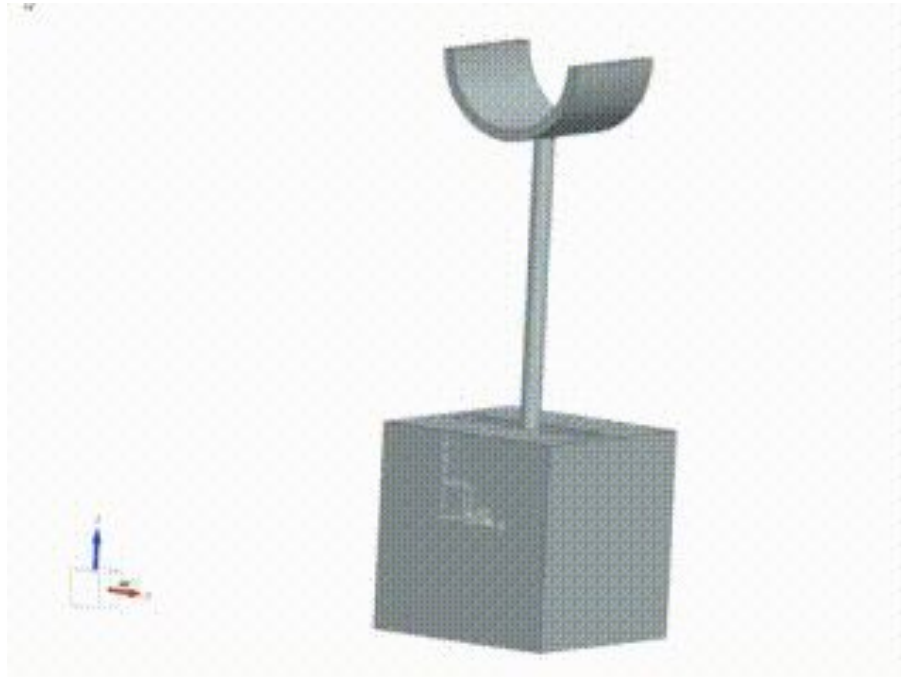


Mechanics & Machines

Course Project

Igor Alentev & Ivan Domrachev

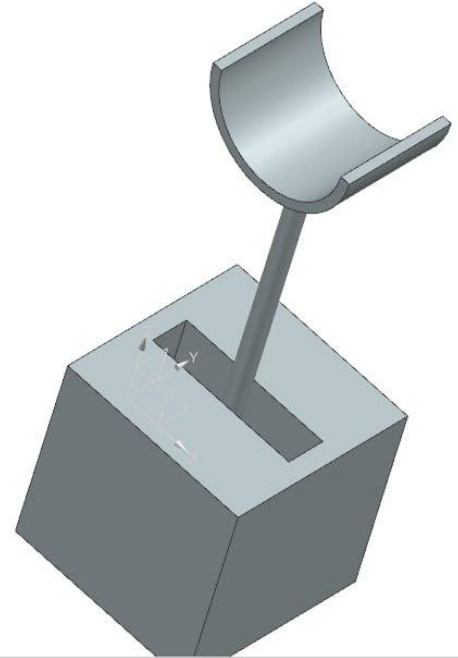
Concept



(actually it is a bowl, modelling is still complicated)

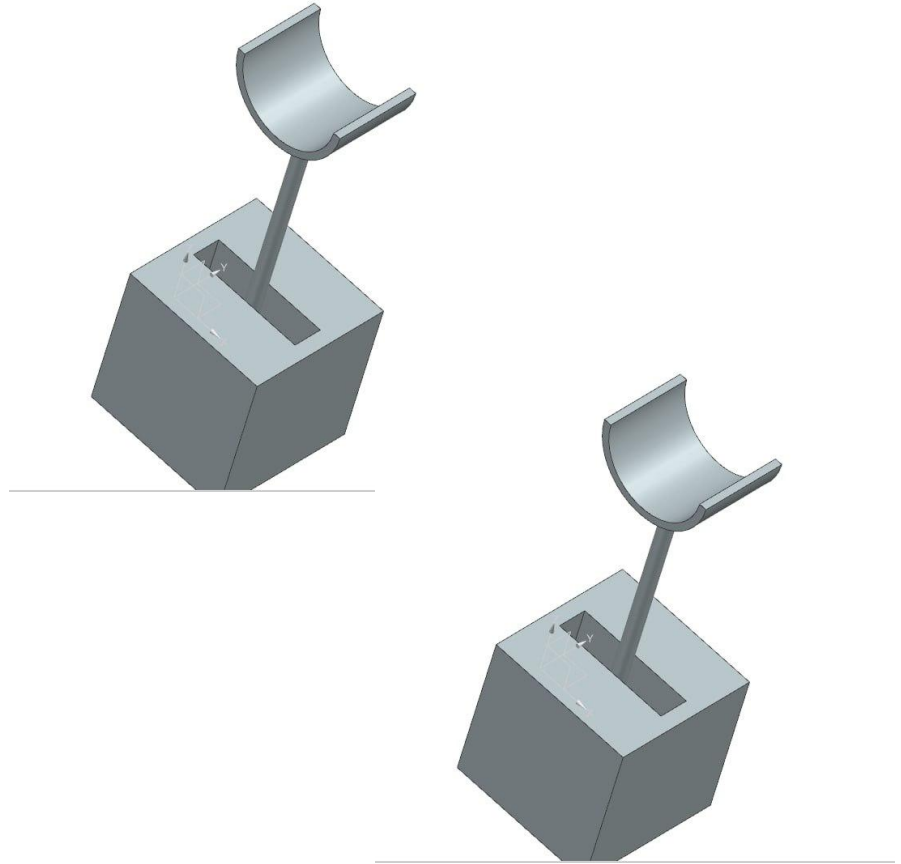
Concept - Tier 3

One station configured for throwing a ball with a prespecified trajectory.



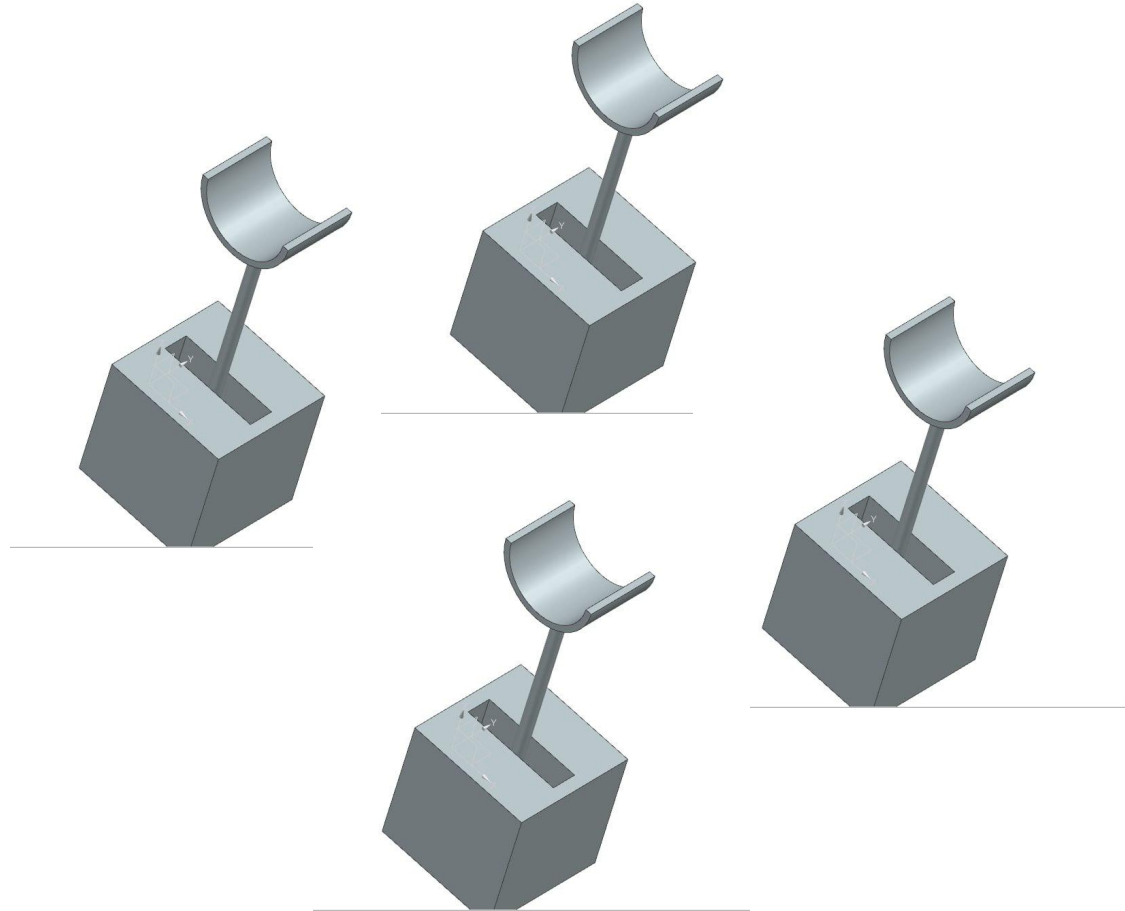
Concept - Tier 2

Two synchronized stations configured for throwing a ball to each other in a cyclic manner



Concept - Tier 1

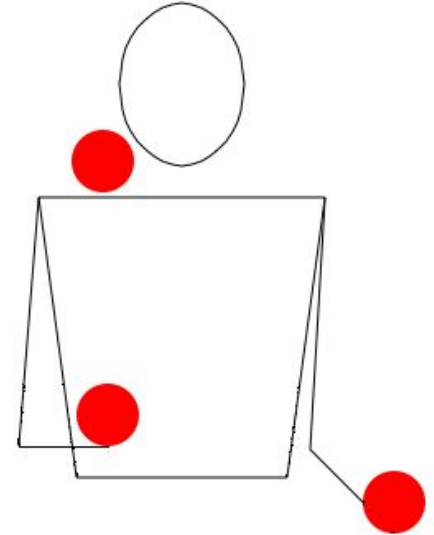
Configurable base station,
which can be replicated several
times to synchronize a chain of
multiple stations with (almost)
arbitrary trajectories



Inspiration

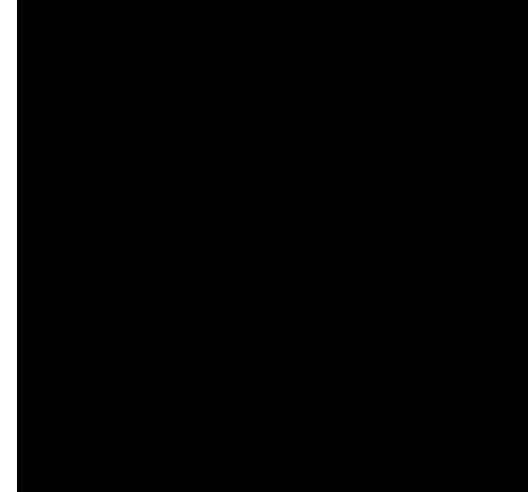
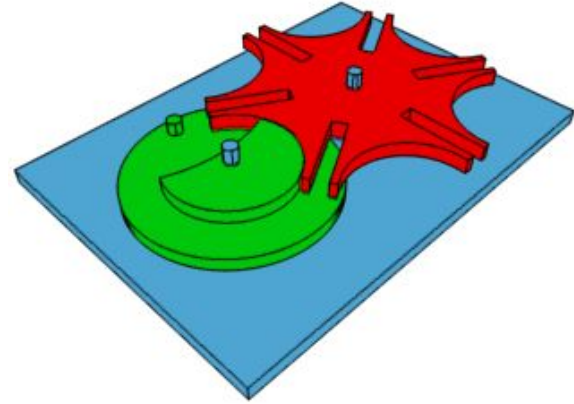
Our main sources of inspiration:

- Manipulators
- Juggling
- Gear mechanisms by Disney
- Repeatability
 - Cyclic process
 - Scalable solution



Challenges & Complications

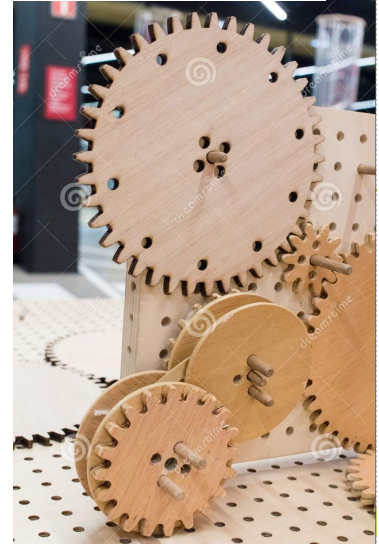
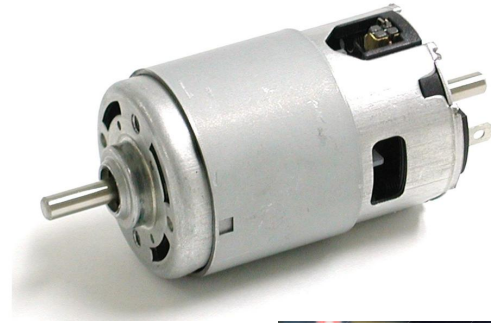
- End-effector acceleration
 - Geneva Drive?
- Trajectory configuration
 - Gear mechanisms with perforation?
- Durability analysis
 - All components are printed
- Dynamics
 - Configuration requires precise analysis
- Ball's dynamics
 - Proper material choice



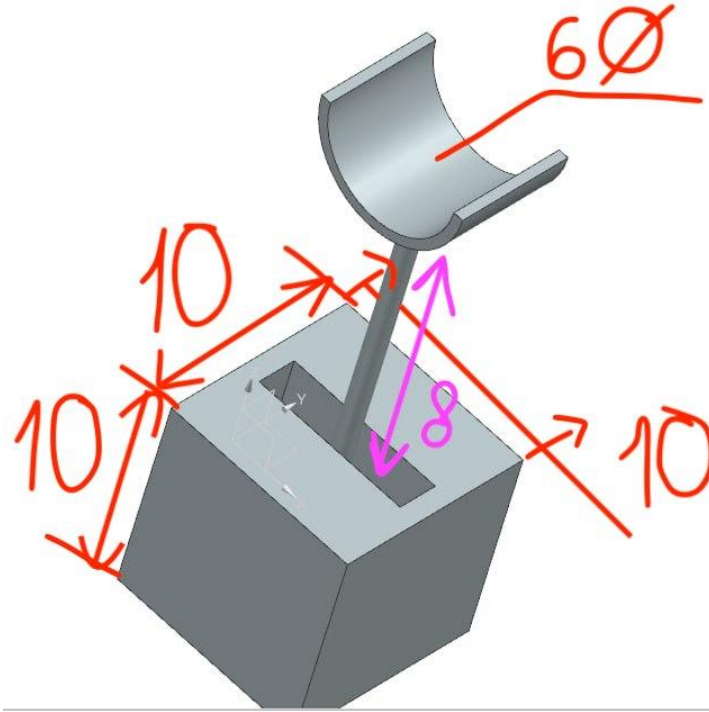
Components & Mechanisms

Ideally all units should be the same and configurable, so each of them:

- The only material: plastic
- The only actuator: motor
- Perforated gears to configure connection radii
 - Gears printed as well



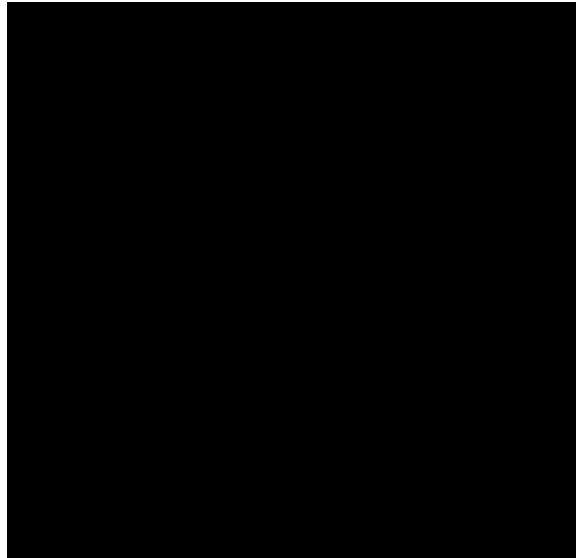
Constraints



These constraints are just a general overview of dimensions of the station and might be reconsidered due to durability, dynamics and other analysis. Due to the choice of materials and components, station weight should not exceed 1kg.

Kinematics

The only issue is to construct a configurable mechanism which can generate satisfactory trajectory for end-effector to throw an object.



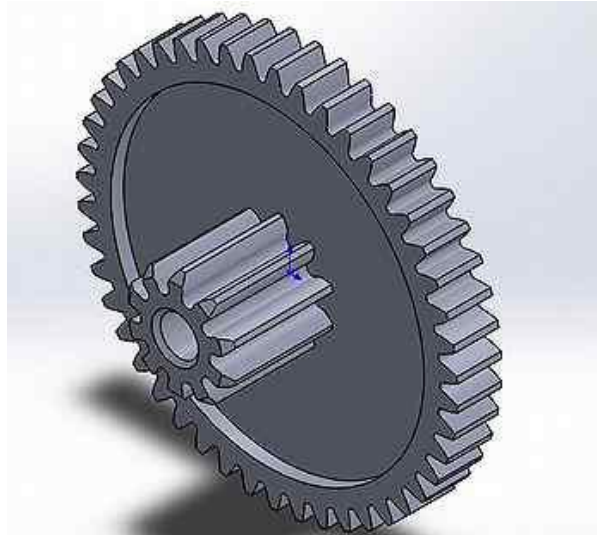
Dynamics

Dynamics is more complicated, we have to analyse it precisely, because

- We throw an object - ballistics
- End-effector has special curvilinear motion in space
- End-effector trajectory is supposedly configurable
- Even small errors are dangerous due to cyclic nature of process

Durability

Durability might be an issue due to printed gears. They can break under weight and acceleration of end-effector. Therefore we have to precisely analyse the construction of gears.



Thank you for your attention!