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Design Portfolio

Introduction:

I am a mechanical engineer currently pursuing my master's in robotics at Northeastern University, Boston. I worked on multiple designing projects as part of my coursework, team projects or just personal interest. In order to expand my knowledge on 3D designing, I took the Solidworks exams and received certifications in CSWA, CSWP, CSWP-Weldments, CSWP-Sheet Metal and CSWP-Drawing Tools. I take this opportunity to showcase my designs in this portfolio. Thank you for taking time to review the same.

Chassis of an All Terrain Vehicle:

During my undergraduate, I was part of an All Terrain Vehicle racing team. We took part in the annual SAE-BAJA Competition held in India. Being part of the design team, I was given the task of designing the chassis. Designing chassis was crucial since there were numerous rules for doing that, considering the ergonomics according to the driver. We took the suspension points for the front wheel from the suspension team and started with the designing from there. There were considerations for the length of the whole vehicle, the width of the nose and the height of the sides. Even the angles for bends were specified and considering all these parameters I could design the chassis. Using the weldments tool, I created the pipes, which I then flattened to get a profile of irregular pipes which could be used for laser cutting. I also looked into the manufacturing, welding and the assembly of the vehicle. Apart from this, we performed simulations for failures in the design.

Breathable Mask:

As a part of exploring opportunities to build a portfolio in designing, I took interest in participating in the annual competition, AAKRUTI, hosted by Dassault Systems. I partnered up with a batchmate and chose to work on designing something innovative for medical purposes. We decided on designing a breathable mask with filters which would have been very useful during the peak of pandemic. I designed the 3 layered filters which were placed on either side of the mask and one filter at the bottom to allow easy exit of exhaled air.

Automatic Answer Sheet Masking Machine:

For my final year project, I had decided to apply my learning in designing to create something in the field of automation. This project gave me an opportunity to implement my interdisciplinary skills. The masking of the name box on the answer sheet is done to retain the integrity of unbiased checking. This is a tedious and repetitive task which takes up a lot of man hours. This gave birth to the idea of developing a machine which did this task automatically without any human intervention. This was an ongoing project of which we developed a specific part. Our work was to design the paper tub which could automatically lift and load the answer sheets onto the conveyor belt. To achieve this, I designed a movable base attached to a lead screw which was driven by a stepper motor. After making the calculations for the number of turns made by the stepper motor to load one answer sheet onto the conveyor belt, I coded it in python for Raspberry Pi. We also make an attachment on the machine which holds the camera to identify the placement of the answer sheet on the conveyor belt and identification of the name box for accurate placement of the mask.

V5 Engine:

The lockdown gave me the opportunity to work on independent projects which seemed interesting to me. As a part of my coursework, I was studying about the working of a car engine. This motivated me to explore different parts of an engine and design them from scratch to understand the internal workings much better. I went through some drawings and proceeded with the designing and assembly of the engine. I took help from some sites and tutorials wherever I was stuck. Within a span of 15 days, I was able to design and perform motion study on the engine.

Gripper arm for a space building robot:

Currently, I am actively taking part in developing a space building robot for the Northeastern Robotics Club. The purpose of this robot is to pick parts from one place and place them to build an assembly/machine in space. For the purpose of picking and placing, a gripper arm was to be designed. I designed two prototypes, one that is a four pronged claw like gripper which can be operated using a linear actuator and another is a two pronged gripper which can be driven by a servo motor. I 3D printed the prototypes and decided on the 4 pronged gripper to be more efficient in performing the required task.