The Smart Pet Feeder

A Proposal to Design and Build an Automated Pet Feeder Capable of Preventing One Pet From Eating Another Pet’s Food

Submitted to Professor Salah Badjou

on January 30, 2008

by

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WENTWORTH INSTITUTE OF TECHNOLOGY

ELMC 461-ELECTROMECHANICAL  Design
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Introduction and Summary:

For this project we will design and build a prototype of an automated pet feeder which will be suitable for use by cats and small dogs. This product will be called the Smart Pet Feeder. This system will hold enough food for 5 feedings. In addition to the features typically found on such feeders, the Smart Pet Feeder will allow the pet owner to prevent one pet from eating food which belongs to another pet.

Pet care is a multi-billion dollar industry is the US and is the second fastest growing retail area. Americans have doubled their spending on pets in the last 10 years and are expected to continue to increase their spending for several more years to come. In spite of the plethora of pet care products on the market, there is no product which keeps one pet from eating another animal’s food, even though this is a very common problem among pet owners. The Smart Petfeeder will give pet owners a solution to this problem, thereby improving the lives of both pets and the owners.

Problem Definition:

Most pet owners cannot stay home to feed their pet several times a day, yet they want their pet to be able to eat as needed throughout the day. One of the most common ways that pet owners try to solve this problem is by so-called free feeding, where a pet has food available all day and eats at will (1). The problem is that the pet owner has no control over how much the pet eats or which pet eats the food. Many households have more than one pet which is fed from a bowl on the floor. Among those households, it is a common occurrence that those pets cannot eat the same food for either medical or financial reasons. These reasons include:
› One pet is on a special diet, such as for diabetes or kitten food, but the other pets eat normal food

› One pet needs to eat less than the others for weight control reason

› There is a dog and a cat, and the cat wants to eat the dog food (or vice versa), which is not healthy

› One pet has to eat a special diet and, while it is not unhealthy for the other pets to eat this food, it is more expensive than normal food and so it is cost effective to restrict the consumption of this food to only the pet which needs it

However, there is no effective way of keeping one pet from eating another’s food short of physically removing the pet from the forbidden food. This creates a problem for both the pet owner and the pet. The issue for the pet owner is that they now have to supervise the pet’s meals to assure that each pet eats its own food, or feed the pets at the same time in different rooms. Either way, the owner’s presence at home is required during meal times. The issue for the pet is that, since the food cannot be left out to be eaten at leisure, it is forced to eat in the amount of time the pet owner allows it, regardless of its own eating preferences.

In addition, having to supervise a pet’s eating leads to reduced mobility on the owner’s part. As the feeding requirements become more complex it gets more expensive to hire someone to look after one’s pets for long periods of time, and even day-to-day care while not traveling can become restrictive. Many pet owners are faced with scheduled pet feedings which require them to get up at the same time every morning to give the pets breakfast and to be home at the same time every night to give them dinner. If a pet takes medication it becomes even more important that a schedule is kept and the pet owner is even more restricted. Add to that the requirement that the different pets not eat each other’s food and it can leave the pet owner with a
demanding and, for some, unrealistic schedule. This type of feeding routine can also cause the pet stress since it knows that it will not be fed until the owner is home.

In short, the problems which pet owners face in feeding their pets are:

1. Making sure that each pet has access to a healthy amount of food throughout the day, regardless of the owner’s schedule
2. Making sure that each pet eats only its own food

Literature Review / Background Research:

There are many different types of pet feeders on the market today attempting to solve the problem of making sure that each pet has access to a healthy amount of food throughout the day, regardless of the owner’s schedule. These feeders range in price from under $10 to $500 and offer varying degrees of control to the pet owner.

The most basic pet feeder is a gravity feeder, which consists of a hopper full of food which falls into a bowl as the bowl is emptied by the pet (see Figure 1). This type of feeder is not meant to control portion sizes or access to the food.

Figure 1: Petmate Café Feeder (2)
The feeder in Figure 1 allows the pet owner to ensure that the pet has access to food throughout the day or for a longer period of time and that the food does not go stale from exposure to the air before the pet eats it, but does nothing to control the amount of food eaten by the pet or to keep one pet from eating another’s food. This feeder is designed to be a hassle free form of free feeding. The user reviews for this type of feeder are positive for the most part, with the most common complaint being that the food hopper can be knocked off by the pet, creating a mess (see Appendix B).

The rest of the pet feeders on the market are designed to provide regular feedings to pets even when the owner is not home. The most common type is based on the same idea as a gravity feeder but goes one step further, providing specifically sized portions at preset times. These feeders are intended both for the vacationing owner and the busy owner who simply does not have time to be home to feed their pets regularly. These feeders range in price from $50 to $500. In the $50 range, there is the Petmate Le Bistro Electronic Portion-Control Automatic Pet Feeder, shown below.

Figure 2: Petmate Le Bistro Electronic Portion-Control Automatic Pet Feeder (3), which retails for $49.99
This pet feeder holds 4.5 pounds of food and can dispense portions from \( \frac{1}{4} \text{ cup} \) to 2 cups up to 3 times per day. The reviews for feeders such as this are positive for the most part (Amazon.com shows an average review for this feeder to be 4 stars out of a possible 5 based on 266 user reviews (3)). The most common complaints about this type of feeder is that the programming is very difficult and is lost when the batteries are removed, the electronic display does not work, the smallest portion of food is too large for some pets, and that the food gets jammed in the chute leaving the pet hungry (4).

One the other side of the price range is the Perfect Petfeeder Lux Model by Pillar Products which was introduced in July of 2007.

![Image of Perfect Petfeeder Lux Model](image.jpg)

**Figure 3: The Perfect Petfeeder (5)**

This feeder holds up to 10 pounds of food, which it can dispense up to 6 times per day in portions as small as a few pieces of food or as large as several cups. Instead of relying on batteries, it runs on AC power from a typical wall outlet and has a battery backup in case of power outages. Among other features, it boasts a “paw safe design” which ensures that no pet will ever get to the food, easy programming, a level meter to let the owner know when the unit is low on food, and almost every component which touches food is dishwasher safe (6). The
drawback of this product is the price and the size. It retails for $499 and weighs about 20 pounds when empty (6). It is a major investment in both money and space. All of the reviews available are positive, but that is expected since the only source of user reviews is the Perfect Petfeeder website. At this time, there are no reports which state how many of these feeders have been purchased.

The other, less common, type of feeder on the market right now is shaped like the ERGO 8 day feeder (see Figure 4). This type of feeder ranges in price from $40 to $200. The advantage of this type of feeder over the gravity-type feeders is that there is no chute to get clogged with food, and the owner does not need to rely on the feeder itself to measure how much food will be served, since the owner places the exact amount to be fed in each compartment.

![Figure 4: The ERGO 8 day feeder (7)](image)

The user ratings for this type of feeder are about the same as those for gravity type feeders, with the most common complaints being flimsy construction which allow the pet tear the feeder apart and to access all of the food, the use of floor space, frequent battery replacement, and the fact that, in most models, the lid rotates so that in order for the pet to eat from the back compartments it must stand on the feeder. One major advantage of this type of feeder is to the pet owner whose
pet must receive medication on a schedule, since the medicine can be mixed with the food and released at a programmed time. Another advantage is that there are less moving parts and therefore fewer things to break.

Interestingly, there is not a single product on the market which addresses the second problem pet owners face when feeding their pets, which is to keep one pet from eating another pet’s food. A search of the internet shows countless questions posed to discussion boards and pet advice experts stating “How can I make my dog stop eating the cat’s food?” or “How do I feed my fat cat less without my skinny cat losing weight?” The answers to the first question range from yelling “bad” to the dog when it eats the cat’s food to moving the cat food to a place where the cat can get to it but the dog cannot reach (8). The advice given to multi-cat owners is to feed the cats separately, which makes the use of any of the feeders discussed above impossible.

It is our goal to create a new type of pet feeder which will solve both of the problems of providing food even when the owner is not home and preventing one pet from eating another pet’s food. Based on the round type of feeder shown in Figure 4, our Smart Pet Feeder will hold enough food to feed an animal for several days. The bowl will rotate under the cover so that the food is always in the same location at feeding time. The food will be revealed at the time which the owner programs and will remain available for the pet to consume at its own pace. Our feeder will, however, go one step further and actually prevent any one pet from eating a forbidden food. This will also allow the pet owner to place medication in the feeder and be sure that the pet that needs the medicine is the only one that will get it.
The Need:

Research reveals that pet care is big business in the US. According to the American Pet Products Manufacturing Association (known as the APPMA), 63% of US households include a pet as of 2007 (that’s over 162 million cats and dogs) (9). And, as Americans increasingly view their pets more as family members than possessions, the amount of money they are willing to spend on their care is steadily increasing. According to the APPMA, Americans spent $41 billion on their pets in the year 2007 (9). This trend is relatively new (for example, in 1996 Americans spent only $21 billion on their pets (10)), but it shows no sign of slowing down. After consumer electronics, pet care is the fastest growing industry in the US (11), and yearly spending is expected to reach $52 billion by 2009 (11).

While the reasons for America’s pet obsession may be debatable, its existence is not. Surprisingly, most of the money spent on pet care is not going toward veterinary bills; it’s going to buy food, where $16.1 billion was spent in 2007 (12). Clearly, Americans are as obsessed with their pets’ diets as they are with their own. Unfortunately, 40% of America’s pets are overweight (1). In cats, obesity is a leading cause of diabetes and urinary tract problems, and obese dogs are more likely to be injured and have more stress on their heart, lungs, liver, kidneys, and joints (14).

Our new Smart Pet Feeder will not be able to cure any of these ailments, but it will make it easier for the pet owner to administer the treatment recommended by their vet. It will make it possible to feed one cat a prescription food while letting the other eat a normal food, or to provide puppy food to the younger dogs while making sure that an older dog does not gain weight from eating it, since puppy food is higher in calories than regular dog food.
This project is perfect for the Electromechanical Design Class. It requires the integration of electrical, mechanical, and programming components. Also, it will force this team to become familiar with the technical design and production processes as well as the business aspects of project planning, scheduling, and cost analysis. As in the professional world, this product will be designed by a team to which each member brings a different set of strengths and skills.

Objectives:

Our objectives are to create a product which will:

1. Enable a pet owner to feed their pets at specific time of day without being physically present at feeding time
2. Allow a pet owner to feed a number of different pets different types of food without the possibility of one pet eating another pet’s food

Functional Requirements:

The Smart Pet Feeder must:

1. Reliably provide food to a pet at the time the owner wishes
2. Be easily programmable by someone with no technical knowledge
3. Keep the pet from reaching the food stored for later feedings
4. Not allow an unauthorized pet to eat from a given feeder

The Workplan/Method:

The prototype must be complete and ready for exhibit by the last week of April. The preliminary schedule for the production of the Smart Petfeeder prototype is as follows:

2. Specify the components: January 30 – February 4, 2008

4. Order components: February 15 to be in hand by March 1, 2008


6. Programming of microcontroller and assembly of electrical system: March 1 – April 1

7. Assembly of Prototype: April 1 – April 15

This schedule has the prototype completed two weeks before the demonstration, leaving enough time to cope with emergencies such as machining or electrical problems, components arriving later than expected, and redesigning as necessary.

The Qualifications:

This team is uniquely qualified to complete this project. All four members have successfully completed the first half of the Electromechanical Engineering program at the Wentworth Institute of Technology and have completed classes in computer programming, network theory, mechanics of materials, digital systems, and analog circuit design. In addition, every member of this group has successfully completed and built designs in the past several years, including speaker design, point of sale system designs, and microprocessor based stepper motor control designs. Also, the team has a strong support network to rely on in the form of professors, upper classmen, and contacts from previous and current jobs. For further details, please see the resumes in Appendix A.
The Budget:

### Deliverables
- Prototype
- Written Report
- Oral Presentation

### BUDGET SUMMARY

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The Project’s Future:

The Smart Pet Feeder will enable a pet owner to prevent a pet from eating a specific food while still allowing access to that food by other pets. For this project, our goal is to develop a prototype which would be used for a cat or a small dog. Once this project is completed, there is the possibility of expanding on the design and/or improving on the design itself. For example, the feeder could come in different sizes for different animals. At a later time, the technology used to keep one pet from eating another’s food could be used with gravity-type vacation feeders like the one seen in Figure 2. This could be accomplished as a senior design or in industry.
Bibliography:


   <http://www.amazon.com/review/product/B000BVWVUA/ref=dp_db_cm_cr_acr_txt?%5Fencoding=UTF8&showViewpoints=1>.


    <http://www.businessweek.com/magazine/content/07_32/b4045001.htm>.


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Appendix A: Resumes
Rachel Heil  
88 Louis Prang St.  
Boston, MA 02115  
(617)330-0165  
heilr@wit.edu

EDUCATION  
Wentworth Institute of Technology, Boston, MA  
Bachelor of Science in Electromechanical Engineering  
Exp. May 2010

RELATED COURSES  
Analog Circuit Design  
Mechanics of Materials  
C Programming  
Digital Systems  
Materials Science Engineering  
Linear Algebra and Matrix Theory  
Introduction to Nanotechnology  
Thermodynamics  
Differential Equations  
Embedded Computer Systems  
Engineering Fluids  
Junior Electromechanical Design

Online Portfolio with more detail: http://myweb.wit.edu/heilr

TECHNICAL SKILLS  
- Extensive use of Microsoft Word, Excel, PowerPoint and Access programs.  
- Moderate experience with AutoCAD, SolidWorks, Agilent VEE, C, PSpice, and MATLAB.  
- Introductory experience with Java, Logger Pro, and MathCAD.  
- Laboratory experience working with digital multimeter, function generator, and oscilloscope instruments

DESIGN/LAB WORK  
Speaker Design  
WIT  
March 2006  
- Designed a speaker by creating coils, taking measurements, and using design skills acquired through class  
- Researched and brainstormed design ideas, created model of design, manipulated design, took measurements, created final design  
- Designed a speaker transmitter that worked within the guidelines along with receivers built by other groups

Alternate Bike Brake Design  
WIT  
September 2005  
- Re-designed the standard braking system of a bicycle for a person with minimal hand movement  
- Brainstormed and drew out ideas, planned out final design, gave final presentation on final product  
- Selected as the second best design by the class

WORK EXPERIENCE  
Engineering Matters ©, Inc., Newton Upper Falls, MA  
Electromechanical Intern  
May - August 2007  
- Worked full time for first optional co-op term  
- Worked closely with engineers in design and test processes  
- Learned from working hands on manufacturing and producing products to be shipped to customers  
- Worked mostly in the electromechanical, power electronics, electromagnetic, and valve actuator fields

Wentworth Institute of Technology, Boston, MA  
Desk Attendant  
August 2007 – Present  
- Help to keep the residence halls on campus safe from those who should not be entering the building  
- Check in visitors who do not live in the building in order to keep track of who is in the building

HONORS AND ACTIVITIES  
- Awarded Merit Award Scholarship  
- WIT Women's Center  
- Member of the Office of Student Leadership  
- Member of the Residential Housing Association for my dorm building  
- Secretary of the Wentworth Billiard’s Club  
- Member of the Wentworth Events Board  
- Soror in Four, a four year leadership program/class  
- WIT Women’s Leadership Conference  

Fall 2006 – Present  
Fall 2005 – Spring 2007  
Fall 2006 – Spring 2007  
Fall 2006 – Spring 2007  
Fall 2006 – Present  
Fall 2007 – Present  
Spring 2007 – Present  
March 23 – 24 2007
Kristine McCarthy  
4 Greenbrier Lane  
Hyannis MA, 02601  
508-280-2802  
mccarthyk8@wit.edu

Education:  
Wentworth Institute of Technology, 2010  
Bachelor of Science in Electromechanical Engineering  

Courses:  
- Introduction to Engineering  
- Introduction to Engineering Design I  
- Mechanics of Materials  
- Engineering Thermodynamics  
- Engineering Mathematics I  
- Computer Aided Manufacture  
- Engineering Statics  
- Calculus I, II, III  
- Engineering Fluids  
- Applied Differential Equations I  
- Linear Algebra and Matrix Theory  
- Computer Science I Using C  
- Materials Science  
- Network Theory I, II  
- Engineering Physics I, II  
- Electromechanical Design I  
- Introduction to Nanotechnology  
- Digital Systems  
- Chemistry I  
- Embedded Computer Systems  
- Analog Circuit Design

Engineering Skills  
- Solidworks  
- Microsoft Office applications  
- PSpice  
- Internet Explorer  
- Unigraphics  
- Photoshop  
- MATLAB  
- Agilent VEE  
- Microcontrollers  
- Benchmark Software and Hardware  
- CNC Lathes  
- Bridgeport Vertical Milling Machines  
- Mechanical Drawing

Professional Experience:  
Company: American Properties Team,  
Position: Lifeguard  
Duties: Supervision of patrons, monitoring chemical levels of pool, light maintenance and cleaning, first aid and life-saving training  
June 2007 – September 2007

Company: Cape Coastal Nursery,  
Position: General help, customer service  
Duties: Customer service, machinery operation, accounting  
Filip Rege
8 Barton Street • Somerville, MA • 02144
regef@wit.edu • (617) 290 0196

PROFESSIONAL EXPERIENCE

Broad Institute of MIT and Harvard, Cambridge, MA
BIOAUTOMATION SPECIALIST
June 2005 - present
Collaborate with a multidisciplinary technology and development group of engineers and biologists who design and build robust automated systems for a world renowned genomics lab.
- Upgrade, troubleshoot and modify existing automated systems to optimize lab operations.
- Identify and analyze automation needs, program instruments and systems.
- Coordinate testing of new systems with development staff and users, strategize and implement modifications utilizing SolidWorks 2003, MasterCAM and CNC machining.

Massachusetts Eye and Ear Infirmary, Boston, MA
OPERATING ROOM EQUIPMENT TECHNICIAN
January 2003 – May 2005
- In charge of maintaining, setting up and troubleshooting all surgical and diagnostics instruments including automated microscopes, ophthalmic and ENT lasers, and image guided surgery machines.
- Determine equipment required for procedure and adjust surgical schedule accordingly.
- Responsible for the surgical equipment of 17 operating rooms, assist surgeons with equipment.

Denis Wilson Partnership, s.r.o., Prague, Czech Republic
HIGHWAY TRAFFIC DESIGN ENGINEER
July 2000 – March 2002
- Drafted designs in AutoCAD for leading British consulting firm specializing in commercial development related traffic and transportation planning.
- Responsible for designing detailed drafts to meet tight deadlines.
- Successfully drafted feasibility plans for traffic access and parking facilities of large-scale shopping complexes to win new customer business.
- Incorporated results of traffic and parking demand surveys into design.
- Developed plans in support of planning and building permits.
- IT responsibilities for the computer network including purchasing equipment, software updates, virus protection and general system management.
- Initiated and implemented consolidation plan for sharing and archiving files improving project productivity, mentored new employees on AutoCAD tools.

VPU DECO Praha, a.s., Prague, Czech Republic
BRIDGE DESIGN ENGINEER
1997 - 2000
Worked for one of the most prestigious traffic and civil engineering firms in the Czech Republic. Drafted designs in AutoCAD for detailed projects of over water, roadway and railway bridges.
- Directly responsible for design of bridge sections, coordinated interfaces for complex projects.
- Analyzed rough engineering sketches, notes and government issued standards to determine optimal solutions, discovered and resolved design conflicts.
- Developed detailed design for steel reinforced concrete structures.
- Evaluated and recommended CAD tools for design of steel reinforcement.

EDUCATION

Secondary School of Civil Engineering, Prague, Czech Republic
(Equivalent to an American Associates Degree in Engineering)
Graduated with honors in Civil and Structural Engineering, Drafting, Construction Materials and English.

SKILLS

Software: AutoCAD, SolidWorks, MasterCAM, MS Office, Agilent VEE, PSpice.
Other: CNC machining.
Languages: Fluent in English (Computer Based TOEFL: 270).

IMMIGRATION STATUS: Permanent U.S. resident with permission to work
Alexis Rodriguez-Carlson  
143 Watertown Street Apt. 2 Watertown, MA 02472  
617-359-9019  
rodriguezcarls@wit.edu  
http://myweb.wit.edu/rodriguezcarls/index.htm

EDUCATION  
WENTWORTH INSTITUTE OF TECHNOLOGY Boston, MA  
• Bachelor of Science: Electromechanical Engineering – Expected June 2010  
  o GPA: 3.558  
  o Dean’s List: Fall 2005, Spring 2006, Fall 2006, Fall 2007  
THE UNIVERSITY OF CINCINNATI COLLEGE-CONSERVATORY OF MUSIC Cincinnati, OH  
• Master of Fine Arts: Sound Design for Live Theatre – June 2001  
THE COLORADO COLLEGE Colorado Springs, CO  
• Bachelor of Arts: Technical Theatre – May 1998

COURSEWORK  
• Applied Robotics  
• Embedded Computer Systems  
• Mechanics of Materials  
• Network Theory (DC and AC)  
• Analog Circuit Design  
• Computer Programming in C++  
• Engineering Thermodynamics  
• Digital Systems (Logic Design and  
  Microcontrollers)  
• Engineering Fluids

DESIGN AND LABORATORY WORK  
• Currently designing a microcontroller-based automated pet feeder which will be capable of preventing one pet from eating another pet’s food  
• Successfully designed and built a system to control a step-motor using the Motorola HCS12 microcontroller  
• Designed a self-calibrating point-of-sale system using a strain gage which allowed the user to sell various goods by weight with flexible pricing options and receipt printing  
• Designed a remote system (to be disguised as a rock) to measure the weight of birds in the wild

TECHNICAL SKILLS  
• Engineering: Computer aided circuit analysis, analog and digital circuit design and testing, stress and  
  failure testing  
• Devices: Signal generator, digital multimeter, Simpson meter, oscilloscope, microcontrollers, hydraulic  
  testing machine, hydrometer, viscosimeter, callipers, various other electrical and mechanical sensors  
• Software and Languages: PSpice, C++, BUFFALO, Agilent VEE, AutoCAD 2000-2007, basic  
  SolidWorks, basic MATLAB, MS Office Suite including Excel

ENGINEERING EXPERIENCE  
SEI COMPANIES  
Electrical Engineering Co-op  
May 2007 – August 2007  
• Using AutoCAD 2007, created and edited electrical drawings such as floor plans, riser diagrams, and  
  sketches for buildings in all stages of construction or renovation  
• Coordinated with other departments to provide appropriate power to HVAC and plumbing equipment  
• Performed research as requested by engineers on topics such as photovoltaic arrays, contactors, and  
  variable frequency drives, as well as power requirements for laboratory equipment  
• Attended training sessions on topics such as VESDA and other fire protection systems, emergency  
  generators, and grounding and bonding  
• Edited the Master Specifications for the Electrical Department for spelling and grammar errors, clarity,  
  consistency, and technical correctness  
• Created a Microsoft Excel-based system to plan the number of hours each staff person would work for  
  each engineer in a week. Each engineer entered the number of hours they required of each staff  
  person on an individual spreadsheet and this information was automatically transferred to a master  
  spreadsheet, which the department coordinator used to distribute the work load evenly
Alexis Rodriguez-Carlson
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OTHER PROFESSIONAL EXPERIENCE

HARVARD UNIVERSITY MEDIA AND TECHNOLOGY SERVICES – Cambridge, MA
Media and Technology Technician
September 2005 – Present
- Work 10-20 hours during the school year in order to help finance education
- Provide technical support for classes, conferences, and special events, including sound and video system design and set up, computer and projection support, and video and audio recording
- Interact with professors, students, guest speakers, and technicians to ensure the smooth execution of events
- Troubleshoot, repair, or replace onsite equipment within a strict time frame

AMERICAN REPERTORY THEATRE AT HARVARD UNIVERSITY – Cambridge, MA
Production Sound Engineer
February 2002 – August 2005
- Assisted in the day-to-day running of the sound department, including making recommendations for equipment purchases and rentals
- Supervised crews during setups and teardowns of shows
- Aided in the design and implementation of sound reinforcement, computer, and intercom systems for all productions, including diagnosing problems and performing repairs on cables and equipment
- Drafted system diagrams in AutoCAD

THE BERKSHIRE THEATRE FESTIVAL – Stockbridge, MA
Sound Master
June 2001 – September 2001
- Managed the sound department, and supervised two interns
- Supervised the load-ins and strikes of sound, intercom, monitoring, and video equipment for all shows
- Acted as a liaison between guest sound designers and management
- Coordinated the necessary equipment rentals, purchases, and repairs
- Generated AutoCAD drawings detailing the signal flow and setup of equipment for each show

REFERENCES:

Alireza Heidari, PE, LEED A.P.
Project Engineer, Electrical
SEI Companies
617-210-1605
ahheidari@seicompanies.com

Mike Tomei
Technical Supervisor
Harvard University
Media and Technology Services
617-495-9460
mtomei@fas.harvard.edu

John Jacinto, PE
Engineer, Electrical
SEI Companies
617-210-1620
jjacinto@seicompanies.com

Mike Tomei
Technical Supervisor
Harvard University
Media and Technology Services
617-495-9460
mtomei@fas.harvard.edu

David Remedios
Resident Sound Designer
American Repertory Theatre
617-496-2000 x8862
daremedios@rcn.com
Appendix B: Workplan Details
**Goal of Project:**

1. Create a Prototype of the Smart Petfeeder Which:
   a. Can be used for cats or small dogs
   b. Which holds 2 days of food at 3 feedings per day
   c. Has 5-7 cups
   d. Has a maximum diameter of 12”
   e. Is not battery operated
   f. Battery backup
   g. Has food dishes which are dishwasher safe
   h. Is robust enough that a pet cannot get to the food stored for later feedings

**Milestones:**

1. Get project approved by Professor Badjou
2. Determine size and shape of the feeder
   a. Bowl size
   b. Overall size
   c. Where is the power supply going
   d. Where is the LCD readout going
   e. What kind of interface for the user
   f. Where the microcontroller is going
3. Determine what components to use
   a. Determine what type of microcontroller to use
      i. Keep a clock
      ii. Accept inputs from a key pad
iii. Output to a display

iv. Control a motor via a Darlington Array

b. Determine what type of motor to use
c. Determine what type of sensors

4. Create the electrical schematic to power the components

5. Machine all of the machined parts

6. Put the physical and electrical components together

7. Complete programming

   a. Programming milestones
      
      i. To run a clock
      
      ii. Control a motor
      
      iii. To accept an input from a keypad
      
      iv. To do all of the above together in a predictable and consistent way

**Material and Financial Resources:**

1. Each team member will contribute $100 for a total of $400

2. Filip has access to a machine shop at his place of work

**Intellectual Resources:**

1. Professors

2. Library

3. Internet

4. Upper Classmen

5. Contacts from current jobs and previous coops

**Target Dates:**
1. Order all parts by Feb 15
2. All parts in hand by March 1
3. Prototype assembled by April 18
4. Final paper completed by April 28
Preliminary Gantt Chart:
Meeting times:

1. Mondays from 8-10 and 1-3
2. Wednesday from 8-10

Attendance Rules:

1. All group members must be present at all meetings.
2. The only acceptable reason for missing a meeting is one which would be acceptable for missing an exam
3. If a member is going to be absent or late they will notify other members via text message, email, or phone call

Mechanisms for Resolving Conflict:

1. Problems will be solved with discussion
2. If no consensus can be met, a vote will be held
3. If the vote results in a tie, the group will seek mediation from a professor

Ali will Maintain the Project File:

1. All documents will be named in this form: Name of file YYYYMMDD

Status Collection:

1. At the end of each meeting, each group member will be given a task to complete
2. The status these tasks will be collected at the next meeting
3. Ali will keep a running Gantt Chart where progress will be tracked
Appendix C: Existing Product Descriptions and Reviews
Appendix D: Pet Economy
It's a pet economy

Americans are spending big bucks on their furry friends, from fancy dog food to designer clothing. The pet industry is booming, and it's showing no signs of slowing down.

The most recent figures from the American Pet Products Association (APPA) show that Americans spent an estimated $77.6 billion on pet-related products and services in 2018. This includes everything from food and toys to grooming and healthcare. And that number is expected to grow even more in the coming years.

But why the surge in pet spending? There are several factors at play. For one, people are spending more time at home due to the pandemic, which has led to a surge in pet adoptions. And with more people working from home, pets have become even more important companions.

Pet owners are also more willing to spend on their pets than ever before. According to a 2019 study by the American Veterinary Medical Association, pet owners are more likely to pay for high-quality food and healthcare for their pets, and they're willing to spend more on luxury items like designer clothes and fancy toys.

And it's not just the pet food and toys that are driving the growth. Pet owners are also spending more on services like grooming, training, and boarding. In fact, the pet services industry is expected to reach $23.4 billion by 2023.

So what does this mean for the pet industry? More growth and more opportunities for businesses. But it also means that pet owners need to be careful about where they spend their money. With so many options out there, it can be hard to know what's best for your pet.

But the good news is that there are plenty of resources available to help you make informed decisions. From websites like ThePetAxe.com to books like "The Complete Idiot's Guide to Pet Nutrition," there's no shortage of information out there.

So the next time you're thinking about spending on your pet, remember to do your research and make sure you're getting the best value for your money. After all, your pet deserves the best!

For more information, check out the Business Journal's pet economy section at https://www.businessjournal.com/pet-economy/
Appendix E: Feeding Different Pets Different Foods
I have 3 cats with very different dietary needs (one is 21 pounds and needs a diet food, the other is under 6 pounds and needs a high fat food, according to the vet). How...
Appendix F: Pet Health
DOBESITY IN CATS...and What To Do About An Overweight Cat

by Catherine B. Can, How to Get a Cat to Lose Weight, Explained In ThePetCenter.com

Once you've determined that your pet has gained weight, it's time to take steps to help him or her become leaner. Weight loss can be a serious issue for both cats and dogs, but cases of obesity are often preventable. Here are some steps you can take to help your cat slim down:

1. Get your cat checked out by a vet. Your veterinarian will be able to rule out any medical conditions that may be contributing to your cat's weight gain.
2. Feed your cat a healthy diet. Choose a food that is appropriate for your cat's age, activity level, and health status. Avoid overfeeding your cat and make sure to offer fresh water at all times.
3. Encourage your cat to play and exercise. Provide your cat with toys and opportunities to engage in play, such as laser pointers or feather toys. Also, make sure your cat has access to a scratching post or other form of exercise equipment.
4. Monitor your cat's weight. Keep track of your cat's weight so you can detect any changes that may indicate weight gain or loss.
5. Consult your veterinarian for additional tips and strategies to help your cat lose weight. Your veterinarian may recommend dietary changes, exercise programs, or medications to help your cat lose weight.

Remember, weight loss is a gradual process and it's important to be patient. With proper nutrition and exercise, your cat can achieve a healthy weight.

http://www.thepetcenter.com/dobesity.html

CHICKEN ORNOXOMIL...and What You Need to Know!

by Catherine B. Can, How to Get a Cat to Lose Weight, Explained In ThePetCenter.com

When it comes to cat nutrition, it's important to choose a food that is high in protein and low in carbohydrates. Chicken is a great choice for cats because it is high in protein and relatively low in fat. However, it's important to choose a chicken food that is appropriate for your cat's age, activity level, and health status. Here are some tips to help you choose the right chicken food for your cat:

1. Look for a food that is high in protein. Protein is essential for your cat's growth and development, so choose a food that contains a high proportion of protein.
2. Choose a food that is low in carbohydrates. Carbohydrates can contribute to weight gain, so choose a food that is low in carbohydrates to help your cat maintain a healthy weight.
3. Avoid foods that contain added sugars or artificial preservatives. These ingredients can be harmful to your cat's health.
4. Choose a food that is appropriate for your cat's age, activity level, and health status. For example, if your cat is overweight, choose a food that is specifically formulated to help with weight loss.
5. Consult your veterinarian for additional tips and strategies to help your cat stay healthy. Your veterinarian can help you choose the right chicken food for your cat and provide guidance on how to maintain a healthy weight.

Remember, proper nutrition is key to your cat's overall health and well-being. By choosing the right chicken food, you can help your cat stay healthy and happy.

http://www.thepetcenter.com/chickenornoxomil.html
For pets:

Why are some pets overweight? The answer is the same for pets as well as people: too many calories and not enough exercise. "The most common cause for overfeeding in dogs is that owners want to show their pets how much they love them," Dr. Steve Forgette-Lawson, a veterinarian at the University of California, Davis. "The easiest way to find out how much you are feeding your pet is by measuring calories per meal and adjusting the amount of food offered at each meal."

If you give the amount of food recommended by your veterinarian, you will not need to track the food intake for your pet. Consult your veterinarian to determine the ideal weight for your pet, then monitor your pet's weight weekly or monthly to see if it should be recomputed or weight loss.

Proper nutrition is the key. It is very hard to get pets to lose weight, especially if they are already fat. A feeding guide to a steady weight is usually recommended. If you are serving your dog a dry food mix, make sure to serve the correct amount or change the brand. There are many commercial foods specifically designed to help with weight loss.

Working with a veterinarian is the best way to determine the health diet for your pet. Monitor your pet's ideal weight, and create a weight loss plan. Consult your local veterinarian if your pet is overweight.