To design a low-cost, programmable automated pet feeder system suitable for a local animal shelter, the solution integrates key features identified from recent research and employs simple, effective components. The design process follows an integrated problem-solving approach ensuring clear problem definition, structured data organization, algorithm design, implementation in plain English, and thorough testing and refinement.

**Step 1: Understand and Define the Problem**

**Features Required:**

* Dispense food for cats and dogs at scheduled times.
* Monitor food consumption or detect if food has been eaten.
* Alert staff if problems occur (e.g., no food dispensed, food not eaten, empty food bin).
* Use low-cost, reliable components (servo motor, sensors) for practical implementation.
* Adjustable portion control based on pet size or feeding needs.
* Support for multiple feedings per day.

| **Inputs** | **Outputs** |
| --- | --- |
| Real-time clock (feeding time) | Rotate servo motor to dispense food |
| Weight sensor under bowl (food consumed) | Display feeding status on LCD |
| Food level sensor (food bin status) | Send alert if food is not dispensed or not consumed |
| User input keypad (feeding schedule, portion size) |  |
| Proximity sensor (detect pet presence) optional |  |

**Inputs and Outputs:**

**Assumptions and Limitations**

* The feeder uses a single type of pet food suitable for both cats and dogs.
* Feeding schedules and portion size are programmable by staff.
* Sensors have limited resolution and communication range.
* The system initially operates offline but can be upgraded to IOT- enabled.
* Battery or solar power may support off-grid operation.
* Alerts can be visual (LCD) or auditory; Future versions may include wireless notifications.

**Block Diagram Sketch (conceptual):**

