Senior Design Dec06-04

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Client: ECpE Senior Design

Presentation Outline

- Definitions
- Problem description
- Operating Environment
- Intended Users/Uses
- Assumptions and Limitations
- Deliverables

- Accomplishments
- Approaches Considered
- Design, Implementation, and Testing
- Resources and Schedule
- Closing Material

Definitions

- **Binary** – base 2 number system.
- **Daylight saving time (DST)** – shifting time by one hour to compensate for Earth's rotation.
- **Fourteen possible calendar years** – only fourteen variations.
- **Geek** - *slang* – a term to describe a person with good computer skills, an interest in technology, and firm knowledge of the sciences…usually accompanied with an almost complete social ineptitude.
- **LED** – light emitting diode.
- **LCD** – liquid crystal display.
- **PCB** – printed circuit board.
- **12-hr format** – the standard hourly display. e.g. 12:34pm
- **24 hr format** – Military Time. e.g. 17:32 is 5:32pm

Problem Description

The purpose of this project is

to develop a binary alarm clock to display the current time and date.

Operating Environment

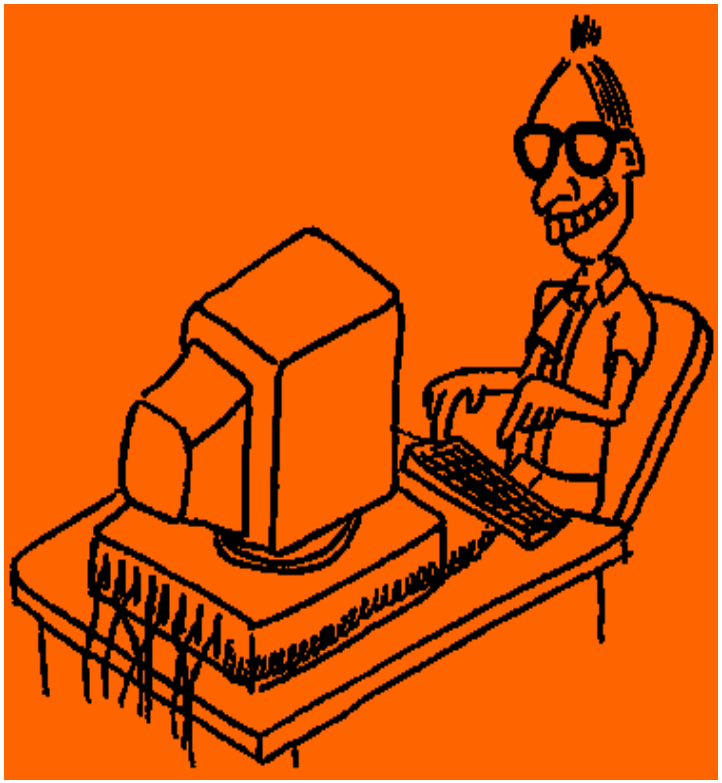
The operating environment is:

- An indoor, dry environment
- Able to supply appropriate power through wall outlet
- Not in areas that contain moisture

Intended Users/Uses

The intended users:

- Know binary code or interested in learning binary
- Fit the geek persona
- Not children due to certain dangers of small parts



Assumptions and Limitations

Assumptions

- LCD display – to display time for “non-geeks”
- DST and leap year – self-correcting
- “Geeky” appearance – transparent case
- LED’s – show time, month, day, and year in binary

Limitations

- Features – alarm, DST, battery backup, binary display, 12 or 24 hr format
- Cost/Budget – Less than $150; labor not included
- Size/Weight – light-weight and wall mountable

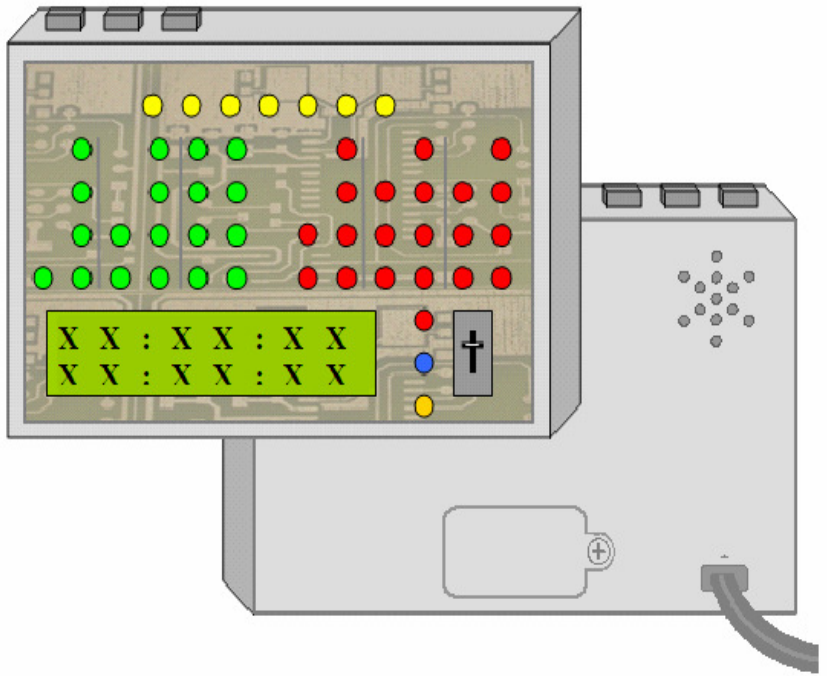
Deliverables

Geek Clock

- Time/Date
- Day of the week
- LCD display

User Manual

- Description
- Instructions
- Troubleshooting



Accomplishments

- Previous
  - Project Plan
  - Design Report
  - Design Review Presentation
- Present
  - Poster
  - Acquired Parts and Casing
  - User Manual

- Future
  - Implementation
  - Testing
  - Commercialization

Approaches Considered

Problems:

1. Binary display: 12/24 hour
2. A settable alarm function
3. Self-correcting for daylight saving time
4. Withstand power outages for at least 2 hours
5. Implement completed consumer product
6. Display “Geeky” personality

Approaches:

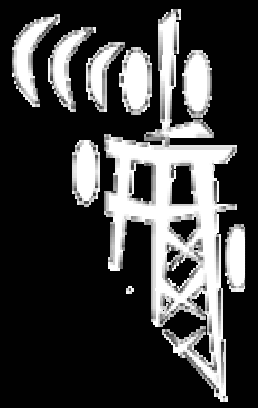
1. LEDs
   - AM/PM indicator
2. Alarm buttons
   - up/down counter
   - fast/slow speeds
3. Software code
4. 9V battery
5. User manual
6. Clear case to sh
   inner circuitry

Additional Approaches Considered

Problems:

1. Self-adjust/correct time
2. Binary week/date display
3. Learn binary
4. Snooze
5. Automatic leap year correction
6. Idle state (lower power required) while running back-up power

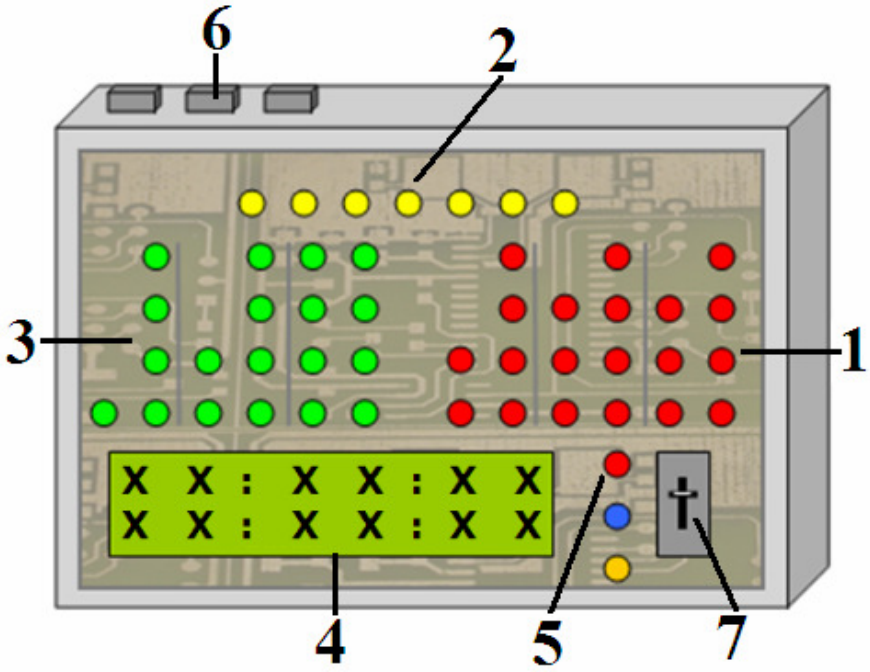
Approaches:



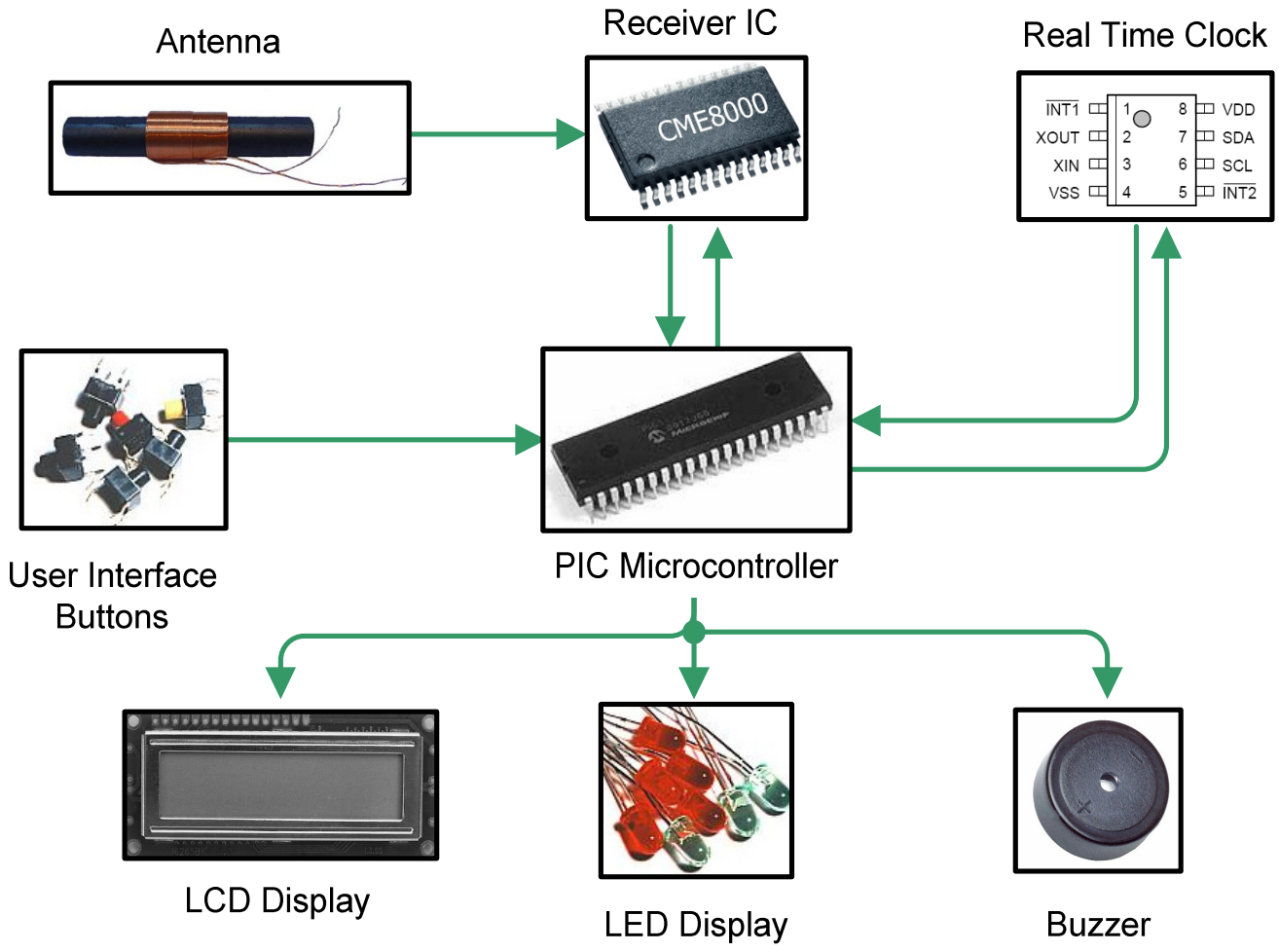
1. RF antenna and receiver
2. Binary LED
3. Digital LCD
4. Any button
5. Real Time Clock (RTC)
6. RTC low power detection – turn off week/date displays

Geek Clock Design

(1) Time
(2) Day of the week
(3) Date
(4) LCD display
(5) ON/OFF or AM/PM notification
(6) Mechanical switches for alarm control
(7) Toggle switch for user preferences

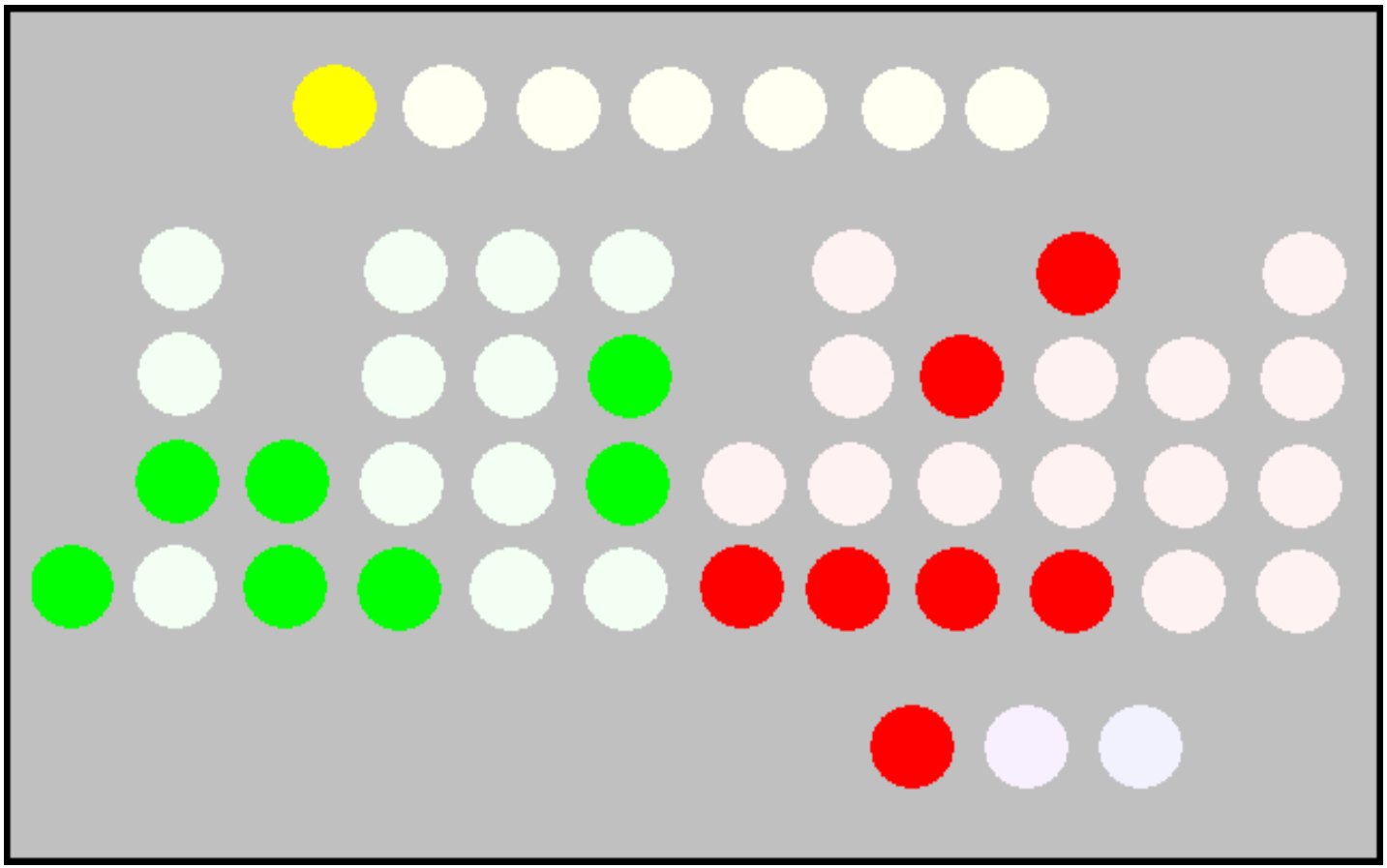


Implementation



Block Diagram

Geek Clock Demo



Animation of Date and Time

Testing

Components

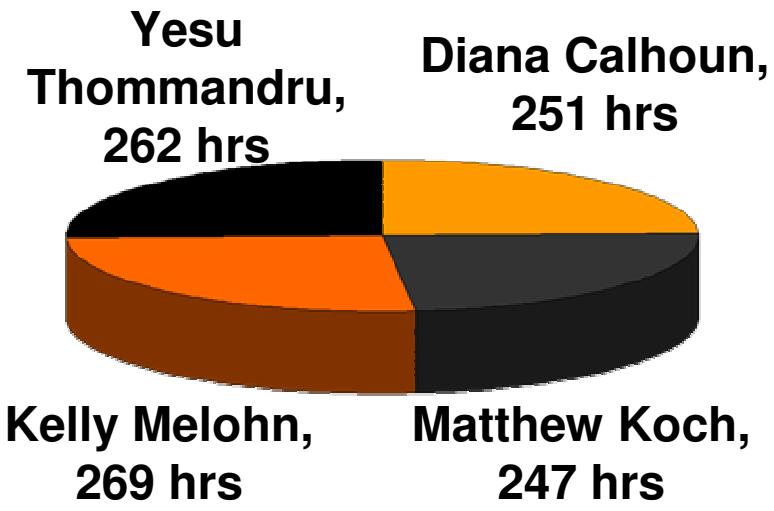
1. LEDs and LCD
2. AC power
3. Time/date/DST
4. Alarm
5. Buzzer
6. Battery backup
7. Software
8. Usability

Testing Method

1. Correct display with appropriate power supply.
2. Stability with AC power.
3. Accuracy upon hardware/software integration.
4. “Setability” using software testing.
5. Apply voltage power supply.
6. “Pulling the plug”.
7. Debugging using the MPLab IDE debugger.
8. Survey of prototype with volunteers.

Resources

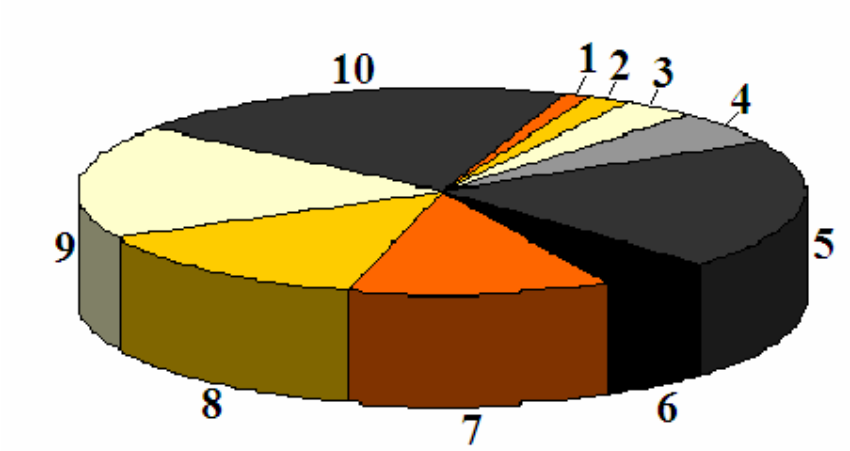
Financial Resources



Labor at $10.50 per hour	
Diana Calhoun	$2,635.50
Matthew Koch	$2,593.50
Kelly Melohn	$2,824.50
Yesu Thommandru	$2,751.00
Total	$10,931.34

Resources

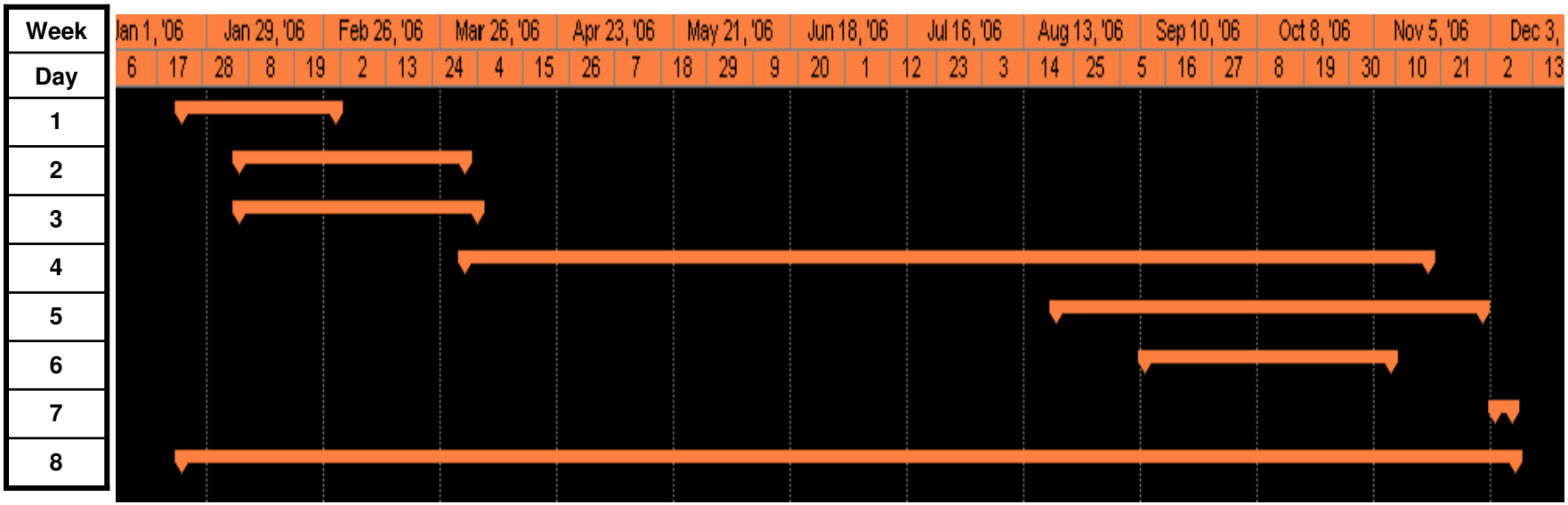
Component Resources



Clock Component Costs

Clock Material	Cost
1 Real Time Clock	$0.89
2 Antenna	$1.50
3 Battery	$2.50
4 Receiver IC	$3.60
5 Transformer	$15.55
6 Microcontroller	$3.71
7 LCD	$8.93
8 Other	$10.00
9 LEDs	$13.60
10 Casing	$15.00
Total:	$75.28

Schedule



Tasks
Task 1: Project Definition
Task 2: Technology Consideration
Task 3: End-Product Design
Task 4: End-Product Implementation
Task 5: End-Product Testing
Task 6: End-Product Documentation
Task 7: End-Product Demonstration
Task 8: End-Product Reporting

Closing Material

- Project evaluation
- Commercialization
- Recommendations for additional work
- Lessons learned
- Risk and risk management

Closing Summary

The Dec06-04 team faced the challenge of building a “geek” clock. The Geek Clock shall be a fun, easy to use household item geeks can be proud to show friends and family.