9Component Analysis

Year: 2019 Semester: Fall Team: 8 Project: Condiment Express

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Assignment Evaluation:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Score (0-5)** | **Weight** | **Points** | **Notes** |
| **Assignment-Specific Items** | | | | |
| **Analysis of Component 1** | 5 | x2 | 10 | Excellent |
| **Analysis of Component 2** | 5 | x2 | 10 | Excellent |
| **Analysis of Component 3** | 5 | x2 | 10 | Excellent |
| **Bill of Materials** | 3 | x6 | 18 | Excellent |
| **Writing-Specific Items** | | | | |
| **Spelling and Grammar** | 5 | x2 | 10 | Good |
| **Formatting and Citations** | 5 | x1 | 5 | Good |
| **Figures and Graphs** | 5 | x2 | 10 | Good |
| **Technical Writing Style** | 5 | x3 | 15 | Good |
| **Total Score** | 88 | | |  |

5: Excellent 4: Good 3: Acceptable 2: Poor 1: Very Poor 0: Not attempted

General Comments:

BoM needs a lot of work. The packaging on the PCB needs to be mentioned for a lot of components. Also, the value in terms of voltages or any criteria for the components would be a good addition. The supplier parts need to be provided for reference. Also, discuss with Todd about the breakout boards.

1.0 Component Analysis:

In our design, there are three major components. The first one is the x-y mechanism. For these components, we are mainly struggling between two candidates. The second one is peristaltic pump. There are several candidate pumps that can be used, but we decide one according to price, flow rate and some critical criterions. The last one is the LED display. This is also a hard decision as there are many choices available, but the choice is made according to our design needs.

1.1 Analysis of Component 1:[3]

The CoreXY motion assembly is the biggest feature in the machine. It is used to dispense solid condiments like salt, pepper, ginger powder, and more. To achieve such a task of moving a subject across 2d space, there are multiple candidates that are considered: first is the regular “RepRap” style XY Cartesian motion assembly which is used by most of the commercialized 3d printer; second is the CoreXY Cartesian motion assembly which is more complicated to build but has many major advantages over the traditional RepRap XY motion assembly. Here is a comparison chart.[3]

|  |  |  |
| --- | --- | --- |
|  | “RepRap” style Cartesian Mechanism | CoreXY Cartesian Mechanism |
| Image |  |  |
| Space Saving | The motor cannot be flat against the surface of the motion | The motor can be flat against the surface of the motion |
| Cost to make | More parts to include, see from picture, there is 8 rail that needs to be purchased and more complicated. | only three rails needed, 2 for the y-axis and one for the x-axis |
| Easy to service | six timing belts to be tensioned | There is only two-timing belt needed |
| Speed | slower | faster |
| Software Implementation | straighter forward, one motor control one axis. | less straight forward, two motor control both axis, if one axis wished to be move, both motors have to rotate |

Because of the overall size, speed, and cost constrain, **picking the CoreXY system is a no brainer** as one of the biggest constraints in our system is the overall size.

1.2 Analysis of Component 2:

The peristaltic pump is used to precisely add liquid condiments by controlling the motor inside of it. The peristaltic pump we chose is the one from Taobao, and we will make it ship to the United States. There are few candidates for the pumps. One of them can be found on digikey, which is a simple version of the peristaltic pump. However, for this one, it doesn’t contain encoder which makes writing program problematic, thus unable to control the flow rate through software. The second candidate is also from Taobao. This pump is very accurate with high quality. The problem of this pump is that since this seller is from China, the input voltage is 220V which is not suitable here in the US. At the same time, it can’t be programmed as well. The pump we chose, which is an MN2/BT peristaltic pump, has a flexible voltage range and programmable step motor installed. The price for this one is also the cheapest among other candidates. Even though the flow rate is relatively small compared to other peristaltic pumps listed below, it is still in the acceptable range as we are just dispensing condiments that don’t require a large flow rate. The only problem with the chosen peristaltic pump is its weight. It weighs 335g, and we need three of them, so the weight might be a problem that needs to be considered.

|  |  |  |  |
| --- | --- | --- | --- |
| Product | MN2/BT[1] | WIG-12915-ND[2] | SN15[3] |
| Image |  |  |  |
| Voltage | 6 ~ 36v | 12 ~ 24v | 220v |
| weight | 335g | unknown | 285g |
| flow rate | <=115ml/min | <= 700ml/min | <= 358ml/min |
| Programable ? | Yes | No | No |
| Price | $38 | $145 | $64 |
| Choice | Chosen | Abandoned | Abandoned |

1.3 Analysis of Component 3: OLED

The OLED is an essential part of the user interface for our condiment’s dispensers. All the processes and warning information will be displayed on the OLED. The OLED helps users to keep track of each dispensing step visually by displaying the process information so that users can adjust their preference and specific quantity. Additionally, the display also shows the warning information for lack of condiments and dangerous working environments such as high temperature and high humidity. In order to well match our criteria, we consider the following OLED displays as potential targets.

16-bit Color 1.5” OLED display [4] (Adafruit)

This display is attractive when we first search online since it has a small display with 16-bit color, where it contains 128x128 RGB pixels [4]. With 16-bit, it can display a large variety of colors and have high contrast. It can be used under 3.3-5V logic and power. Since the OLEDs work individually, the actual current depends on the level of usage with 30mA on average without including an SD card. It can be sued with 4-wire write-only SPI to control. The mechanical dimension of this product is 43.17mm x 42mm x 5.42mm. The market price we found in Adafruit is $39.95.

Character display OLED 16x2[5] (Adafruit)

This display is the standard OLED we used with in ECE 362, which has 16 characters wide with 2 rows. The information is displayed by a bright blue color on a black background with no backlight. Its built-in character set supports English text in addition to 8 extra custom characters that can be created. This OLED can be controlled by SPI with 3V or 5V logic and power. The supply current is approximately 30mA in total. For the mechanical dimension, its screen size is 56.95mm x 16mm. And the market price is $27.95 in Adafruit.[5]

# Monochrome 2.42" 128x64 OLED Graphic Display [6] (Adafruit)

This display is black-white OLED with high contrast with 128x64 individual white OLED pixels without backlight [6]. It is made of 128x64 individual pixels, which is controlled by SPI. The average power is 50mA with 3.3V supply depends on the specific task, which is considerable.

As it’s the example used online, it can be used to display patterns in great detail with its massive OLED pixels. Its screen size is 29mm x 56mm x6.8mm. The market price for this OLED on Adafruit is $39.95.

The comparison of three different OLEDs is following.

|  |  |  |  |
| --- | --- | --- | --- |
|  | 16-bit Color 1.5 OLED display | Character display OLED 16x2 | Monochrome 2.42" 128x64 OLED Graphic Display (CHOSEN) |
| Product overview |  |  |  |
| Voltage | 3.3/5V | 3/5V | 3/5v |
| Pixel/Character count | 128x128 | 16x2 | 128x64 |
| Color | yes | no | no |
| Screen size | 43.17mm x 42mm | 56.95mm x16mm | 29mm x 56mm |
| Price | 39.95 | 27.95 | 39.95 |

Ultimately, we have chosen the Monochrome 2.42" 128x64 OLED Graphic Display [6]. This OLED has high contrast and plenty of pixels for us to display patterns in detail. Since the power consumption and voltage requirement is similar among these three products, we lean towards the one with a more appropriate size. The screen size plays an important role in this comparison since the main command and information will display on OLED for users. At the same time, this product offered by Adafruit comes with the entire kits and lots of examples and open sources for us to review.

2.0 Sources Cited:

[1]MN2/BT peristaltic pump. *Taobao.* [Online]. Available: <https://item.taobao.com/item.htm?spm=a1z10.5-c-s.w4002-21841364754.80.7adc276bK87hio&id=598194669018> [Accessed 6 September 2019]

[3]SN15 peristaltic pump. *Taobao.* [Online]. Available: <https://item.taobao.com/item.htm?spm=a230r.1.14.23.20a05b96P2Vk9A&id=530106515220&ns=1&abbucket=9#detail> [Accessed 6 September 2019]

[2]WIG-12915-ND peristaltic pump. Digi-Key.[Online]. Available: <https://www.digikey.com/product-detail/en/sparkfun-electronics/WIG-12915/WIG-12915-ND/7387392> [Accessed 6 September 2019]

[3]CoreXY. CoreXY.[Online]. Available: <https://corexy.com/index.html> [Accessed 6 September 2019]

[4]Adafruit Industries, “OLED Breakout Board - 16-bit Color 1.5’ w/microSD holder,” Adafruit industries blog RSS. [Online]. Available:<https://www.adafruit.com/product/1431>. [Accessed: 07-Sep-2019]

[5]Adafruit Industries, “Blue Character OLED 16x2” Adafruit industries blog RSS. [Online]. Available:<https://www.adafruit.com/product/823>. [Accessed: 07-Sep-2019].

[6]Adafruit Industries, “Monochrome 2.42" 128x64 OLED Graphic Display Module Kit,” Adafruit industries blog RSS. [Online]. Available:<https://www.adafruit.com/product/2719> [Accessed: 07-Sep-2019]