MSE 222: KINEMATICS AND DYNAMICS

Project Proposal

Design and Fabrication of a Dynamic System

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In the design process of the dynamic system several steps were taken to incorporate each member's ideas and to meet the listed criteria for the project. Existing dynamic systems were researched in preparation for this design. In particular, various marble machines were observed to get an idea of the types of features and mechanisms that are feasible at a similar physical scale to this project. The complexity of the mechanisms was also considered, as our system must operate with no electrical intervention. After discussing as a team and making quick sketches each component of the system was designed compared with the criteria. The next step was to start developing a preliminary design with proper dimensions. This was done in SolidWorks. Developing the system in SolidWorks allows for easy adjustments and dimensioning.

As the description mandates, each component is to be implemented using recycled materials. There are several sources that can be used to find recyclable materials. The plastic and metal components from thrown out kitchen appliances and electronics can be easily repurposed. Recycling scrap wood and plastic is another option as these materials are easy to cut and shape into specific dimensions. In case the component is difficult to build by hand it can be made using recycled 3D printer filament. Each component will be attached to the board using recycled hardware or hot glue.

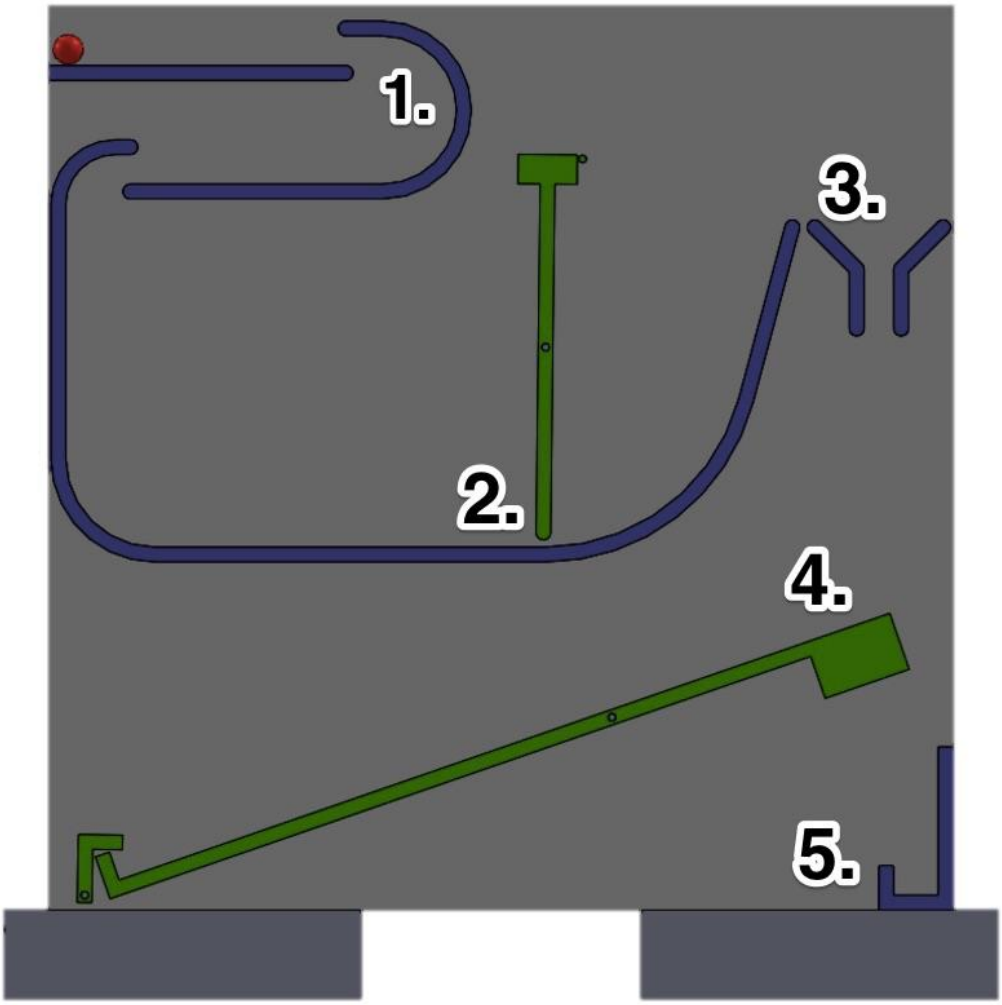

Figure 1. Preliminary Design of Dynamic System

Component Outline

The components in the dynamic system were chosen to meet the criteria in the project description. The blue components are static elements and the green components are dynamic elements. The red ball will start in the top left corner of the board where it will be propelled by a spring and will eventually end at the bottom right corner.

1. After being propelled to the right across a flat platform, the ball will be redirected to the left by a curved path as it drops down to a lower platform. This satisfies the criteria for a curved path and a right-left direction change.

   (The ball will continue to the left and encounter a similar curved path which was broken into two quarter circles of different radii and separated by a long straight wall. The ball will be redirected again towards the right.)

2. The ball strikes the end of a hammer and causes the hammer head to swing down and hit the ball up the ramp where it will be launched towards the funnel. This component satisfies the rotating element and impact criteria.

3. After leaving the ramp the ball will be air bound for a short time before it lands in the funnel. In the air the balls direction will change from up to down satisfying the down-up direction change. The funnel acts as a simple way to direct the ball towards the next component

4. Once falling through the funnel, the ball will land on weighted end of the lever. It will then roll down to the left side where it will release a latch which will allow the lever to lift it up. As the lever lifts the ball up it will begin to roll back to the right. This satisfies the down-up direction change component.

5. After rolling all the way to the right the ball will fall off the lever and land in a small tray at the bottom right corner where it will come to a complete stop. This satisfies the requirement that the ball must make a complete stop once it has passed through the entirety of the system.