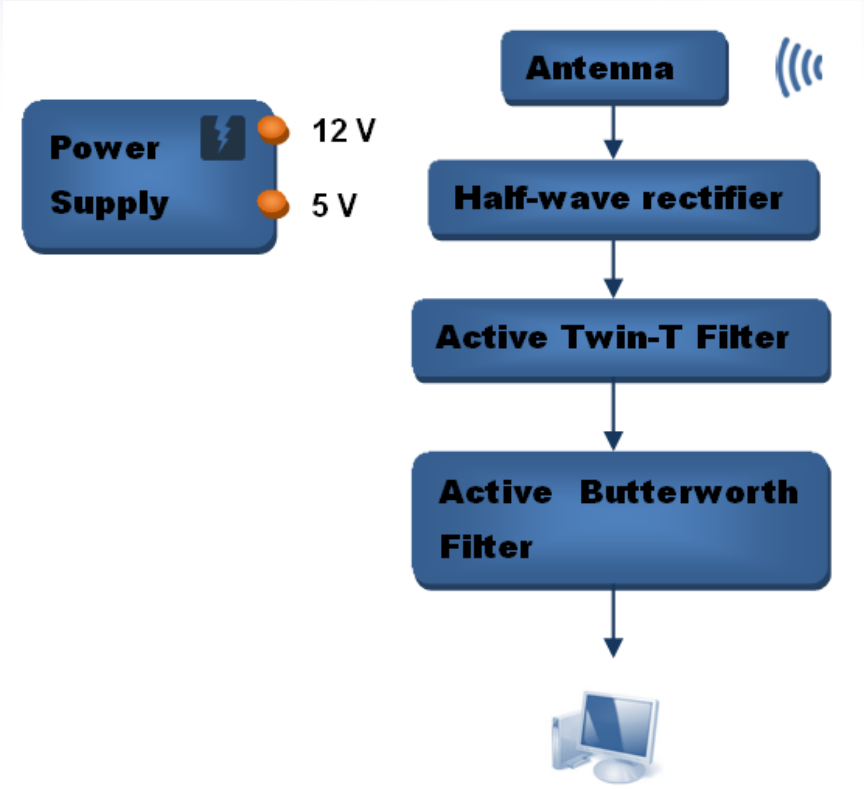
Transmitter

The block diagram consist of



Receiver

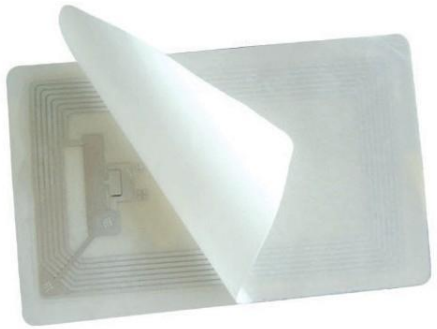
The block diagram consist of



Tag

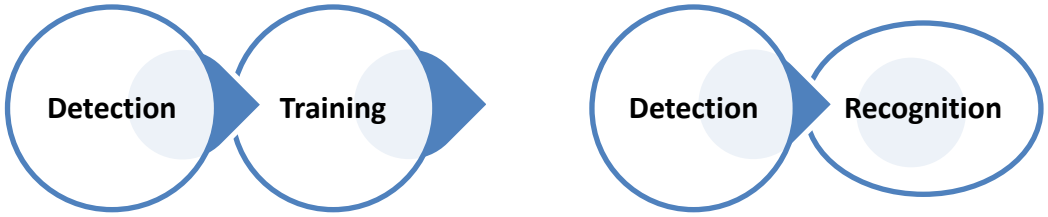
- Passive tags
  - Do not require power

    Signal induces a small amount of current to respond with modulated signal
  - FSK (frequency shift key) modulated
  - 15.6 Khz corresponds to ‘ 1‘
  - 12.5 Khz corresponds to ‘ 0‘



Software

- The software is divided into two modules:
  - Pre-loaded data
    - Face detection
    - Training and derivation of eigenvalues & eigenvectors
  - Real time detection
    - Face detection
    - Face recognition based of the loaded data



Face detection

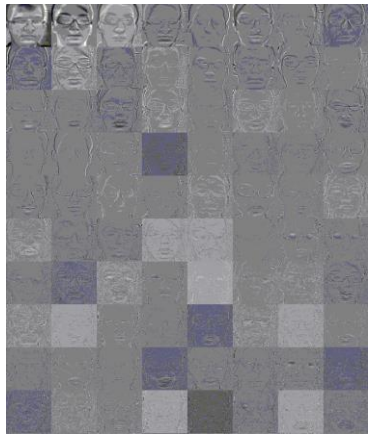
- The method used for detection is known as Haar Cascade method.
- The concept is each positive face region generates many hits from the Haar detector.
- The minimum detection scale is 24x24

Face training

- The pre-processing part of the system
- The method is based on Eigen faces.
- During the learning, face images are converted into vectors.

Face training

- Eigen faces are obtained by subtracting the average face from each face vector
- Create a large image made of many Eigen face images
- Projecting all training samples into the Principal Component Analysis (PCA) subspace.



Face recognition

- Projecting the query image into the PCA subspace.
- Finding the nearest neighbor between the projected training images and the projected query image.

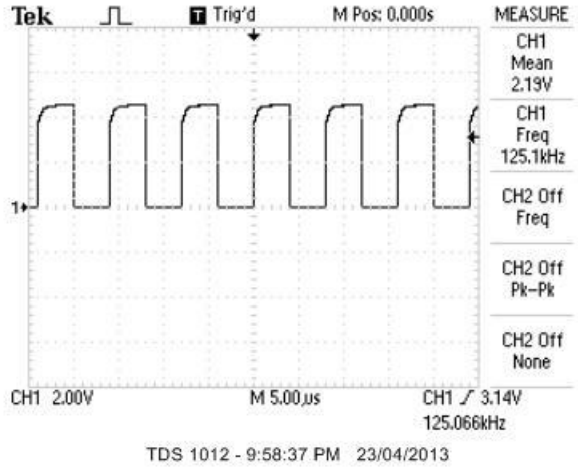
TESTING

Hardware

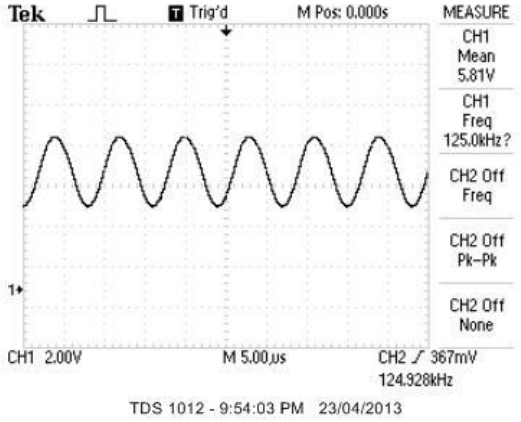
Software

Hardware

- Receiver



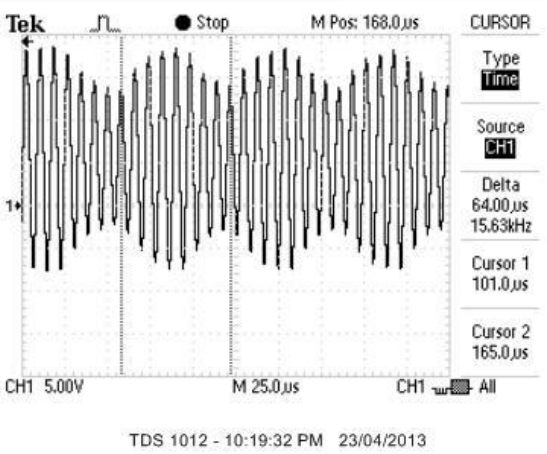
Square wave 125 kHz



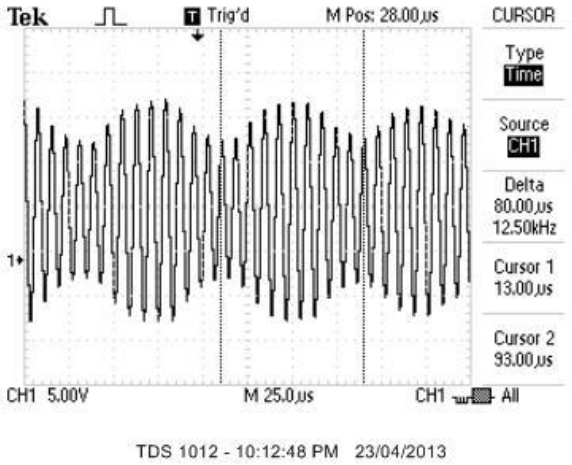
Sine wave 125 kHz

Hardware

- Receiver



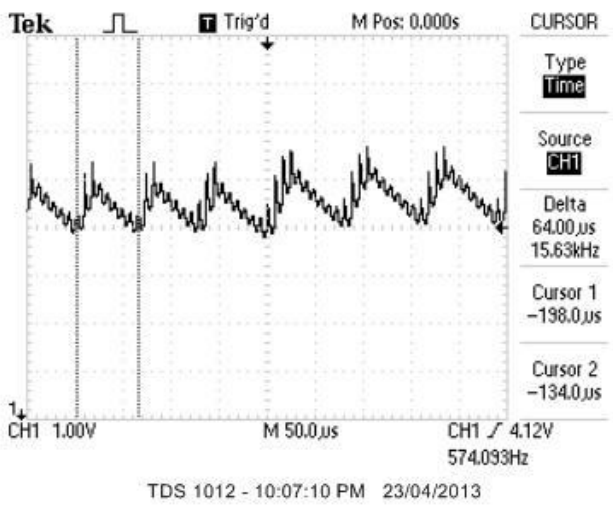
Modulated with 15.6 kHz



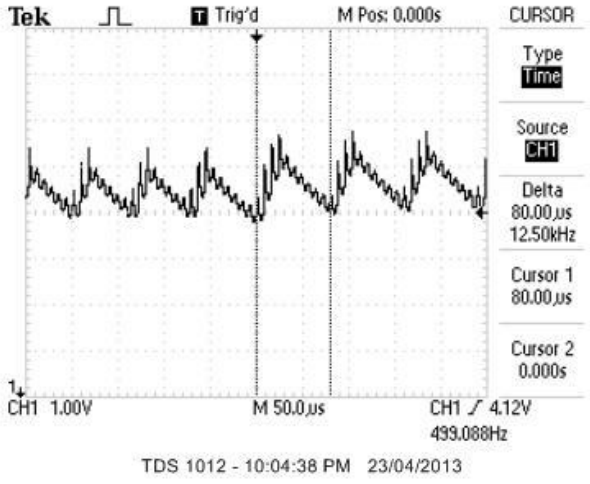
Modulated with 12.5 kHz

Hardware

- Receiver



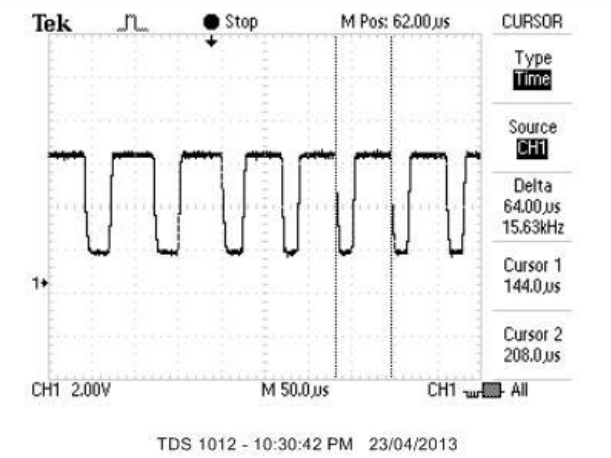
Rectifier 15.6 kHz



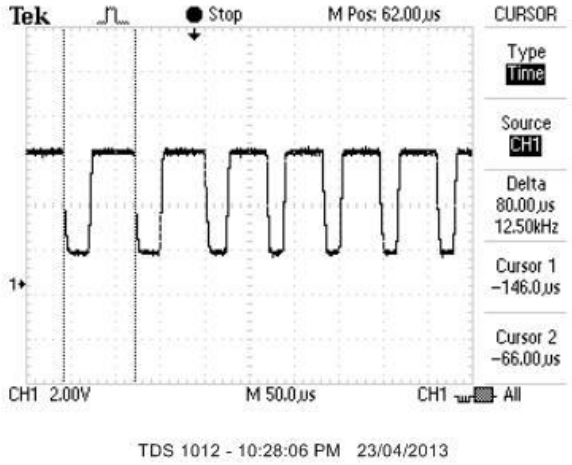
Rectifier 12.5 kHz

Hardware

- Receiver



Modulated signal after Filter 15.6 kHz



Modulated signal after Filter 12.5 kHz

Hardware

- Microcontroller
  - MPLAB Debugger
  - Output Files

Address	Hex Value	Decimal Value	Binary Value
130	0xB0	176	10110000
131	0xEC	236	11101100
132	0xB2	178	10110010
133	0xAA	170	10101010
134	0xB5	181	10110101
135	0x53	83	01010011

Address	Hex Value	Decimal Value	Binary Value
132	0xB0	176	10110000
133	0xEC	236	11101100
134	0xB2	178	10110010
135	0xAA	170	10101010
136	0xB5	181	10110101
137	0x53	83	01010011

Hardware

- Microcontroller
  - Detecting Header and Trailer
  - Detecting Data Bits
  - Transferring Data to Computer through RS232 port

Software

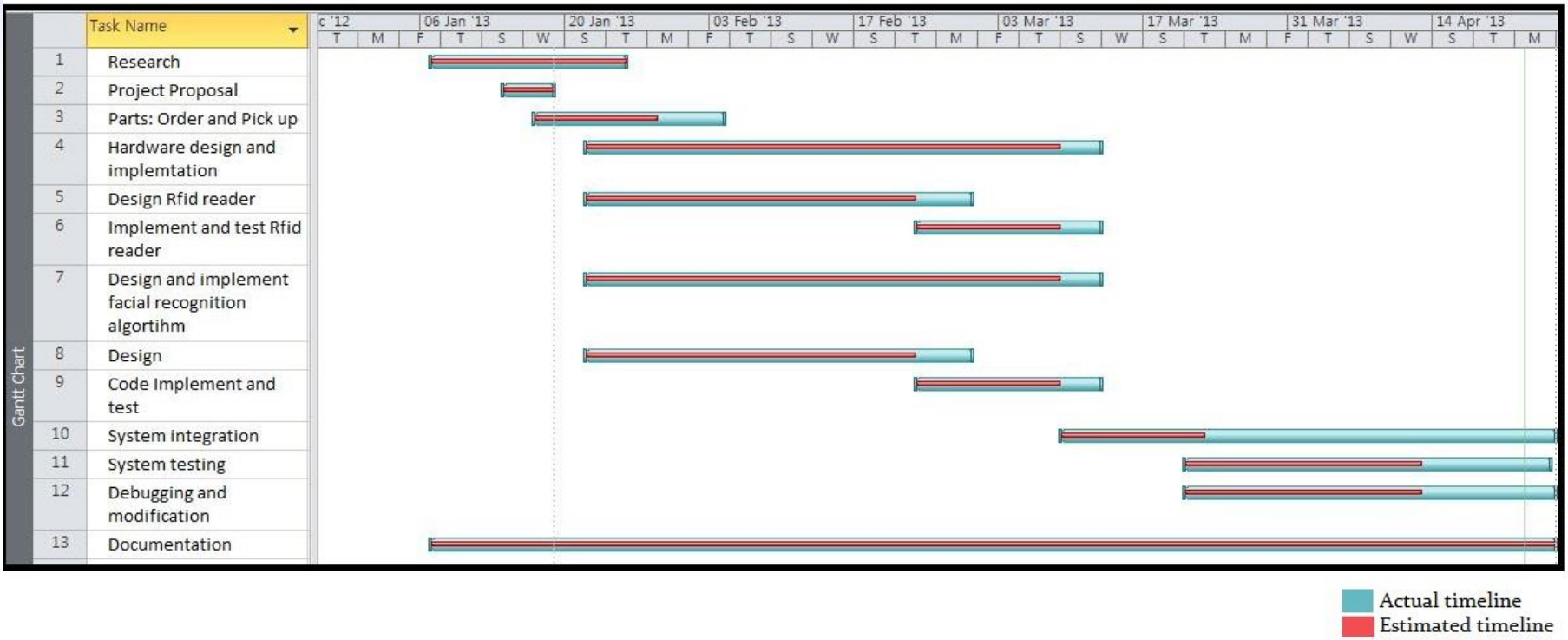
- The Video we played at the demo

PROJECT MANAGEMENT

Timeline & Budget

Business case

Timeline


Gantt Chart
Task Name
c '12
06 Jan '13
20 Jan '13
03 Feb '13
17 Feb '13
03 Mar '13
17 Mar '13
31 Mar '13
14 Apr '13
T M F T S W S T M F T S W S T M F T S W S T M F T S W S T M
1 Research
2 Project Proposal
3 Parts: Order and Pick up
4 Hardware design and implemtation
5 Design Rfid reader
6 Implement and test Rfid reader
7 Design and implement facial recognition algortihm
8 Design
9 Code Implement and test
10 System integration
11 System testing
12 Debugging and modification
13 Documentation
Actual timeline
Estimated timeline

Budget

Equipment List	Projected Cost	Actual Cost
Power toggle switch	$7.09	$0.60
Battery holder	$8.94	$2.50
Magnet wire 24 AWG	$6.40	$6.40
Microcontroller PIC16F88	$6.00	$6.00
USB PIC Programmer	$34.95	$34.95
Voltage Regulators for 5V & 12V	$1.60	$1.60
Taxes/Shipping	N/A	$8.80
Total	64.98	$60.85

Business case

- SFU math department is trying paper based face verification, however the method is very time consuming and inefficient.
- SAT college entrance exam case revealed that student identification is an issue in exams to reduce cheating and unfairness to other exam takers.

Time for digitalDNA

FUTURE WORK

Future plan

What we learned

Future plan

- Design for a marketable product.
- Productionize the code for low power device.

What we learned

Team dynamic

Time management

Acknowledgment

- Dr. Andrew Rawicz
- Mr. Steve Whitmore
- Mr. Lukas-Karim Merhi
- Mr. Ali Ostadfar
- Mr. Hsiu-Yang Tseng
- Mr. Lakshman One
- Dr. Parvaneh Saeedi
- Mr. Bamdad Hosseini
- Dr. Emily walsh
- Families & Friends ☺

Incentive

Q&A session

Thank you