

# Assistive Technology Project

## All-In-One (AIO) Pet Feeder

Alicia McFarlane, Tuong Nguyen, Raphael Umali

### Abstract

Pets are ubiquitous features of the lives of many. Not only are they beloved companions, but they often provide much-needed assistance and utility to some of the most vulnerable people in society. However, an aspect of pet ownership that gets overlooked, or worse, forgotten, is feeding them! Although we hold our pets in high regard, their healthy eating habits are often neglected – especially in the context of our busy lifestyles, or with those who's disabilities make it difficult to remember when it is feeding time, or physically get up to feed their pets. Beyond the elderly or disabled people with forgetfulness, even adults with good cognitive functioning are prone to forgetting to feed – or accidentally over-feeding – their pets (especially in households where more than one person is designated to do this job). Whilst existing solutions on the market are automatic feeders that dispense dry food at a certain time and given amount each day, traditional feeders fail to cater towards pets on wet food diets. Dry kibble simply does not meet the needs of every pet; another solution is long-overdue.

This is why we have created the All-In-One (AIO) Pet Feeder. The AIO Pet Feeder is like a traditional feeder – offering an automatic dry food-dispensing function, with a weighing scale feedback system – but with extensive alternative features that enable pet owners the ability to be reminded when to feed their pets wet food. The manual feeding mode acts as a reminder system, alerting owners with a buzzer when it is time to feed their beloved pets, as well as giving owner's the weight of food inside the bowl when it comes time to feed them. Our entire product is thoughtfully designed with canine eating habits in mind – which is why we have opted for a low-set bowl holder, positioned inside the enclosure to prevent movement of the bowl while in use. Many existing feeders also have bowls built into the design, but we have opted for a removable bowl for ease of cleaning.

The AIO Pet Feeder combines automation, user friendly controls, and an alert system to create a unique and versatile feeding experience that accommodates every food requirement. Addressing limitations of traditional feeders, the AIO Pet Feeder provides a both reliable and inclusive solution for every type of pet owner from those with busy schedules to those with cognitive or physical impairments. Overall, the AIO Pet Feeder reshapes modern pet care solutions with a blend of both accessibility and functionality into one simple, yet comprehensive, elegant system.

### Enclosure Implementation

The design and implementation of a physical enclosure was the first step in prototype development. Designing an enclosure with thoughtful consideration of hardware positioning and physical size ensures the ability to properly test the integrated system and gives direction for further prototype development.

The methodology followed by the team to design the enclosure was:

1. Source the physically constraining components of the enclosure: the integrated pet food bowl and food-safe container/dispenser.
2. Measure the depth and diameters of these components.
3. Draft the dimensions of the enclosure, with space/tolerance between these components and the sides of the enclosure.
4. Design a CAD model (part modelling and assembly) in SolidWorks of the load cell subsystem, consulting the obtained dimensions of the food bowl and the specification sheet for the load cell (see Electronic Hardware Implementation section). Notably, the pet food bowl holder for the load cell apparatus was designed to be 3D-printed and made to prevent movement of the food bowl while in use.
5. Design a CAD model (part modelling and assembly) in SolidWorks of the enclosure by designing each of the six rectangular faces. Consultation of specification sheets for the electronic hardware was required to integrate mounting and I/O port holes into the CAD models.

After designing the enclosure and load cell subsystem, the required parts were submitted to The Creator Space (TCS) for laser cutting and 3D-printing. The team then assembled the enclosure and load cell subsystems using adhesives and screws provided by TCS. The team also fabricated the food enclosure/dispenser apparatus by mating together the purchased food-safe containers and cutting dispensation and mounting holes (for the servo motor; Electronic Hardware Implementation section). Once the enclosure and load cell subsystem was assembled, the electronic hardware was ready to be installed and tested inside the prototype.

The CAD assemblies can be found in Appendix B, and contribution statements are found in Appendix E.

## Electronic Hardware Implementation

The electronic hardware in the AIO Pet Feeder underpins the integrated feeding system. The main electronic hardware components sourced by the team were: Uno R3 Microprocessor; SG90 Servo Motor; 16x2 Character LCD; 4x4 Membrane Keypad; 1kg Beam Load Cell; Piezo Buzzer. These components can be grouped based on their working function in the prototype: the 16x2 Character LCD and 4x4 Membrane Keypad are user-interface (UI) components; the SG90 Servo Motor, 1kg Beam Load Cell and Piezo Buzzer are operational components; and the Uno R3 Microprocessor implements the finite-state machine (FSM) system control (see Software Implementation). Notably, the 4x4 Membrane Keypad allows full user control of the FSM, and the 16x2 LCD displays menu information for users.

The general methodology that the team followed for implementing the integrated hardware system was:

1. Conduct research regarding hobbyist automatic pet feeders – investigate common components, design novel dispensing mechanism, determine additional functionalities that can be implemented (i.e. ‘manual mode’; Software Implementation).
2. Select and purchase components that fit the design requirements and specifications – components that are compatible with lightweight microprocessor package, size-appropriate, and components that can reasonably execute required actions given the budget.
3. Mount components to their respective positions in the enclosure/relevant subsystem. This required faithful physical modelling of components in SolidWorks CAD prior, to match through holes and visualise mountings.
4. Connect components together using jumper wires and solder. Care was taken in the connections to the microprocessor pins, and good colour-coding and cable management was practiced, including securing male-to-female connections with electrical tape.

Component connections were managed on a standard-sized breadboard and can be viewed in Appendix C. With the electrical hardware components mounted and connected, the software implementation controlling the integrated system could then be developed and tested.

## Software Implementation

The AIO Pet Feeder implements a finite-state machine (FSM) to control the integrated system. This FSM was implemented via Arduino IDE, with test and final builds being uploaded to the microprocessor. The entire FSM can be viewed in Appendix D. The methodology used to develop the FSM was simple – the team had already identified the key operational modes of the integrated system, so it was simply a matter of coding each state and the relevant transitions between them, as well as fine-tuning the response and (weight) feedback system for the ‘automatic’ feeding mode.

## Market Research

Brief market research for the purpose of the investor’s pitch yielded very promising results pertaining to the success of our product. For a thorough cost breakdown of the AIO Pet Feeder prototype, consult the investor pitch slide deck, but we estimate the prototype cost to be \$50. When compared to existing pet feeders on the market, the AIO Pet Feeder presents strong competitiveness in both aspects of functionality and price. The cheapest automatic feeders retail in the range of \$60 to \$80, yet they typically lack sophisticated features like a general user interface or multiple operating modes that allow users full control over the eating habits of their pets. In contrast, the AIO Pet Feeder offers greater versatility and functions centred around the user experience at a lower cost. On the other end of the market, while considerably more expensive pet feeders may incorporate some level of user interface, the price point typically far exceeds \$150, which for many, is not particularly viable. This highlights the affordability of the design, which delivers comparable features at a fraction of the price. Additionally, it is worth further noting that there is no other pet feeder currently available on the market that is specifically targeted towards assisting those with cognitive impairment or those with memory challenges. The AIO Pet Feeder was designed and built on a foundation of inclusivity and user convenience, by incorporating an integrated reminder system that alerts users when it is time to feed their pets, expanding accessibility within the pet care market. Such an innovation places the AIO Pet Feeder in a very competitive position, being a cost-effective solution that also addresses the diverse needs of every pet owner.

Potential avenues of product development were discussed proceeding the investor’s pitch. Popular pet feeders in the market, although substantially more expensive, integrate wireless connectivity features. Implementing these features via mobile applications would markedly improve the user experience, particularly for pet owners suffering with disabilities, by allowing a richer feature system. The team is confident that the required components to implement this, as well as the added development time, would not compromise the cost-competitiveness of the AIO Pet Feeder. Furthermore, a more robust enclosure and higher-capacity food container could be built by utilising higher-quality materials. This domain of improvement has yet to be explored, with material and manufacturing costs potentially being much higher. With a cost-difference exceeding \$50 between the AIO Pet Feeder and similarly high-quality pet feeders, however, it is possible that these improvements to the physical design can be made whilst being price-competitive.

## Appendix A: Meeting Minutes

| Date Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Type      | Location                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Attendance                                            |
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| 13 <sup>th</sup> October 2025<br>3:00pm – 4:00pm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | In person | ERC Library                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Raphael Umali<br>Alicia McFarlane<br>Tuong Bao Nguyen |
| Discussion Lead                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |           | Rapporteur                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                       |
| Alicia McFarlane                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           | Meeting notes created by Tuong Bao Nguyen.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                       |
| Agenda & Discussion Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |           | Action Items, Responsibility, Deadline                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                       |
| <ul style="list-style-type: none"><li>- Discuss and decide upon a project idea revolving around assistive technology<ul style="list-style-type: none"><li>o Growing population of people suffering from dementia (large target demographic)</li><li>o Pet feeder – appeal to emotion (easy to sell idea of an automatic pet feeder)</li></ul></li><li>- Discuss how to implement actual design<ul style="list-style-type: none"><li>o Hardware side (physical electrical components and physical enclosure)</li><li>o Software side (FSM with different operating modes – automatic for dry food and manual for wet food)</li></ul></li><li>- Discuss items that need to be purchased<ul style="list-style-type: none"><li>o Dog bowl x1</li><li>o 2L Plastic containers x2</li><li>o Pasta to act as dog food 500ml</li><li>o Electrical components (load cell, keypad)</li></ul></li><li>- Discuss project timeline<ul style="list-style-type: none"><li>o Reviewed as a team all project components including presentation/demo as well as reports</li><li>o Reviewed all deadlines for project progression.</li></ul></li></ul> |           | <ul style="list-style-type: none"><li>- <b>Alicia:</b> To design the dispensing system and order electrical components, and review/establish project timeline<ul style="list-style-type: none"><li>o Deadline: 15<sup>th</sup> October 2025</li></ul></li><li>- <b>Raph:</b> To model the enclosure and the bowl holder.<ul style="list-style-type: none"><li>o Deadline: 15<sup>th</sup> October 2025</li></ul></li><li>- <b>Tuong:</b> To plan the electrical wiring<ul style="list-style-type: none"><li>o Deadline: 15<sup>th</sup> October 2025</li></ul></li><li>- <b>All:</b> To purchase non electrical items necessary (namely the dog bowl and plastic containers).<ul style="list-style-type: none"><li>o Deadline: 15<sup>th</sup> October 2025</li></ul></li></ul> |                                                       |
| Next Meeting & Agenda                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                       |
| 15 <sup>th</sup> October 2025 12:00pm; to discuss the physical assembly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                       |

| Date Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Type      | Location                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Attendance                                            |
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| 15 <sup>th</sup> October 2025<br>12:00pm – 7:00pm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | In person | The Creator Space                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Raphael Umali<br>Alicia McFarlane<br>Tuong Bao Nguyen |
| Discussion Lead                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |           | Rapporteur                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                       |
| Raphael Umali                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |           | Meeting notes created by Tuong Bao Nguyen.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                       |
| Agenda & Discussion Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |           | Action Items, Responsibility, Deadline                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                       |
| <ul style="list-style-type: none"><li>- Begin the assembly of the prototype<ul style="list-style-type: none"><li>o Need to use TCS equipment in order to make the prototype, namely the laser cutter, 3D printers and power tools.</li><li>o Assembly will be held together with the use of adhesives</li></ul></li><li>- Test initial build for functionality<ul style="list-style-type: none"><li>o Works well thus far after a few test runs.</li></ul></li><li>- Identify any key issues before moving forward with the software<ul style="list-style-type: none"><li>o Need to drill holes in enclosure to mount the motor</li><li>o Need to cut a ramp for the dispenser</li><li>o Enclosure friction not enough to hold itself together so have to use glue</li><li>o Enclosure doesn't sit completely flat so elevate by modelling and laser cutting feet.</li><li>o Cable management issue (fixed via electrical tape)</li></ul></li></ul> |           | <ul style="list-style-type: none"><li>- <b>Alicia:</b> To finalise the assembly of the enclosure, and creating the food container/dispenser. Also, modelling and laser cutting feet for enclosure<ul style="list-style-type: none"><li>o Deadline: 17<sup>th</sup> October 2025</li></ul></li><li>- <b>Raph:</b> To 3D print and laser cut enclosure components at the TCS<ul style="list-style-type: none"><li>o Deadline: 17<sup>th</sup> October 2025</li></ul></li><li>- <b>Tuong:</b> To assist in assembling the prototype, mounting the motor and wiring up the electronics<ul style="list-style-type: none"><li>o Deadline: 17<sup>th</sup> October 2025</li></ul></li><li>- <b>All:</b> To purchase MDF wood and screws used for the enclosure at Bunnings<ul style="list-style-type: none"><li>o Deadline: 16<sup>th</sup> October 2025</li></ul></li></ul> |                                                       |
| Next Meeting & Agenda                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                       |
| 17 <sup>th</sup> October 2025 3:00pm; to discuss the software development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                       |

| Date Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Type      | Location                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Attendance                                            |
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| 17 <sup>th</sup> October 2025<br>3:00pm – 4:00pm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | In person | ERC library                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Raphael Umali<br>Alicia McFarlane<br>Tuong Bao Nguyen |
| Discussion Lead                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           | Rapporteur                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                       |
| Tuong Bao Nguyen                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           | Meeting notes created by Tuong Bao Nguyen.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                       |
| Agenda & Discussion Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           | Action Items, Responsibility, Deadline                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                       |
| <ul style="list-style-type: none"><li>- Discuss software development<ul style="list-style-type: none"><li>o Minor bugs in early code development were identified and discussed in particular with handling errors and edge case considerations.</li><li>o Discussed the functionality of the keypad and how to implement.</li><li>o Agreed to implement error handling for unexpected inputs</li><li>o Agreed on different dispensing modes to ensure more accurate and precise results.</li></ul></li><li>- Review theoretical FSM implementation<ul style="list-style-type: none"><li>o The team reviewed the theoretical FSM implementation, noting if it correctly handles state transitions, initialisation, processing, and outputs</li><li>o Reviewed code modularity and readability with focus on commenting and consistent naming conventions.</li><li>o Confirmed the final structure of the FSM with stages to verify behaviour</li></ul></li><li>- Assign tasks for coding and debugging<ul style="list-style-type: none"><li>o Divided work evenly among team members</li><li>o Integration with hardware was discussed, ensuring all systems were integrated.</li></ul></li></ul> |           | <ul style="list-style-type: none"><li>- <b>Alicia:</b> To calibrate load cell and servo motor for correct, consistent and reliable operation.<ul style="list-style-type: none"><li>o Deadline: 19<sup>th</sup> October 2025</li></ul></li><li>- <b>Raph:</b> To write the dispensing code and weight checking algorithms.<ul style="list-style-type: none"><li>o Deadline: 19<sup>th</sup> October 2025</li></ul></li><li>- <b>Tuong:</b> To write the main FSM, UI code for both automatic and manual feeding modes.<ul style="list-style-type: none"><li>o Deadline: 19<sup>th</sup> October 2025</li></ul></li></ul> |                                                       |
| Next Meeting & Agenda                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                       |
| 19 <sup>th</sup> October 2025 1:00pm; to finalise prototype and plan presentation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                       |

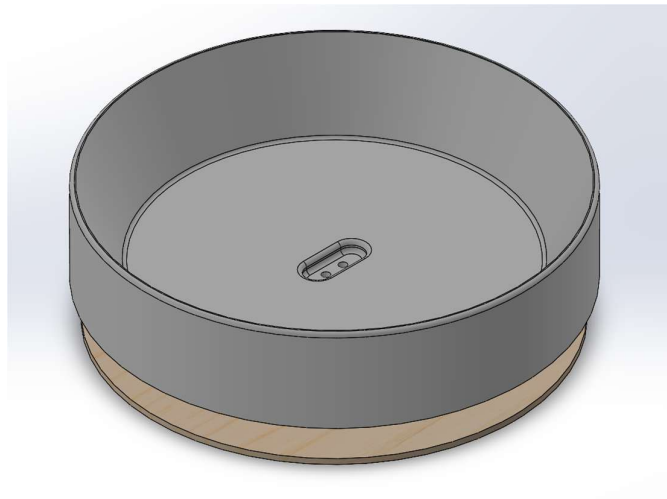
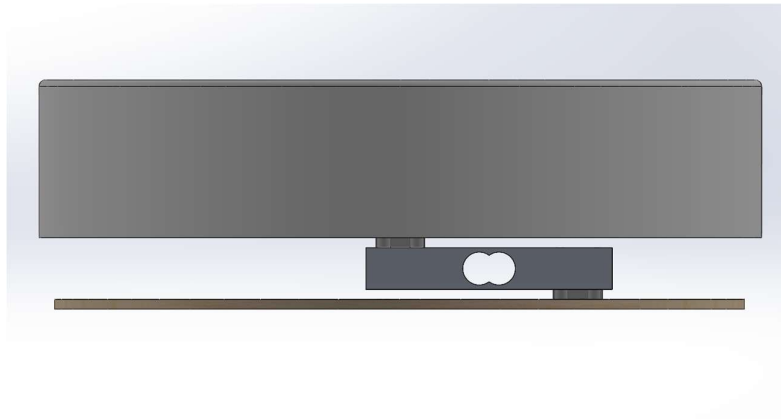
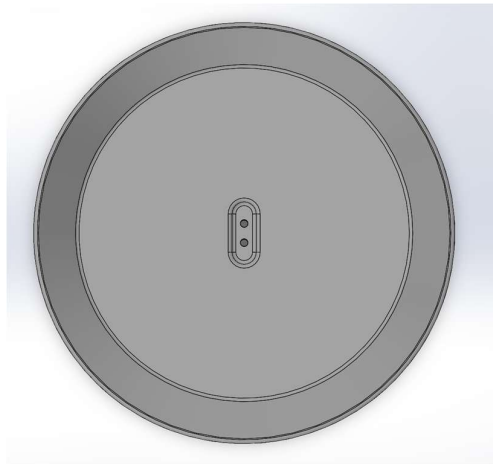
| Date Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Type      | Location                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Attendance                                            |
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| 19 <sup>th</sup> October 2025<br>1:00pm – 5:00pm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | In person | ERC library                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Raphael Umali<br>Alicia McFarlane<br>Tuong Bao Nguyen |
| Discussion Lead                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           | Rapporteur                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                       |
| Alicia McFarlane                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |           | Meeting notes created by Tuong Bao Nguyen.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                       |
| Agenda & Discussion Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |           | Action Items, Responsibility, Deadline                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                       |
| <ul style="list-style-type: none"><li>- Plan and structure of final project presentation<ul style="list-style-type: none"><li>o The team discussed the structure of the presentation, including objectives, design approaches, and outcomes (both hardware and software), market comparison, cost breakdown, etc.</li><li>o Visual aids like models and diagrams determined and reviewed</li></ul></li><li>- Allocate presentation roles and responsibilities<ul style="list-style-type: none"><li>o Each team member was assigned specific speaking roles and ensure balanced participation and smooth transition between chosen topics.</li></ul></li><li>- Prepare demonstration setup and materials.<ul style="list-style-type: none"><li>o Prototype was tested to ensure reliable operation and functionality under different operating conditions.</li><li>o Timing was practiced to meet time limits and assessment criteria.</li></ul></li></ul> |           | <ul style="list-style-type: none"><li>- <b>Tuong:</b> To write a script and make presentation slides for the problem at hand and make the FSM diagram.<ul style="list-style-type: none"><li>o Deadline: 21<sup>st</sup> October</li></ul></li><li>- <b>Raph:</b> To make CAD models for presentation and write about the enclosure and different modes and their respective slides.<ul style="list-style-type: none"><li>o Deadline: 21<sup>st</sup> October</li></ul></li><li>- <b>Alicia:</b> To write about the product, the details of the product, cost breakdown, and market comparison and their respective slides.<ul style="list-style-type: none"><li>o Deadline: 21<sup>st</sup> October</li></ul></li></ul> |                                                       |
| Next Meeting & Agenda                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                       |

| 21 <sup>st</sup> October 2025 10:00am; to finalise presentation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                       |
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| Date Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Type      | Location                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Attendance                                            |
| 21 <sup>st</sup> October 2025<br>10:00am – 2:00pm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | In person | ERC Library<br>project room                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Raphael Umali<br>Alicia McFarlane<br>Tuong Bao Nguyen |
| Discussion Lead                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |           | Rapporteur                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                       |
| Tuong Bao Nguyen                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           | Meeting notes created by Tuong Bao Nguyen.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                       |
| Agenda & Discussion Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           | Action Items, Responsibility, Deadline                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                       |
| <ul style="list-style-type: none"><li>- Final review of presentation slides<ul style="list-style-type: none"><li>o The team conducted final checks on the presentation slides, making sure they are ready for presentation and up to standard.</li></ul></li><li>- Final review of presentation script<ul style="list-style-type: none"><li>o The team conducted final checks of the presentation script, ensuring there is logical and cohesive flow of structure during presentation and that all necessary topics are covered.</li></ul></li><li>- Presentation Rehearsal<ul style="list-style-type: none"><li>o The team rehearsed the presentation multiple times to get comfortable with the script as well as presenting.</li><li>o The team ensured that the prototype was working correctly for the project demonstration.</li></ul></li><li>- Project Report Planning<ul style="list-style-type: none"><li>o The team planned the structure and content of the project report, ensuring all topics on the rubric are covered.</li><li>o The team allocated writing responsibilities among the members and established a timeline for report completion.</li></ul></li></ul> |           | <ul style="list-style-type: none"><li>- <b>Raph:</b> To create project report template to be filled out, and fill out sections electronic hardware implementation and enclosure implementation.<ul style="list-style-type: none"><li>o Deadline: 10:00am 25<sup>th</sup> October 2025</li></ul></li><li>- <b>Alicia:</b> To fill out sections Abstract and Market Research.<ul style="list-style-type: none"><li>o Deadline: 10:00am 25<sup>th</sup> October 2025</li></ul></li><li>- <b>Tuong:</b> To fill out section software implementation.<ul style="list-style-type: none"><li>o Deadline: 10:00am 25<sup>th</sup> October 2025</li></ul></li></ul> |                                                       |
| Next Meeting & Agenda                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                       |
| 25 <sup>th</sup> October 2025 3:00pm; to finalise project report.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                       |

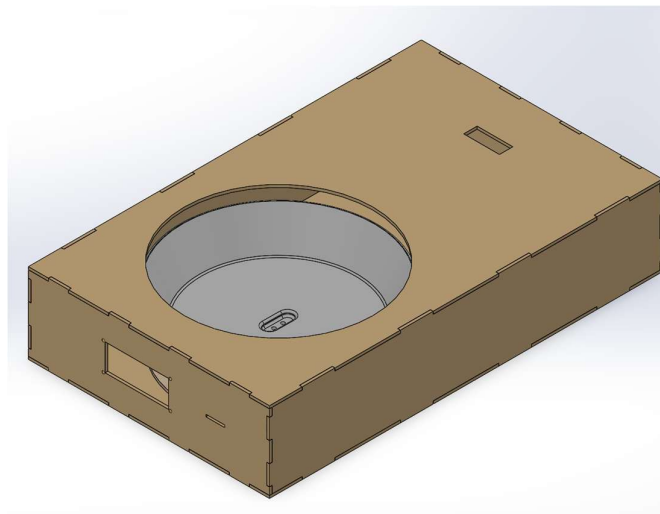
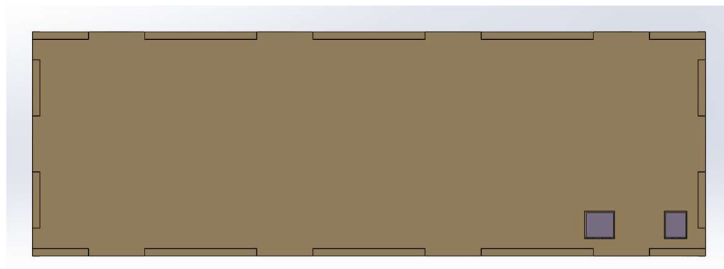
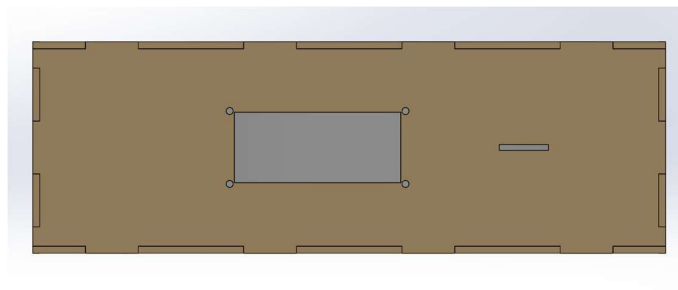
| Date Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Type   | Location                                                                                                                                                                                                                                                                                                                                                                     | Attendance                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| 25 <sup>th</sup> October 2025<br>3:00pm – 4:00pm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Online | Microsoft Teams                                                                                                                                                                                                                                                                                                                                                              | Raphael Umali<br>Alicia McFarlane<br>Tuong Bao Nguyen |
| Discussion Lead                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        | Rapporteur                                                                                                                                                                                                                                                                                                                                                                   |                                                       |
| Alicia McFarlane                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |        | Meeting notes createdby Tuong Bao Nguyen.                                                                                                                                                                                                                                                                                                                                    |                                                       |
| Agenda & Discussion Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |        | Action Items, Responsibility, Deadline                                                                                                                                                                                                                                                                                                                                       |                                                       |
| <ul style="list-style-type: none"><li>- Final review of project report<ul style="list-style-type: none"><li>o The team conducted final checks of the project report, ensuring that all sections, figures were complete and correctly formatted.</li></ul></li><li>- Confirmation of report requirements<ul style="list-style-type: none"><li>o The team reviewed all sections of the report and crosschecking with the provided rubric.</li></ul></li><li>- Reflection of project outcomes and team performance<ul style="list-style-type: none"><li>o The team reflected on overall project progress, highlighting effective teamwork, and adhering to deadlines.</li></ul></li></ul> |        | <ul style="list-style-type: none"><li>- <b>Alicia:</b> To make final edits toreport (grammar &amp; spelling check).<ul style="list-style-type: none"><li>o Deadline: 9:00pm 25<sup>th</sup> October 2025</li></ul></li><li>- <b>Raph:</b> To deliver final report.<ul style="list-style-type: none"><li>o Deadline: 11:59pm 25<sup>th</sup> October 2025</li></ul></li></ul> |                                                       |
| Next Meeting& Agenda                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |        |                                                                                                                                                                                                                                                                                                                                                                              |                                                       |
| N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                                                                                                                                                                                                                                                                                                                                                                              |                                                       |

## Appendix B: CAD Assemblies

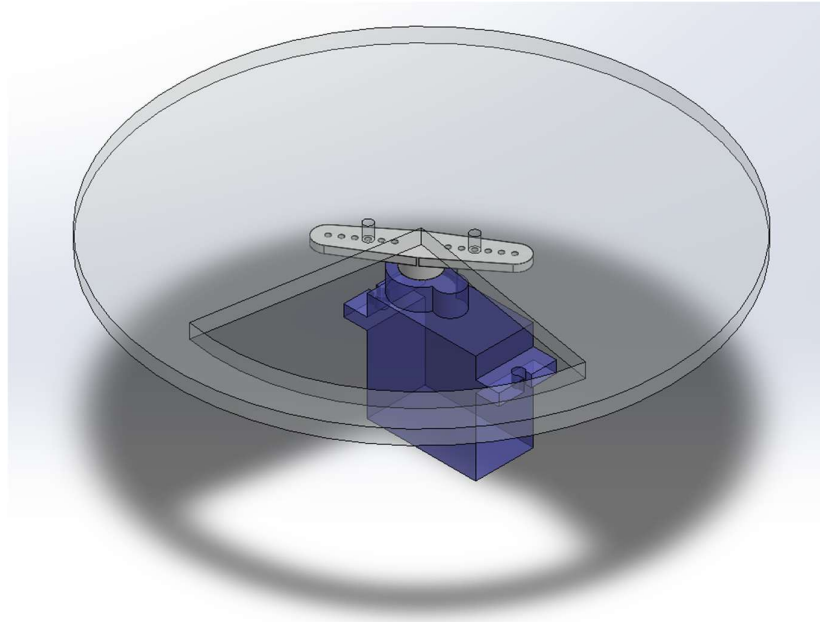
Top, side and isometric views of the Load Cell Assembly (1kg Beam Load Cell, Pet Bowl Holder, Scale Base, Spacers):



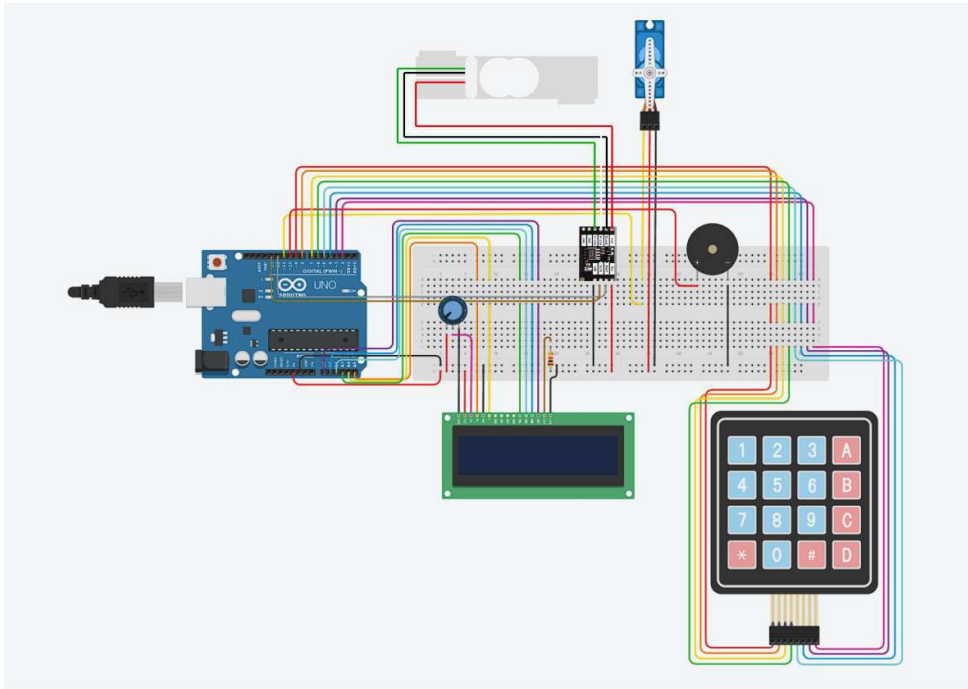
Top, front, back and isometric views of the AIO Pet Feeder Enclosure (with Load Cell Assembly and Uno R3 microprocessor model inside):



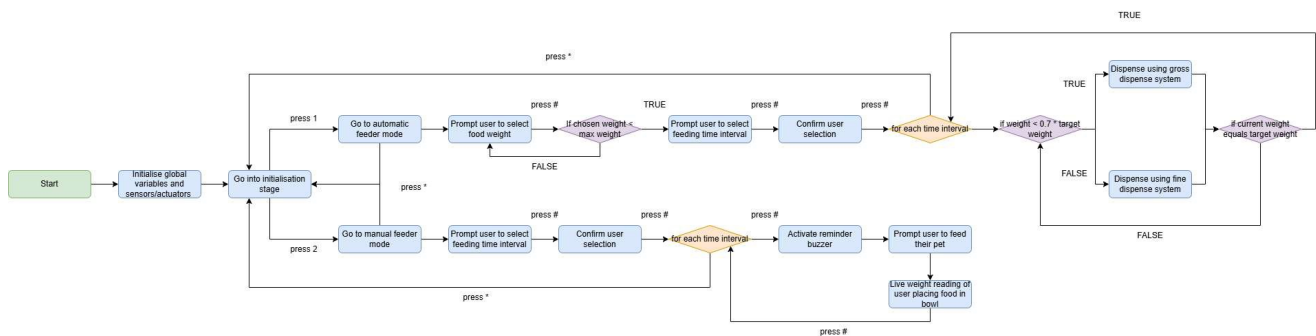
Isometric view of the SG90 Dispensing Assembly (SG90 servo motor, servo motor horn, servo horn attachment/dispensing fin):



## Appendix C: Circuit Schematic



## Appendix D: FSM Flowchart



## Appendix E: Contribution Statements

**Alicia McFarlane:** Generated original idea; ordered electrical components; designed dispenser; modelled and laser cut spacers, feet and acrylic piece mounted to servo; formatted all CAD onto drawings ready for laser cutting; constructed final prototype with Tuong; generated circuit schematic on TinkerCad; calibrated load cell with Raph; coded and tested automatic feeder mode with Raph; built dispenser (as group); purchased non-electrical materials (as group); made slides for presentation (as group).

**Tuong Nguyen:** Implemented FSMs within Arduino code; completed the bulk of the UI coding; wired up circuit connections; constructed final prototype with Alicia; generated FSM flowchart; implemented Nokia buzzer sound; soldered; mounted servo motor and Arduino; purchased non-electrical materials (as group); built dispenser (as group); made slides for presentation (as group); documented all meeting minutes.

**Raphael Umali:** Designed enclosure and scale; modelled enclosure and scale on SolidWorks as parts and assemblies; submitted 3D print job for bowl holder; laser cut enclosure; calibrated load cell with Alicia; finished coding the manual mode; coded and tested automatic feeding mode with Alicia; purchased non-electrical materials (as group); built dispenser (as group); made slides for presentation (as group).