Team Eleven: S.T.A.B.L.E.

Objective

Team Eleven set out to provide bakers, caterers, and homeowners with a product which would automatically level any table surface. Conventional methods of dealing with wobbling or uneven tables such as cardboard or matchbooks underneath table legs are inaccurate and usually do not provide much stability. In applications where a level table is required, such as when a baker is decorating a delicate and tall cake, or when caterers are holding an event outdoors, a more accurate and adaptable system is needed.

Team Eleven’s solution to this problem is the STABLE system. Standing for “Systematic Table And Bench Leg Equalizer”, the product is meant to meet the needs of customers who encounter issues of table surface instability and levelness no matter what their specific situation may be. STABLE is meant to be a one size fits all solution, and as such will incorporate features to allow multi directional adjustment, wide range of lifting capacities, and weather proofing when in its production design.

To make the device easy to use and autonomous the team also decided to look into an electronic controller, allowing the device to automatically check and adjust the length of each table leg no matter where the table is placed.

Concept Generation

Team Eleven’s concept generation phase focused on three main areas: the mechanism to lift the table legs, how to interface with the ground, and how to hold the table legs within the mechanism. To limit the number of images, the concepts for all three categories were combined. However, concepts for each portion of the design were evaluated separately. Ultimately the team found that a scissor lift mechanism combined with a box type table leg connector, and a rubberized bottom had the most potential for success.

Design

The Design of STABLE was focused on achieving as many of the determined customer requirements as possible, while maintaining acceptable manufacturing costs, and maximizing potential profit margins. Components of the device were designed in SolidWorks CAD software, and then analyzed using Finite Element Analysis.

Prototype and Testing

The prototype STABLE system was created using a combination of purchased and student machined components. The prototype was created to be slightly larger than actual size, so as to allow for proper testing, design adjustment, and due to available manufacturing capabilities. The prototype was tested for level accuracy, lifting capacity, lifting speed, and reliability.

Test Results and Future Work

Testing Results showed promise in the design of STABLE, and the concept behind it. The level accuracy was within 5%, and lifting capacities and times were seen to be high enough to meet or exceed customer requirements. To further advance the design, and to make it more profitable, changes need to be made. The prototyping that Team Eleven did revealed that engine power required to operate the device at an adequate lifting capacity was quite high. As such, the mechanism should be optimized to gain a higher mechanical advantage, while still maintaining level accuracy. Additionally, further development in the controller algorithm could result in shorter leveling times, more accurate leveling, more self awareness (recognizing that the device must re-level), and less power draw. These design changes, and the lower cost that comes from mass production and manufacturing processes such as casting could make the STABLE an effective, affordable, and profitable device that could alleviate the ever present nuisance of an uneven or wobbly table.