Robot Gripper

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Contributions List			
Name	Abdelrahman Abdelghany	Mostafa Elsabagh	Martin Rober
1 -	Introduction	Presentation	Model arms (gripper parts)
2 -	Model body (piston & body)	Design	Results
3 -	Cover Page	Prototype	

Introduction

Robot arms[1] are usually designed to handle a job for a human. They're usually motor operated, and are composed of parts connected together through joints in order to mimic a human hand's movements (although, some are much more primitive; i.e. not exhibiting the complex anatomy of a human hand).

A special class of robot arms are robot grippers, which are usually primitive in shape.

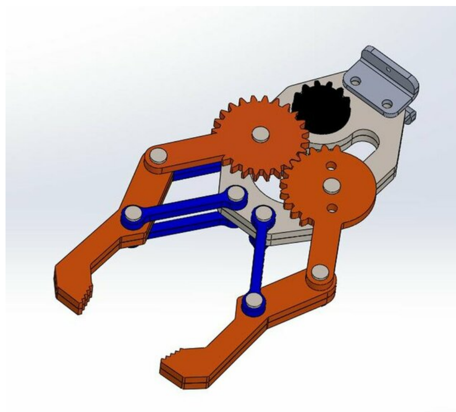

Figure 1: Example of a Gear-Operated Robot Gripper

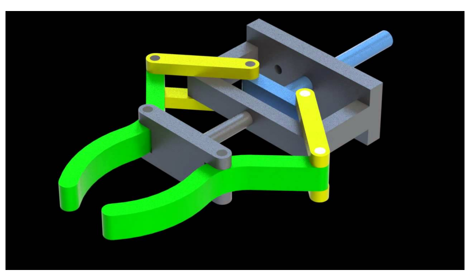

Figure 2: Example of a Piston-Operated Robot Gripper

Robot grippers are usually constructed using simple mechanisms, such as a gear-operated gripper, which mainly depends on a set of gears to work, or such as a piston-operated one, which relies on a piston to open and close the hand.

Robot grippers are most often used for a simple reason; that is[2], a human hand is prone to tiring and is prone to making mistakes and errors during repetitive tasks, while a robot gripper does not tire and operates endlessly and tirelessly. For this reason, robot grippers are sometimes used in the industry in production lines, where routine tasks are to be performed continuously.

Design

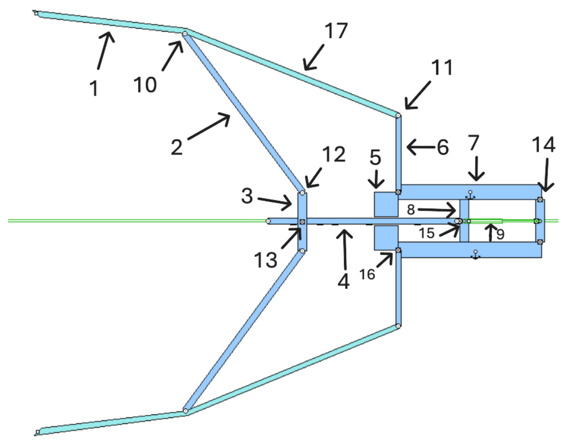

Figure 3: Robot Gripper Design

Note: All the members are made of steel to withstand any hard tasks.

Member 1 → H = 0.02 m W = 0.5085 m

Member 17 → H = 0.02 m W = 0.7521 m m_{1+17} = 2.26 kg

Member 2 → H = 0.65 m W = 0.02 m m = 1.3 kg

Member 3 → H = 0.19 m W = 0.03 m m = 0.57 kg

Member 4 → H = 0.02 m W = 0.63 m m = 1.26 kg

Member 5 → L = 0.08 m m = 0.64 kg

Member 6 → H = 0.25 m W = 0.016 m m = 0.4 kg

Member 7 → H = 0.05 m W = 0.47 m m = 2.35 kg

Member 8 → H = 0.14 m W = 0.03 m m = 0.42 kg

Member 9 → Actuator

Member 10, 11, 12 → Pin joints

Member 13, 14, 15, 16 → Connecting joints

Results

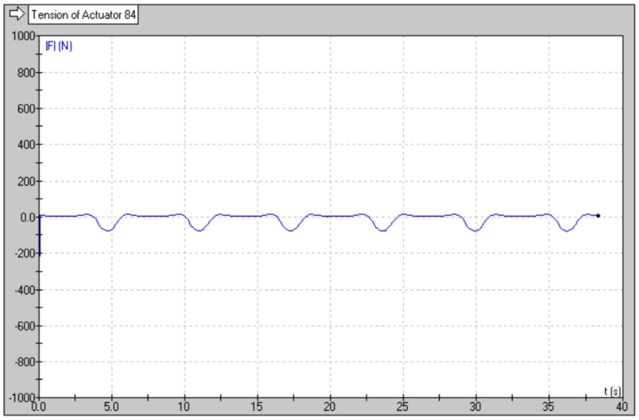

Figure 4: Actuator tension

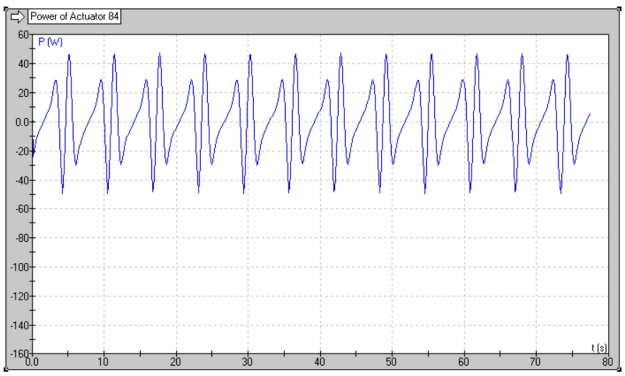

Figure 5: input power

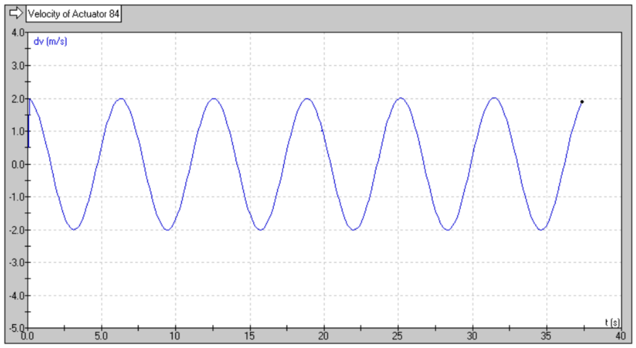

Figure 6: Actuator velocity

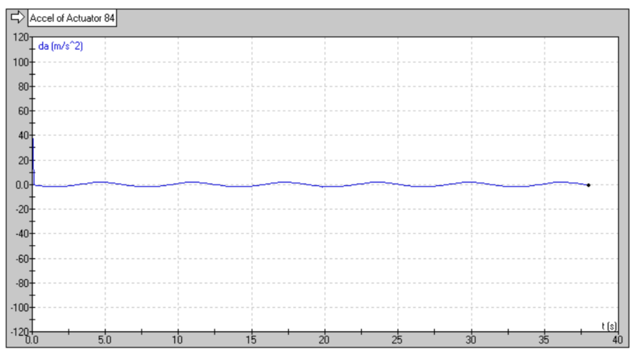

Figure 7: Actuator acceleration

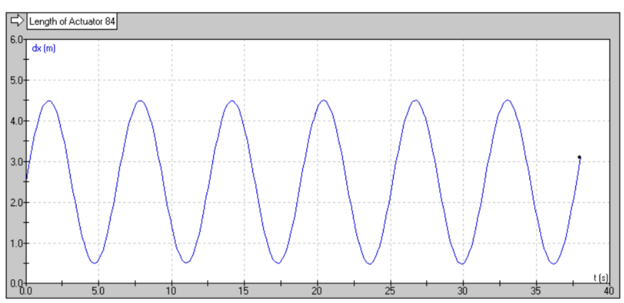

Figure 8: Actuator length

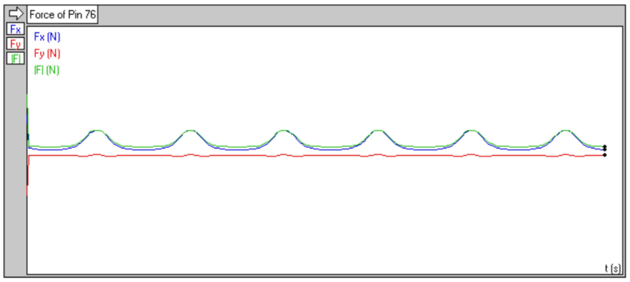

Figure 9: Member 10 force

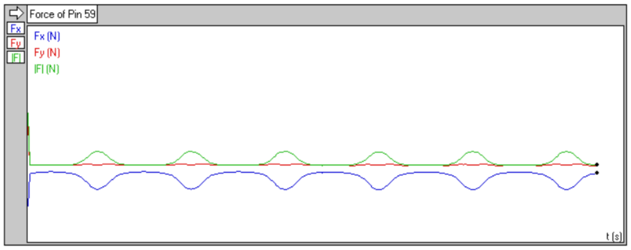

Figure 10: Member 12 force

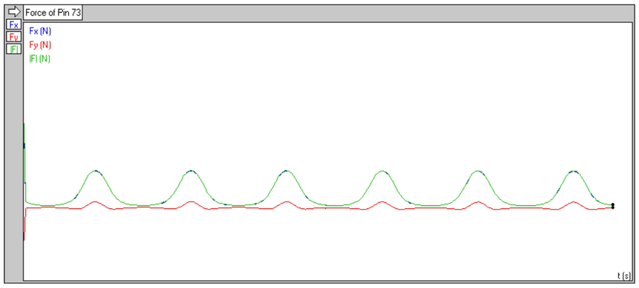

Figure 11: Member 11 force

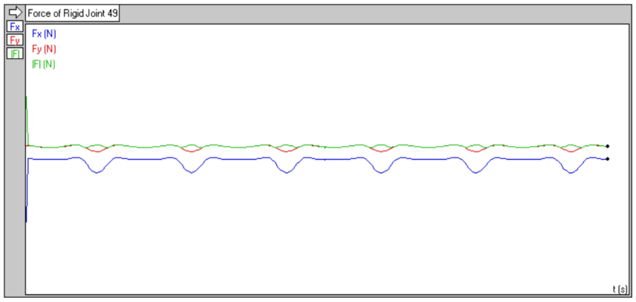

Figure 12: Member 13 force

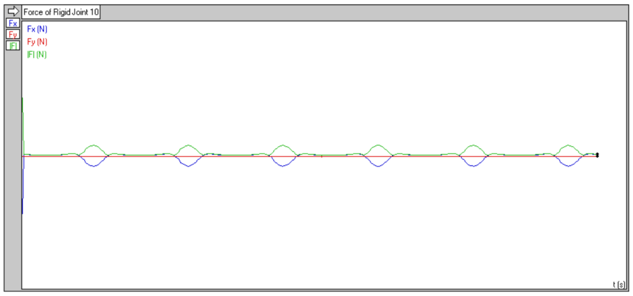

Figure 13: Member 15 force

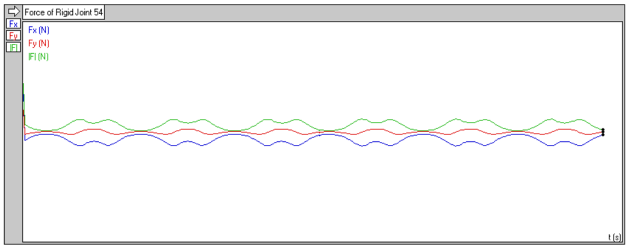

Figure 14: Member 16 force

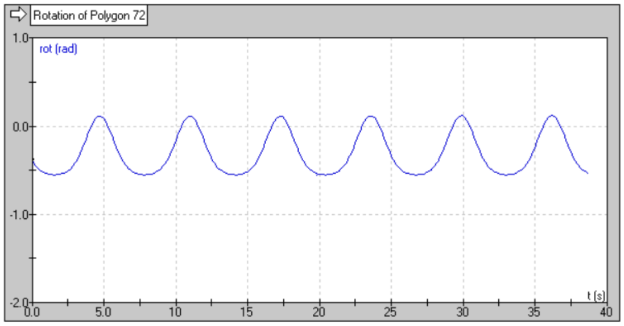

Figure 15: Member 1+17 P-V-A

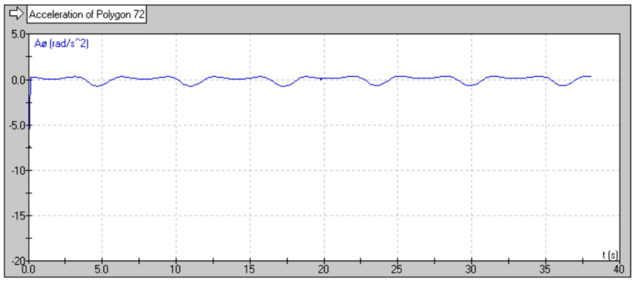

Figure 16: Member 1+17 acceleration

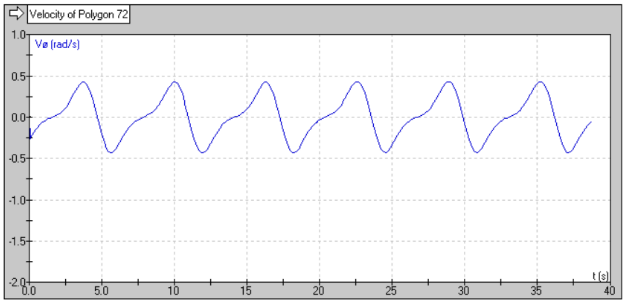

Figure 17: Member 1+17 velocity

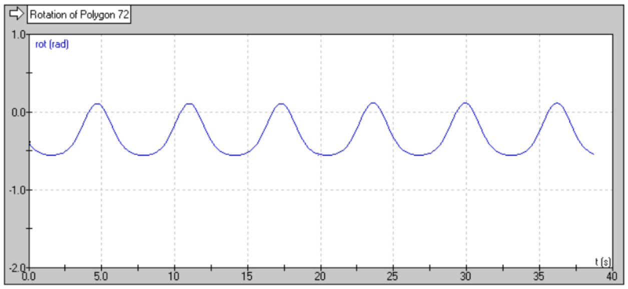

Figure 18: Member 1+17 position

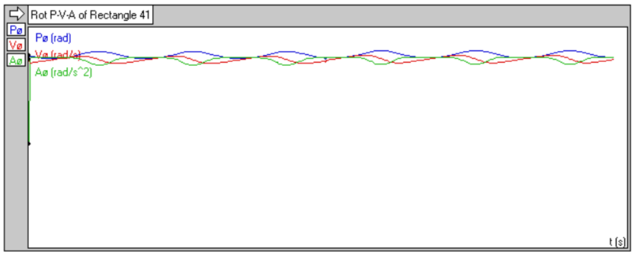

Figure 19: Member 2 P-V-A

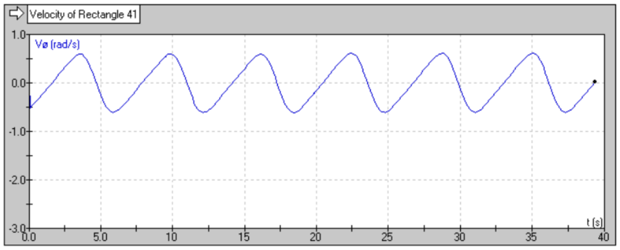

Figure 20: Member 2 velocity

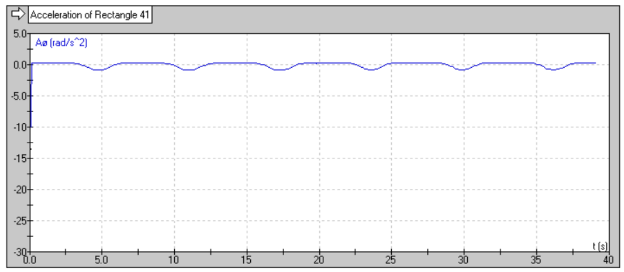

Figure 21: Member 2 acceleration

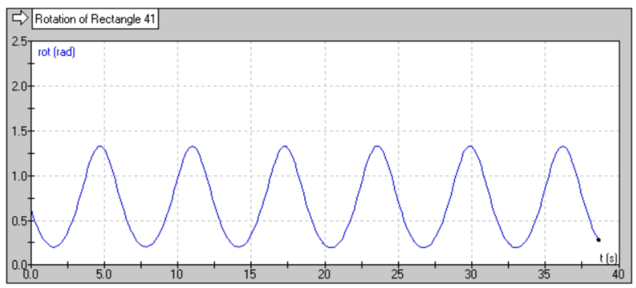

Figure 22: Member 2 position

Comment: Any graphs that were not considered on other members were due to the constant factors affecting them , So it wasn't necessary to include them in our graphs as they didn't contribute in any calculations, as an example the torque on the pin joints graphs, as the graph is constant on zero so it doesn't give us a meaning in our calculations.

Conclusion

In conclusion, robot grippers are mainly used for their ability to perform routine actions tirelessly, where a human would be more error-prone. For this reason, we've designed a robot gripper (albeit small-scale), which performs said menial tasks without any issues. With this report, we have included the necessary dimensions needed for the design, as well as the masses required to construct such a system, alongside some images of the finished design.

References

[1] Universal Robots. "ROBOTIC ARM" [2] Universal Robots. "Robot Grippers Explained"