Egg Cracker

SD2 Problem Assignment

Group 9

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# Overall Objective

This project involves reverse engineering a handheld egg cracker. A detailed analysis of the device will be developed along with the creation of design equations with respect to the motion and force of the movement. Also, a prototype will be fabricated using both 3D printing and ready-to-buy components, therefore, demonstrating that the product can be effectively produced. Lastly, the ability to operate over a range of conditions will be shown. SolidWorks will be used to replicate the system and explore the necessary dimensions and design equations. Throughout all of these design choices, cost conscious decisions will be considered to allow the product to be affordable to consumers. The deliverables include the design equations, a functional simulation, and a working final prototype.

# Background

Cracking an egg is a very simple task that many people do extremely often in their daily life. Although it seems uncomplicated and effortless for most people, there are some that are unable to do this. Certain disabilities that affect hand coordination and muscles could inhibit a person from doing a basic task. This fine motor disability is seen as a symptom in neurological conditions ranging from adults recovering from a stroke or brain injury to developing diseases including rheumatoid arthritis and dyspraxia (Burr and Choudhury, 2022).

There are many adaptive tools in this area that allow people with disabilities more freedom in everyday tasks such as this. This specific problem has been addressed by the development of the handheld egg cracker. This allows for the user to squeeze handles together in one movement instead of the finer motor coordination needed when just using our hands

Previous iterations of this design exist in many forms. One such form used regular popsicle sticks and bamboo skewers to break open the egg (Instructables, 2024). The use of popsicle sticks allows for affordability and simplicity in construction. However, the product’s durability is not ideal (Instructables, 2024). Another solution includes an egg cracking knife with a left blade, a right blade, and two supporting blocks (Researcher, 2024). One of the benefits of this design is when the egg is placed in the device, it will automatically crack the egg, allowing for more ease of use (Researcher, 2024). However, this design is overcomplicated and expensive compared to other egg cracking devices (Researcher, 2024). There is a design that requires it to be squeezed to crack the egg. The machine is made of mainly plastic, making the material cheaper to produce. The design is simple and cheap. However, the material is not sustainable (Jung, 2021).

The commonality in these designs show the puncture in the horizontally loaded eggs to crack them at the side. We will create our own model based on Emson EZCracker (Dolub, 2008). Once successful, improvements will be considered based on our analysis and research. Based on a recent study on the comparison of a vertically and horizontally dropped egg from MIT, a possible new design we can consider is one loaded vertically and punctured at the base or top area (Sutanto et al., 2025). Of course the velocity of the drop and changes in spring constant compared to a still cracked egg is different, we will conduct our own tests to analyze this further.

# Needs Statement

Whether they are disabled or have sensory issues, some people are unable to crack eggs in their daily life. This project is going to take an existing product, a handheld egg cracker, and reverse engineer it while studying the design equations and possible areas of improvement for a final prototype.

# Implications of Project Success

The focus of our project will analyze the properties of the Emson EZCracker egg cracker and improve upon it by simplifying the mechanics and dynamics of the user’s motion needed and decreasing the material needed for the design. Our new design will be compared to Emson EZCracker to measurably indicate the success of our project (Dolub, 2008). If the project is successful, then the design will be cheaper, more accessible, and more sustainable. By making changes to the egg cracker, we can aid the 17 sustainable goals from the UN. Goal twelve revolves around sustainable consumption and production, which is one of the goals of this project which can be achieved by reducing plastic usage (United Nations, 2015). Goal ten focuses on reduced inequalities, which is another goal of this project as this device makes cooking more accessible for disabled individuals (United Nations, 2015). Overall, if successful, this project can improve the original designs in numerous ways.

# Citations

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