**Autonomous Coffee Machine**

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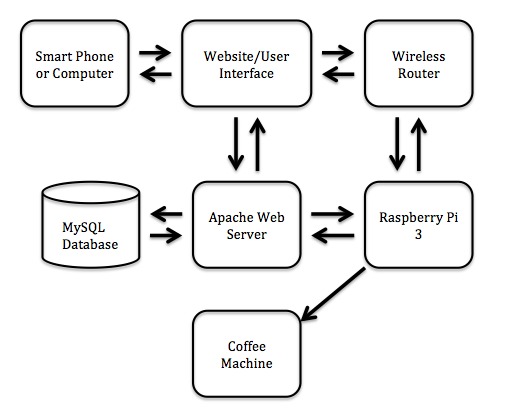
**Product Description:**

The Autonomous Coffee Machine enables people to be lazier and become more obese (I’m going to be rich). The machine is Wi-Fi enabled, and should be able to be controlled anywhere the user has a network connection and the machine has a network connection. The machine is autonomous in the sense that it is completely hands free with the exception that the filters need to be manually cleaned out every brew. With this machine the user will have full remote control of when and how they want their coffee brewed, eliminating the headache of setting up and waiting for your coffee.

**Features:**

1. Wi-Fi Enabled for remote control
2. Multi-Cup Brewing as a user option
3. Brew Strength as user option
4. Senses and prevents brewing when filters are dirty
5. Keeps coffee warm for the perfect amount of time
6. Database to store use information

**Flow Chart:**



**Primary Market**

Home Owners

Small Businesses

**Secondary Markets**

Large Corporate Offices

Gas Stations & Coffee Shops

**Assumptions and Constraints**

High Cost to Produce

Requires Wi-Fi network connection on both Client and Server

Size of machine must be compact

**List of Technology and Subjects**

Wi-Fi

Analog to Digital Conversion

Software as a Service

Hardware Design (basic circuitry)

Software Logic

Web Development

Computer Networks

Interfacing Microcontrollers & Sensors

Mechanical Design

|  |  |  |
| --- | --- | --- |
| **Purchase Invoice** | | |
| **Component** | **Description** | **Cost** |
| Raspberry Pi 3 | Microcontroller that controls coffee machine and hosts website with the user interface | $34.72 |
| Micro SD Card | Hard Drive for the controller | $10.00 |
| Mainstays 12-Cup Coffee Maker | Base Machine with functional components | $10.84 |
| E-flite 5mm Prop Adapter | Prop Adapter to Connect the stepper motors shaft to something threaded | $3.21 |
| Nema 17 Bipolar Stepper Motor (84 oz.in) | Stepper motor to precisely spin the carousel | $13.99 |
| (2) Reusable Coffee Filters | Reusable coffee filters to hold the grounds and sit in the carousel | $8.00 |
| 6MM x 130MM all thread rod | My way of extending the motor shaft to connect to the carousel. | $2.19 |
| (2) 6MM Coupling nut | How I am connecting the all thread rod to the prop adaptor on the motor | $1.98 |
| 6MM Wing nut | The wing nut is acting as the lower nut holding the carousel to the all thread shaft. | $1.73 |
| 6MM Acorn cap nut | The upper nut holding securing the carousel to the all thread | $1.67 |
| Motor mount | 3D printed motor mount to attach stepper motor to the machine | $5.00 |
| Carousel | 3D printed carousel to hold coffee filters | $38.25 |
| Motorized Ball Valve | ¾” Electrical Ball Valve to control the flow of coffee | $31.99 |
| Water Solenoid Valve | ½” Solenoid Valve to control the flow of water | $9.22 |
| Wood for Frame | 0.625” x 11.25” x 60” lumber to build frame | $5.65 |
| (4) Rods for Frame | 36” x 5/16-18 All Thread Rod to build frame | $10.52 |
| (16) 5/16 Washer | Washers for frame | $2.36 |
| (4) 5/16-18 Cap Nut | Cap Nuts for the bottom of the frame | $4.72 |
| (12) 5/16-18 Jam Nut | Jam Nuts used to connect frame | $2.36 |
| ¾” PVC Male Adapter | PVC Adapter to extend the neck of the ball valve through the frame | $0.46 |
| (4) #6-1.5” Sheet Metal Screw | Screws to secure the coffee machine to the project frame | $1.27 |
| (4) #6 Washer | Washers for the sheet metal screws | $1.18 |
| 15 Amp Outlet Plug | Outlet Plug to power the project | $3.99 |
| 3’ 16/3 ORG Wire | Wire to connect the project and plug | $2.97 |
| ½” PVC Elbow | PVC Elbow to connect water reservoir to coffee machine’s reservoir | $1.14 |
| ½”x 2’ PVC Pipe | PVC Pipe to connect water reservoir to coffee machine’s reservoir | $1.26 |
| Faucet Locknut | Lock nut to secure the water solenoid valve to the water reservoir | $2.18 |
| Aquarium Seal | Non toxic waterproof silicone to prevent water leaks | $4.57 |
| NeeKeons AC 110-240V To DC 12V 2A Switching Power Supply | 120V AC to 12V DC 2A power supply | $8.99 |
| RobotDyn - Relay Module 4 channels, operation 5V. VC - 10A 110VAC/250VAC/60VDC | 4-Channel 12V DC & 110V AC Relay Module for switching the valves and coffee machine | $6.99 |
| MEAN WELL RS-25-5 AC to DC Power Supply | 120V AC to 5V DC 5A power supply | $13.41 |
| Hammond Project Box | 7.5”x4.3”2.2” Project Box for enclosing the exposed circuits | $7.51 |
| 20’ 18 AWG Wire | 18 AWG Wire for coffee machine | $3.60 |
| 30’ 20 AWG Bell Wire | 20 AWG Bell wire for connecting everything other than the coffee machine | $4.35 |
| 1/8” Heat Shrink Tubing | Heat Shrink for insulating wires I had to solder together | $2.79 |
| 12-PK Small Wire Connectors | Small wire connectors | $1.79 |
| 22-16 AWG Disconnecting Terminals | Small Disconnecting Terminals for connecting wire to the water solenoid valve | $2.19 |
| (4) ¼-20 x 2” Tap Bolt | Bolts for securing Power Supply Box | $2.20 |
| (4) ¼-20 Jam Nut | Nuts for securing Power Supply Box | $1.10 |
| Orange Duct Tape | Duct Tape for wrapping frame rods to prevent them from cutting the wires running up them | $4.49 |
| 3.65” x 7.25” Perforated Circuit Board | Perforated Circuit Board for mounting the relay and stepper motor modules | $11.95 |
| (8) 6/32 x ½” Machine Screw | Small screws for securing relay and stepper motor modules to the PCB | $0.40 |
| (8) 6/32 Lock Nut | Small nuts for securing relay and stepper motor modules to the PCB | $0.64 |
| LoveRPi Raspberry Pi 3 GPIO Case – Clear Transparent | Case for Raspberry Pi to mount to the frame | $5.49 |
| (40) 12” Female to Female Jumper Wires | Long Female to Female Jumper Wires for connecting GPIO pins to the relay and motor modules | $2.50 |
|  | **Total Price** | $297.80 |