Bluetooth Enabled Coffee Machine

Team Members:
Lam Dinh
Jesse Garrard
Shayan Rizvi
Mevludin Guster

Advisor: Marten Van Dijk
Sponsor Contact: Michael Daigle
Who are we?

Team Members:
• Jesse Garrard
• Lam Dinh
• Shayan Rizvi
• Mevludin Guster

Advisor: Marten Van Dijk
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Outline

• iDevices
• Our Project
• Keurig Coffee Maker
• Hardware and Microcontroller
• Servo Motor
• Android Application
iDevices

- Founded in 2010
- Located in Avon, CT
- “Leaders in the development of app-enabled products and processes”.
- Develops app-enabled products both independently and with partner companies.
Our Project

• To Bluetooth-enable a coffee machine that will allow users the convenience of operating the machine from any location in its vicinity.

• Keurig Coffee Maker

• Electronic components
  – AVR Microcontroller
  – Broadcom Bluetooth Module
  – Servo motor

• Android App
Keurig Coffee Maker (B40)

- 4 PCBs
  - Power conditioning and fuse board
  - Main Board: AVR Microcontroller
  - Heat control/filtering and power distribution
  - Button Interface Board
Hardware Components

• Take apart a Coffee maker

Microcontroller

LCD indicator

Voltage Conversion circuit

Wires for heating element
Microcontroller and Bluetooth Module

• Atmega 328
  – Operating Voltage: Vcc=5V
  – 32 Kb Flash memory
  – 23 GPIO, 10bit-ADC

• Bluetooth Module (Broadcom)
  – Operating Voltage: Vcc=3.3V
  – Operating range: 50-75ft
  – Send and receive with AVR via serial communication
Servo Motors

- Used in robotics, toy cars, airplanes, etc.
- It has circuitry built in the motor unit and has a positionable shaft which is fitted with a gear.
- The motor of the servo is controlled with an electric signal which ends up determining the movement of the shaft.
- Made up of a small DC Motor, potentiometer and a control circuit.
Servo Motors (Continued)

- Servo Motors turn 90 degrees in either direction resulting in 180 degrees of total movement.
- Servo’s run on proportional control – this means the motors speed proportional to the difference in the servo’s position from its desired position. So it will move at a slower rate if it is closer to the desired position. This is a very efficient model.
- There are two types of Servo motors
  - AC and DC
- AC Servo’s handle higher currents and are designed for industrial machinery.
- DC Servo’s handle smaller currents and are used for smaller applications, this goes to show that we will be applying a DC Servo motor.
Servo Application w/Keurig

• The goal is to expand the idea of the coffee maker
• Allowing the user to select the brand of coffee they want to have brewed at a specific time from the smart phone application
• Integrating the Servo motor with the Keurig coffee maker so it can apply the proportional control to rotate the different K-cups within the Keurig
Software

- Java
- Communication via Bluetooth(API 5)
- Minimum Froyo(2.2)(API 8)
- Current Jelly Bean(4.3)
- Basic Layout
- User friendly
Android Application

- Set time to brew
- Coffee ready push notification
- Water level
- Cup size (8oz, 10oz, 12oz)
- Flavor
- Stop/Cancel Brew
When Will This Work Occur?

| First Semester       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|    |
| Meet with advisor   |  9 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Create Project      |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Specification       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Create Project      |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Proposal Presentation | |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Research Keurig      |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Research Bluetooth Module | |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Design               |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Initial testing     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

| Second Semester     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Design Circuit      |  3 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Build Circuit       |    |  3 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Design PCB          |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Design Mech.        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| System              |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Build Mech.         |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| System              |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
Budget

• Prototyping Cost < $1000
• Final Product Cost < $300
Demo

• ATmega328P Microcontroller
• RN42 Bluetooth Module
QUESTIONS?