**Microcontroller Rationale**

Microcontrollers

For the control of the Stepper Motors, two types of microcontrollers were considered; Arduino’s and Raspberry pi’s. In the context of the project (used only for the control and the manipulation of the stepper motors), Arduino’s were deemed more appropriate as they are generally used for simple repetitive tasks useful for simple robotics (due to having only a single processor and ability to load a single program), whereas, Raspberry pi’s are more suitable for driving more complex robotics that need multiple tasks being performed simultaneously.

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| Advantages and Disadvantages of the most common Arduino Microcomputers | | |
| Type | Advantages | Disadvantages |
| Nano – (0.73” x 1.70 “)  https://images-na.ssl-images-amazon.com/images/I/71QlJty6m-L._SL1001_.jpg | * Smallest out of the three. * Uses a smaller Mini-USB connection. * Cheapest out of the three. * Configuration of the electronics is more flexible due to being small and not being confined to a fixed board size. | * Requires breadboard and/or soldering in-order to connect external peripheral devices. Conceptually, this can allow for much smaller circuitry at the cost higher manual effort. * No power jack however can take external power from Pin 27 (from a regulated 5V) or pin 30 (Vin; 7-20V). |
| Uno – (2.7” x 2.1”)  http://www.geeetech.com/wiki/images/1/12/ArduinoUno_r2_front.jpg | * Includes a physical reset button. * Includes a power jack. * Better ease of use than Nano for simple applications as majority of shield boards are catered for the Uno. * Mid-priced. | * A lot larger than the Nano – as fixed in terms of size, especially with shields, less variety in terms of shape and configuration. |
| Mega – (4” x 2.1 “)  http://www.geeetech.com/wiki/images/4/4b/ArduinoMega2560_r2_front.jpg | * Highest amount of digital I/O and analog in pins; 54 Digital I/O pins (14 of which can be used as PWM output) and 16 Analog inputs. * Also includes a power jack. * Much more flexible in terms of register level programming (e.g. more timer counters available). | * Largest out of the three hence not suitable for projects that are size constrained. * Most expensive out of the three. * Due to the nature of the project, the cost and the features would be a waste as there is no need for a large number of pins and the use register level programming. |

In summary, the chosen board was the Arduino Nano (although an *Elegoo* clone was bought for the project) due to the size of advantage of the board over the others. The effortless advantages of the Uno and its dedicated shield drivers is outweighed by the size of the Nano as it allows for the head design to be closer to the geometry of the fish. The Mega was omitted due to its size and also because its advantages do not bring any direct benefits to the project.

References:

1. Nano picture link: <https://www.amazon.co.uk/Keywish-Arduino-ATmega328P-Moudle-Compatible/dp/B07MFXJRP9/ref=sr_1_1_sspa?ie=UTF8&qid=1549717035&sr=8-1-spons&keywords=arduino+nano&psc=1>
2. Uno picture link: <http://www.geeetech.com/wiki/images/1/12/ArduinoUno_r2_front.jpg>
3. Mega picture link: <http://www.geeetech.com/wiki/images/4/4b/ArduinoMega2560_r2_front.jpg>