

Design Exercise #2. Design of Frame

Assigned: 9/20/12, Due: ASAP (Build of this design cannot be started until all members of the design group submit their design to the instructor who will pick the best design.)

This is the first major element of your machine that will be designed and built this semester. **You must pick either a trebuchet or an onager form of catapult. NOTE: all members of the same design group must design a frame for the same type of catapult. If you join a design team after this choice has been made, you must comply with that team's decision.**

The top level functional requirement for your design will be either A. a automatic potato hurling trebuchet or B. an automatic potato hurling onager.

The second level functional requirements for your design will be

- A) a machine frame to contain all components and allow adjustment of the range
- B) an element to store energy for release on firing and transfer that energy to the potato
- C) an automatic latch mechanism, actuated by the provided servo motor, which will hold the element in B in the fully loaded position
- D) an automatic clutch mechanism, actuated by the provided servo motor, which will decouple the gearbox (E) from the energy storage element (B)
- E) a gearbox, actuated by the supplied DC motor, which will wind the energy storage element (B) through the coupling (D).

This design exercise is to develop a design to fulfill functional requirement A.

Constraint One: The device in one configuration must fit into a box 24"x24"x12" in some orientation.

Identify the third level functional requirements for FR A (call them A1, A2, ...). Some example functional requirements might be:

- hold the pivot for the counter-weight/spring
- comply with the ground so as to remove location-to-location variations
- keep the machine stable during cocking and firing
- provide an aiming adjustment
- couple the pivot to the ground-compliance device in a way that has minimal deflection due to forces exerted by the pivot
- mount the gearbox
- stop the travel of the potato-hurling mechanism

This is not an exhaustive list nor is it necessarily independent. Teams are expected to mix-match-create their own FRs.

NOTE: all members of the same design group must design to the same set of functional requirements. If you join a design team after this choice has been made, you must comply with that team's decision.

Design Output: Produce a report that includes the mapping of Functional Requirements to Design Parameters. Discuss special features or design decisions so as to facilitate the selection of your device for the group's build. Provide detailed engineering drawings for all parts and assembly drawings to illustrate your design concept. Provide an inventory of parts that need to be purchased, along with part numbers and suppliers and cost (put it in a table please). Provide an inventory of materials that need to be purchased, along with part numbers and suppliers and cost (put it in a table please).