Automated Drink Mixer

Group 40
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Introduction

- Automated drink making with minimal user interaction
- WiFi enabled system tracks transactions
Objective

- Systematically reduce clutter at busy bars
- Track user purchases with RFID cards
- Reduces human error in mixing drinks

Pour Bros
Champaign, IL
DID IT WORK?
Power Circuitry

- 120VAC to 24VDC converter
  - Used for pumps
  - ~24.3V

- 24VDC to 12VDC transformer
  - Used for stepper motor

- 24VDC to 5VDC transformer
  - 5.024
  - Used for small electronics
Logic Unit

- NodeMCU microcontroller
- Refill Indication Control
- Component Drivers
NodeMCU Microcontroller

- Powered by 5V
  - internally converted to 3.3V to send signals

- CPU to run software
  - sends control signals to subunits

- IOT capabilities
  - connects to a server to keep tabs
NodeMCU Communication

- Problem: Not enough pins
  - Left side used for flashing
  - Bottom right used for RFID
  - Top right used for I2C

- Solution: MCP23017 chip
  - 2-to-16 expansion chipset
Software Flow

Boot System
- Connect to Wi-Fi Network
- Initialize RFID Sensor, Calibrate Disk
- Set Recipes, Ingredients and Variables

Get User Input
- Scan RFID
- Display Menu
- User Chooses Drink

Make Drink
- Rotate & Pour Ingredients
- Finish, Calibrate Disk
- Update Tab on Server
Recall: Refill Indication Control
Refill Indication Control

MOSFET Typical Characteristics Graph
Component Drivers

- Pump Driver
  - Stepped 3.3V to 24V

- Laser Driver
  - Stepped 3.3V to 5V
Stepper Motor Driver

- Controller for bipolar stepping sequence

- Problems:
  - Complexity
  - Shoot-through
  - Circuit Protection

- Precision half-stepping positions
Stepper Motor Driver

<table>
<thead>
<tr>
<th>Coil</th>
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<th>B</th>
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Peristaltic Pumps

<table>
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<th>Time (s)</th>
<th>Volume Dispensed (mL)</th>
<th>Ticks Measured</th>
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<tbody>
<tr>
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<td>90</td>
<td>2474</td>
</tr>
<tr>
<td>11.10</td>
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<tr>
<td>27.77</td>
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Stepper Motor

- Spins bottom disk to preset positions
- 400 steps per revolution: 0.9° per step
- Laser & photocell for calibration
  - More detail in the sensor section
Sensors

- Photocell and Laser Calibration
- Flow Meters
- Weight Sensor
Photocell and Laser Calibration

5V

330 Ω

To MCU Pin

Photocell General Schematic
Flow Meters

- Hall Effect Sensor
- Generates a tick(wave) with each volumetric step
- Ticks used to calculate volume
Flow Meters - Data

**Flowmeter Accuracy**

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<th>Ticks per mL</th>
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<tr>
<td>100</td>
<td>27.5</td>
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<tr>
<td>200</td>
<td>27</td>
</tr>
<tr>
<td>300</td>
<td>26.5</td>
</tr>
<tr>
<td>400</td>
<td>26</td>
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<tr>
<td>500</td>
<td>25.5</td>
</tr>
<tr>
<td>600</td>
<td>25</td>
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</table>

**Time Accuracy**

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<th>Time per mL (mL/s)</th>
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</thead>
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<tr>
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<td>18.0</td>
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<tr>
<td>600</td>
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Weight Sensor Characterization
Recall: Refill Indication Control
User Interface

- User-friendly, minimal interface
  - 4 buttons & LCD

- WiFi Indicator

- RFID Scanner
  - eliminates the need to type
Buttons & LCD

- User-friendly, minimal interface
  - Left, Right, Select, Back

- LCD connected via I2C
WiFi & Server

- LED to show connectivity
- Uses SMTP to send email
- Python script collects email & keeps tab

```python
import numpy, smtplib, time, imaplib, email

# define constant variables
Email = "handsfreemixer445@gmail.com"
Password = "secret"
Server = "imap.gmail.com"
button_delay = 0.2

# Function to read and delete the latest email
def read_latest_email():
    ...
    return email_subject, email_message

tab = {
    "Dave": [Lemonade, Iced Water, ...],
    "Eric": [Fresh OJ, milk, ...],
    "Matt": [Iced Water]
}
```

Emails as received by the pseudo-server

<p>| | | |</p>
<table>
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<tr>
<th></th>
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<tbody>
<tr>
<td>me</td>
<td>BB5B530D</td>
<td>drinkName</td>
</tr>
<tr>
<td>me</td>
<td>BB5B530D</td>
<td>drinkName</td>
</tr>
</tbody>
</table>

Server-side Transaction Log
RFID

- MFRC522 Sensor

- Reads 13.56MHz Tags
  - simulates iCards

- Scan time
  < 5ms
Conclusion

- Overall system integrated successfully
- Problematic Components:
  - LCD
  - Stepper Driver
  - Flow Meters
- Future work:
  - expand and streamline software
  - use iCard compatible RFID sensor
  - optimize the physical form factor
Questions?
Citations


Citations


