

Anteater Dynamics

Problem Definition



Team Introduction



Lucas Cardona
Mechanical Engineer



Diego Avila
Software Engineer



Rogel Aguilar
Software Engineer



Tomas Mejia
Electrical Engineer



Ishan Malik
Mechanical Engineer



Noah Castillo
Electrical Engineer

Quad Chart

Purpose <ul style="list-style-type: none">• Offer mid-tier option robotic arm option for home researchers• Use to train robotic AI models on interactions with physical world	Customers/Stakeholders <ul style="list-style-type: none">• Industry Sponsor: Robotis Inc• Open-source design• For robotics machine learning researchers
Technical Approach <ul style="list-style-type: none">• Incorporate Robotis electronics (sensors, actuators, etc)• Design parts for additive manufacturing• Design for ease-of-assembly	Success Criteria <ul style="list-style-type: none">• Able to be mass produced via injection molding OR by 3D printing at home• \$500-\$600 full BOM range• 7DOF for ML research• Able to pick up ~500g

Problem Statement and Objectives

Problem Statement:

Create a low-cost 7 degree of freedom robotic arm capable of picking up small household items to collect data for machine learning, and document the development in a public manner.

Objectives

- High Priority
 - Low Cost (<\$1000)
 - Capable of lifting 300-500 g
 - Use of ROBOTIS components
- Secondary Priority
 - Open Source

Sponsor & Existing Solutions

ROBOTIS

Open-Source Humanoid
Robotics Developer

Supplies servos, actuators,
manipulators

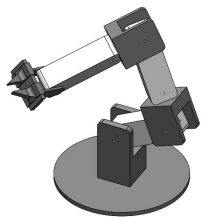
Using ML for Robotics
Development

Koch v1.1 Low-Cost
Robot Arm: Leader



Koch v1.1
Low-Cost
Robot Arm

\$237
Low Fidelity



Our Solution

Mid-Range
~\$500-600
Open-Source
ML Capable



OpenMANIPULATOR-X

\$1,416
High-Fidelity

Timeline Milestones

WBS NUMBER	TASK TITLE	TASK OWNER	START DATE	DUE DATE	DURATION
X	ROBOTIS Objectives				
A	Project Outline Discussion and Defining Parameters	ALL	WK3	WK4	
B	Initial Virtual Kinematics Validation	ALL	WK4	WK5	
C	Problem Definition and Initial Physical Prototyping	ALL	WK6	WK7	
E	Physical Prototyping Design	ALL	WK7	WK8	
F	Bugfixing and testing	ALL	WK9	WK10	
F	Initial Design Review w/ Functional Prototype	ALL	WK9	WK10	

Project Deliverables

1. 7 DOF Robot Arm
2. Project documentation/resources
3. Weekly updates on GITHub

System Requirements

- 7 DOF
- Pick up small household objects (e.g. a soda can)
- 650mm reach, 500mm at load
- Clamped/Bolted for table mounting
- 400g lifting capacity
- Aluminum and plastic injection molding
- Under \$1000

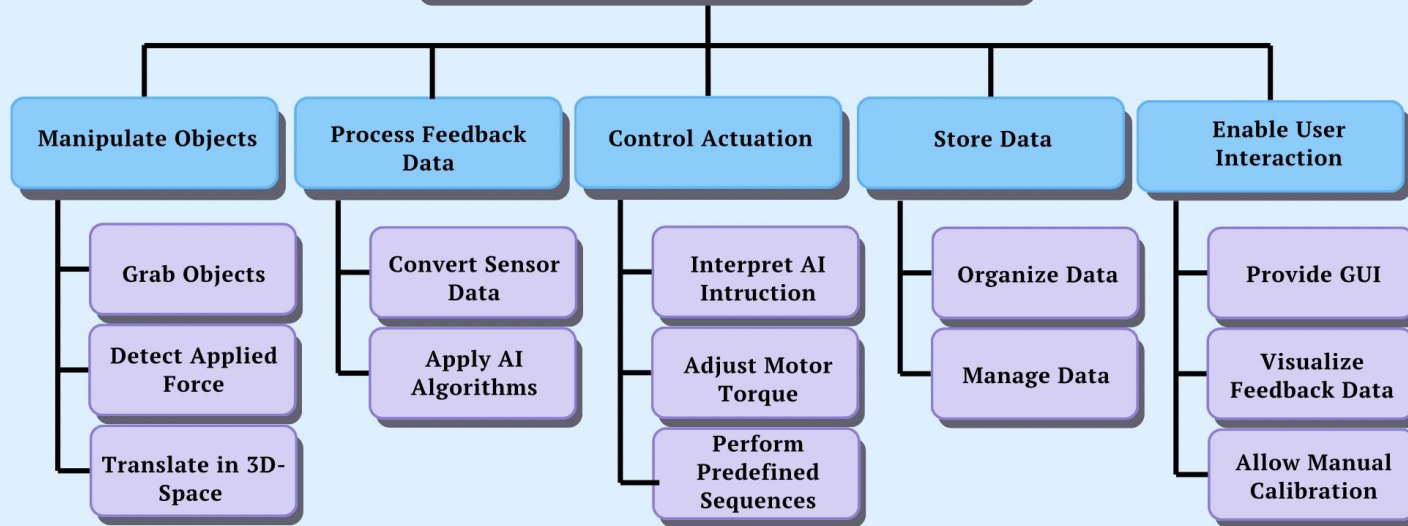
Measures of Effectiveness

- The final product is affordable in the \$500-600 range
- The arm can easily manipulate a 500g mass
- The design is open source and available to 3D print at home
- Integrates ROBOTIS actuators

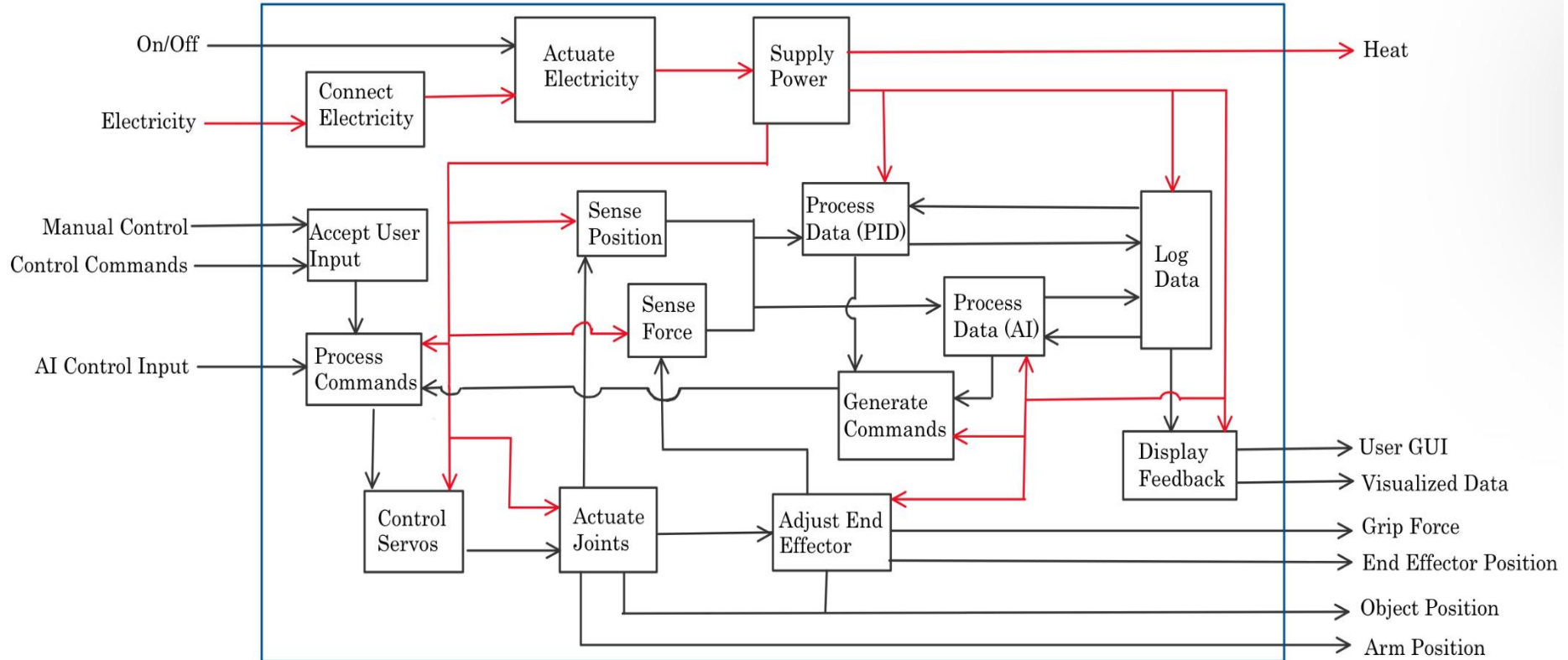
Functional Hierarchy

Anteater Dynamics

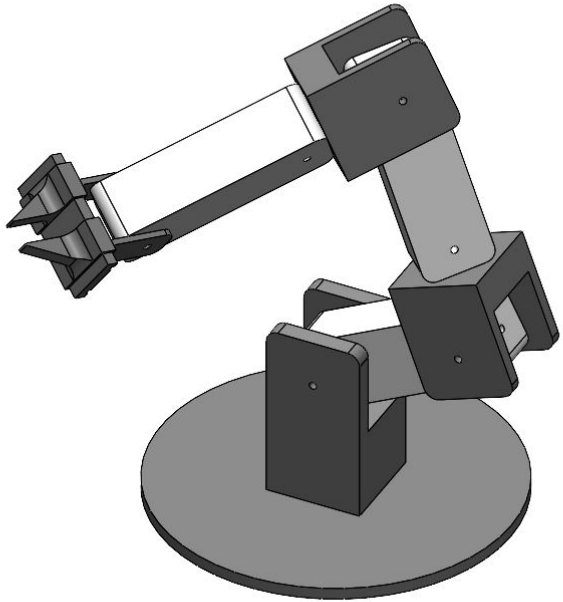
Utilize a Low-Cost robotic arm with 7 DoF to manipulate small household objects for machine learning training



Grey Box Diagram



Anticipated Technical Concerns



Preventing Servo Stall

Load Cell Sensor
Integration End Effector

Joint Stability and Backlash
Prevention for Data Accuracy

Achieving Desired Reach
and Load Targets

Weight vs Strength
Trade Off

Range of Motion and
Collision Prevention

Thank You For Listening

