Senior Project

System and Software Architecture

DRINC

Dynamically Refreshing Interplexing Number of Cordials

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Revision History

Revision Number	Date	Comment
1.0	Nov. 11, 2013	First version of document available
1.1	Jan. 13, 2014	Converted document to LaTeX

Contents

List of Figures

1 Introduction

1.1 Purpose

The purpose of this system architecture document is in partial fulfillment of the DRINC project.

1.2 Architectural Assumptions

- The machine will not collapse on its own.
- The bottles must not be able to be moved without removing any safety restraints.

2 | Summary of Requirements

2.1 Hardware

- Frame must securely hold 9 liters of mixers, glass enclosures as well as the back end control systems and drink transport track.
- Power Supply must be capable of powering the back end control system, drink transport track, valves, and flow meters must be included.
- A microcontroller with enough I/O pins to monitor a flow meter and valve for every mixer, as well as the servos controlling the drink transport track and a data connection to the front end system must be used to control the back end control systems
- The drink transport track must be able to safely, securely, and accurately move a cup to any point on a square grid.
- The transport track requires at least two servos, which must be strong enough to move a full pint of mixed drink reliably.
- Each mixer must have a valve that can be quickly turned on and off via the back end control system.

2.2 Software

- The website must be able to log in a user based off of authentication held in the backend database.
- The website must be able to log a user off of the account.
- The website must present the user with the main menu upon logging in
- The website must have the following options:
  - Create a Custom Drink

  - Select a Drink
  - Most Drank

- The Android app must be able to log in a user based off of authentication held in the backend database.
- The Android app must be able to log a user off of the account.
- The Android app must present the user with the main menu upon logging in
- The Android app must have the following options:
  - Create a Custom Drink
  - Select a Drink
  - Most Drank

The goal of this project is to create a machine that will accurately mix drinks selected by the user from a preset list of mixers.

3 | System Architecture

3.1 Physical Architecture

3.1.1 Back End Requirements

The Raspberry Pi

Processor Broadcom 700 MHz

RAM 256MB

Graphics VideoCore IV

OS Debian Linux

3.1.2 Front End Requirements

The Nexus 7 Android

Processor ARM Cortex-A9 Nvideia Tegra 3 T30L 1.2 GHz quad-core

RAM 1 GB

Graphics 7in Touch screen

OS Android Jelly Bean

3.1.3 Hardware Design Overview

Touch screen talks to backend server on the raspberry pi. This formats the proper protocol commands that are sent to the arduino. The arduino then processes these commands and sends the proper data instructions to the proper pins that will control the solenoids.

Front End

- The front end is an Android device which will run the front end software described later.
- The front end will connect to the back end with a custom protocol that will communicate with the front end over a USB cable.

Back End

- The backend is a Raspberry PI running the backend software and an Arduino device that will communicate with the valves/flow meters directly.

Frame

The frame of the machine will accommodate all other components. It will suspend 9 bottles 750mL in volume above a track consisting of a cup holder moving horizontally along two rails assisted by a pair of servos. The frame will also house an Arduino Mega, a Raspberry Pi, and a standard ATX power supply, as well as a mounting point for the frontend device.

Electronics

The backend will communicate with an Arduino Mega microcontroller. The microcontroller will in turn control a valve attached to each available mixer. Additionally, the microcontroller will control a pair of servos to move the cup holder to any of the available mixers.

Arduino Mega

- 16MHz core clock
- -124KB available flash
- -49 digital I/O pins
- -15 digital I/O pins capable of PWM
- -16 analog I/O pins

Valves

- Aquatech AQT15SP Solenoid Valve

- 12V operating voltage
- $\frac{3}{4}$in diameter

Servos

- 43R Robot Rotation Servo
- 5V operating voltage
- Direction and speed controlled
- 60 RPM

Power Supply A standard 400W ATX power supply will adequately power all electronic components. The backend can bring the PSU out of standby and shut it back down when the machine is not in use.

3.2 Software Architecture

3.2.1 Website

The website will be created using Django and Python. It will be hosted on an Apache server. The front end will use HTML, CSS, and Javascript to create the viewed website.

The reason for using Django is that it is flexible and allows for a multitude of plugins to use. It also allows for a website to be built quickly without compromising quality. It is open source which allows for free use and can be changed if need be.

Django gives an easy-to-use database interface. It creates the databse, along with sanitizing all SQL queries and ensure than any user input is escaped preventing XSS.

3.2.2 Android App

The Android app will be written in Android Java and XML to be a native app. The app will communicate with the back end server in the same manner as the website.

3.2.3 Apache Server

The Apache server will host the Django website and send the site over port 80 to the client.

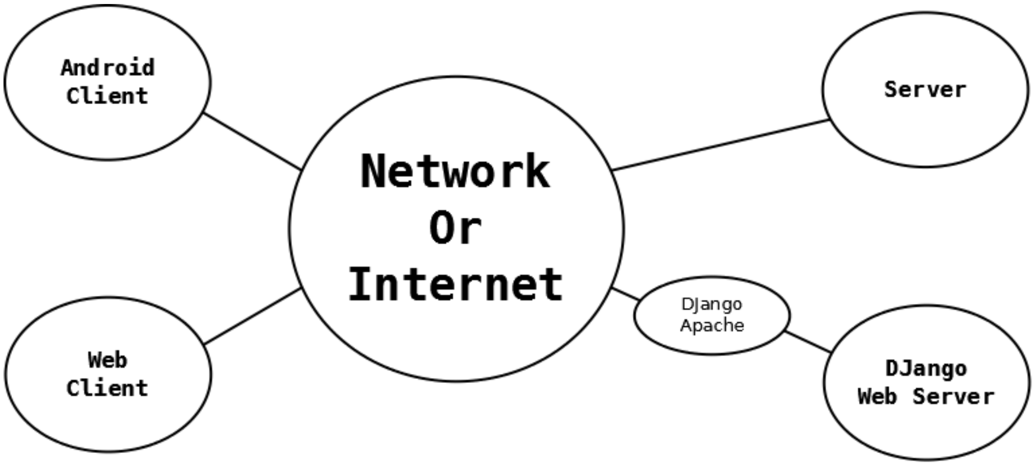

Figure 3.1: Diagram showing server and client connections

3.2.4 PostgreSQL

The PostgreSQL database will store login credentials, drinks, and list of drinks saved for each user. All private or sensitive information stored in the database will be salted and hashed before being put into the server.

4 Conclusion

This document is the System and Software Architecture Document for the DRINC project. The document provides architectural descriptions of the systems and processes involved in automating the process of creating a mixed drink. This document is meant to be used by the software development team in implementing the system functionality in code.

Bibliography

[1] Apache. http://httpd.apache.org.

[2] Postgresql. http://www.postgresql.org.