**Visual Indication Block Research Datasheet**

**I Provide a block diagram, flowchart, and/or public function headers of your block(s) for the system you will prototype in the next stage of the project.**

* Label all inputs and outputs consistently.
* If required estimated external memory requirements

Blade Count Block

1 bit

1 bit

1 bit

1 bit

1 bit

1 bit

1 bit

1 bit

7-Segment Display

(SC56-51PBWA-A)

7-Segment Display Decoder Driver

(sn7447a)

PIC

Blade Ready/Reload Available Block

λ=568nm

1 bit

Green LED

Blade Ready/

Reload Available

Power: 5V/40mA

1 bit

1 bit

1 bit

PIC

Input from motion

in the x, y, and z axis

x

Force Indication Block

1 bit

1 bit

1 bit

1 bit

LED

LED

LED

LED

λ=640nm

λ=610nm

λ=588nm

λ=568nm

PIC

**II Alternative Approaches**

Provide block diagrams, flowcharts, and/or public function headers of the alternative approaches you considered and rejected. Describe in a short paragraph why you feel these are not viable options.

**Blade Count**

-7-Segment Display with a 7-s decoder to convert the 4 bit binary number into 7-bits that will individually turn on each segment based on the number that it is to display

**Alternative:**

-5 or so led’s to represent each blade that could be loaded and led is lit if blade is loaded.

|  |  |  |
| --- | --- | --- |
|  | Option 1 | Option 2 |
| Product Used | 7-s common anode display with decoder driver | LEDs (green) |
| Power(max) | 4.0V/20mA, 15V/40mA | 2.5V/20mA |
| Pins Used | 4 pins | 1 pin per LED and one LED per blade held |
| Price | $2.70+$3.03=$5.73 | $0.09 each , minimum $0.45 |

We decided to use option 1, though it is more expensive and requires a little more work, it uses less pins for up to twice as many blades and is a more user friendly method. There will also be a lot more difficulty when doing the layout of the board when there has to be more than 4 paths from pic to LED’s, whereas the 7 segment requires 4 pins only to the decoder and the trace routing to the 7 segment from driver can be secluded to directly around the two components, taking up less total space. Though the LEDs would be the obviously cheaper choice, the 7 segment display will look better and improve the devices appearance.

**Blade Ready/Reload available**

-One LED to signify blades ready and Reload available (press reload button to check if reload is available, if light stays green then it is available if it turns off then no reload available).

**Alternatives:**

-Separate LED’s for each: Green that is lit only when weapon is ready to fire and yellow that only is lit when a reload is available.

-Use 2 LEDs, a red and a green, one for ready to fire or reload available and one to signify not ready to fire or no reload available

|  |  |  |  |
| --- | --- | --- | --- |
|  | Option 1 | Option 2 | Option 3 |
| Products Used | One Green LED | Green and Yellow LED | 2 Green and 2 Red LEDs |
| Power (max) | 2.5V/20mA | 2.5V/20mA each | 2.5V/20mA each |
| Pins Used | 1 pin | 2 pins | 4 pins |
| Price | $0.09 | $0.19 | $0.40 |

We chose to do option one because it is the simplest, cheapest and most convenient of the options. It will take up the least space and still accomplish the same goal as the others with less hardware.

**Force Indication**

-Use 4 LEDs in a row, one red, one orange, one yellow, and one greens. The red lights up for a bad throw, orange lights up for a low force throw(5ft range), yellow indicates decent force throw(15ft range), green indicate full range throw.

**Alternatives**:

-10 segment display that will visually show the amount of force that was exerted to throw weapon by lighting more bars to signify more force. This would require a driver and a DAC and is not very space or cost friendly

-No force indication, it’s not a requirement and may just over complicate the project and take up too much space.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Option 1 | Option 2 | Option 3 |
| Products used | Red, Orange, Yellow, and Green LEDs | HDSP-4832 Bar Graph display, LM3914 Driver, and DAC7512 | None |
| Power(max) | 2.5V/20mA each | 2V/20mA, 5.5V/1µA, 25V/10mA Respectively | 0 |
| Pins Used | 4 pin | 1 pin | 0 |
| Price | $0.39 | $14.07 | 0 |

The LEDs are the obvious choice here based on the power comparison and price comparison. There would also be a lot of unnecessary coding that would have to be done to implement the Bar Graph. Though the 10 segment display would definitely be the coolest choice, the space, time and money it would take is not worth it for something that is not a requirement for the project.

**III Data Sources**

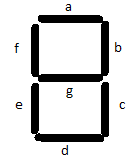
In the table below list the sources of information you used in your research. These may include websites, datasheets, books, prior code, etc. Indicate which sources you will be using in your prototype. Please bring a copy of all the data sources you found useful

|  |  |  |
| --- | --- | --- |
| **Type of datasource** | **Title, URL, etc.** | **Using in Prototype?** |
| Datasheet | http://www.us.kingbright.com/images/catalog/SPEC/SC56-51PBWA-A.pdf | Yes / No |
| Datasheet | http://www.ti.com/lit/ds/symlink/sn7447a.pdf | Yes / No |
| Website | http://www.makeyourownchip.com/7447.html | Yes / No |
| Datasheet | http://www.us.kingbright.com/images/catalog/SPEC/WP7104SRD-E.pdf | Yes / No |
| Datasheet | http://www.us.kingbright.com/images/catalog/SPEC/WP7104ND.pdf | Yes / No |
| Datasheet | http://www.us.kingbright.com/images/catalog/SPEC/WP7104YD.pdf | Yes / No |
| Datasheet | http://www.us.kingbright.com/images/catalog/SPEC/WP7104SGD.pdf | Yes / No |
| Datasheet | http://www.avagotech.com/docs/AV02-1798EN | Yes / No |
| Datasheet | http://www.national.com/ds/LM/LM3914.pdf | Yes / No |
| Datasheet | http://www.ti.com/lit/ds/symlink/dac7512.pdf | Yes / No |
|  |  | Yes / No |
|  |  | Yes / No |

**IV Simulation**

Provide a simulation if possible or, if this is not possible, a graph or sketch of the expected inputs and outputs of your system. These should be correctly labeled and as quantitative as possible.

Input lines from PIC to Decoder are A, B, C, D and output corresponds to the lighting of the segments as labeled in the figure



(Format of segments was taken from datasheet.)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Binary Decoder Input from PIC by Line | | | | Binary Decoder Output/7-Segement Input | | | | | | | 7-Seg Output |
| A | B | C | D | a | b | c | d | e | f | g | X |
| 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 |
| 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 2 |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 3 |
| 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 4 |
| 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 5 |
| 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 6 |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 7 |
| 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 |
| 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 9 |

|  |  |  |
| --- | --- | --- |
| Blade Ready Indication | | |
|  | LED ON | LED OFF |
| Blade is Ready Input=1 | 1 | 0 |
| Blade Not Ready Input=0 | 0 | 1 |

|  |  |  |
| --- | --- | --- |
| Reload Available Indication (Reload button is being pressed down) | | |
|  | LED ON | LED OFF |
| Reload Available Input=1 | 1 | 0 |
| Reload Not Available Input=0 | 0 | 1 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Force Indication | | | | |
|  | Red LED | Orange LED | Yellow LED | Green LED |
| Input=1 | 1 | 1 | 1 | 1 |
| Input=0 | 0 | 0 | 0 | 0 |

**V Discussion**

Be prepared for an in-depth discussion of the results of your research with the instructor and/or TAs.

**TA Scoring Sheet**

Student Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

TA Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Due Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date Demonstrated: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Rating** | **Score** | **Complete** | **Engineering Judgment** | **Datasheet** | **Simulation / Code Model** | **Understanding** |
| Master | 100% | Research is complete and convincing.  Valid sources of information used. | Knows which parts of project are constrained and which are open to design. Chooses best approach from multiple possibilities based on technical reasons. | Datasheet (info. from previous page) is complete and correct. | Simulation provides guidance on approach. Understands system inputs and outputs. | Thorough understanding of the design and shows insight from research and simulation. |
| Journeyman | 80% | Research is sufficient but not complete.  Some question about sources of information. | Some lack of clarity on freedom of choice vs. constraints.  Multiple approaches considered.  Judgments based on effort or knowledge rather than technical reasons. | Some information missing from datasheet, but it is correct. | Simulation provides guidance on approach. Some lack of clarity on inputs/outputs of their block. | Understands their design enough to complete but not improve work. |
| Apprentice | 60% | Research is spotty or incomplete.  Serious questions about the validity of sources. | Little understanding of constraints vs. choices available to them. Multiple approaches considered.  No valid basis for choosing one design over another. | Datasheet has several major items missing, and/or some minor errors. | Simulation incomplete and may lead to wrong approach. Inputs/outputs not clearly defined. | Does not fully understand how their design works.  Significant gaps of knowledge. |
| Not acceptable | 0% | Research not done, incorrect, or incomplete. | Multiple approaches not considered. | Datasheet is significantly incomplete or incorrect. | Simulation provides no guidance. Can’t identify inputs/outputs. | Lack of understanding.  Ignorance risks team's project or poses safety hazard. |

Overall Score: \_\_\_\_\_\_ / 100 Pass / Fail

Comments: