Simulation and Assembly of a 5-DOF 3D Printed Manipulator Robot

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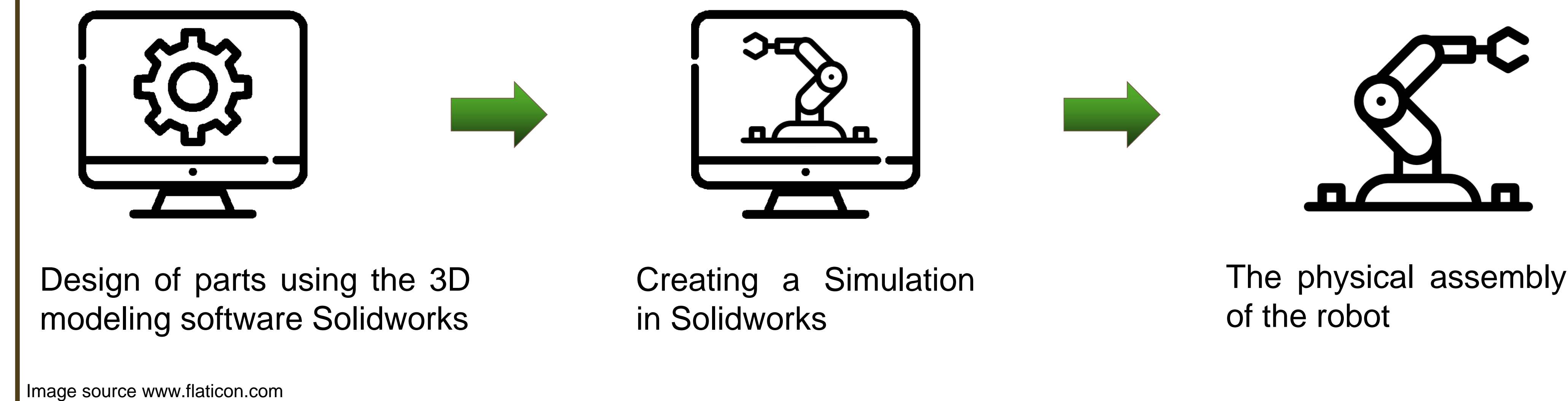Dr. Rafiq Ahmad: rafiq.ahmad@ualberta.ca

Motivation

- Small businesses and large manufacturing companies are becoming more robotized in order to increase production to keep up with growing demands.

- Facilities such as research labs and educational training centers are also in need of low-cost robotic assistance to speed up various processes and aid in experimentation and training.

- Robots have the abilities to complete repetitive tasks without fatigue and with greater consistency and efficiency.

- The problem many small companies are currently facing is the cost of automated system installation. A single robust robotic arm could cost around $100,000.

- A 3D printed robot (that could be built in-house) can provide a much cheaper solution for experimentation and automation.
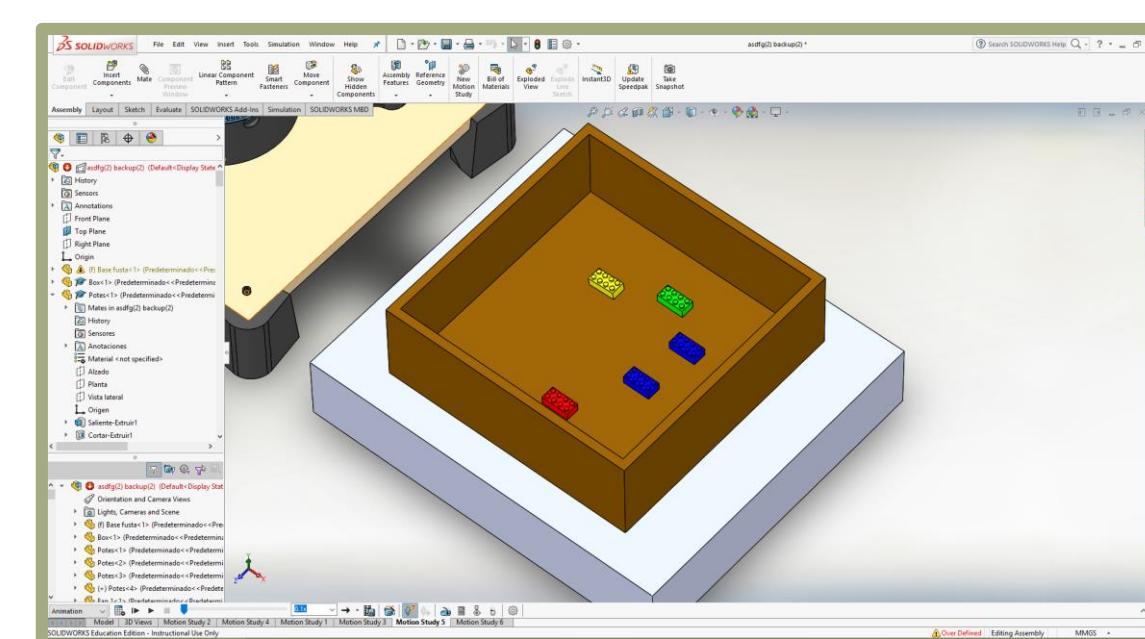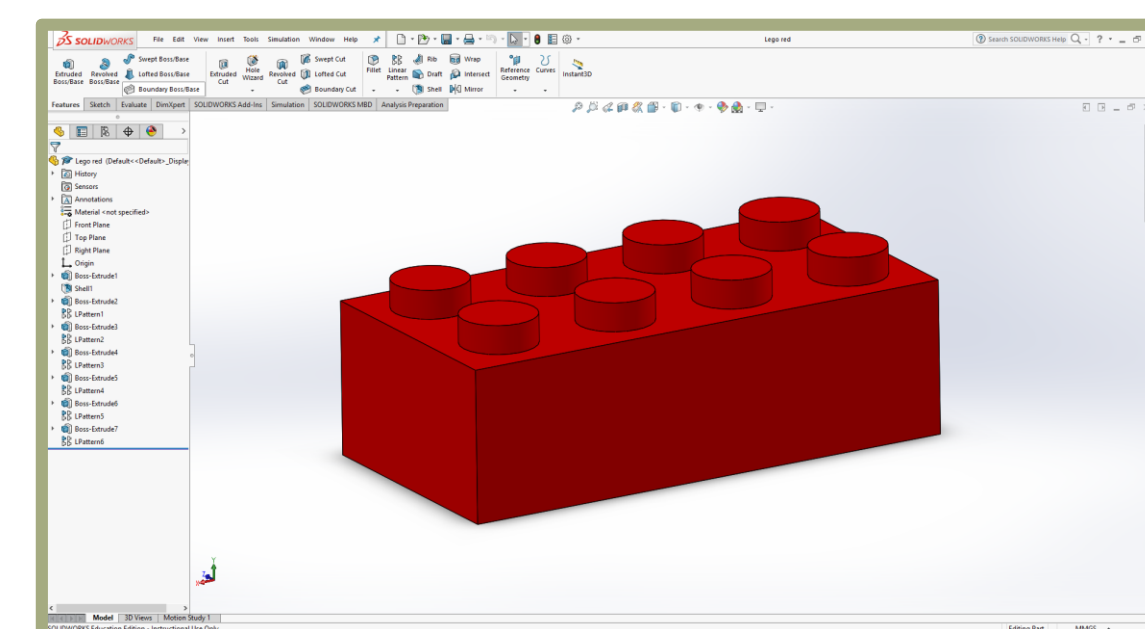
Objectives

- The purpose of this study was to learn the importance of the simulation process when designing, programing and working with automated systems.

- The focus of this project was the development of a 5 Degrees of Freedom (DOF) 3D printed robotic arm.

- The objective of the project is to help other researchers to develop a 3D printed robot which costs less than $5000.
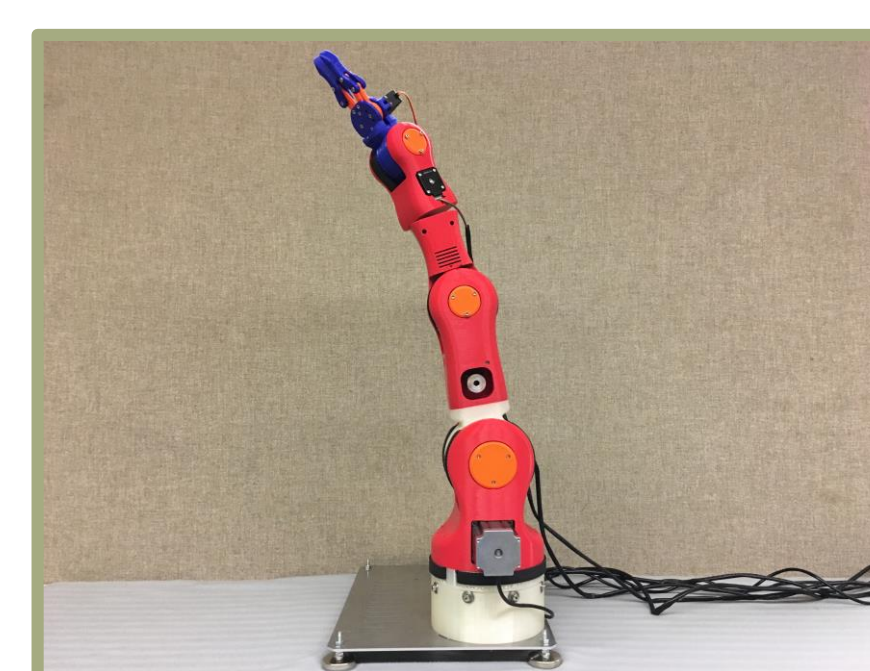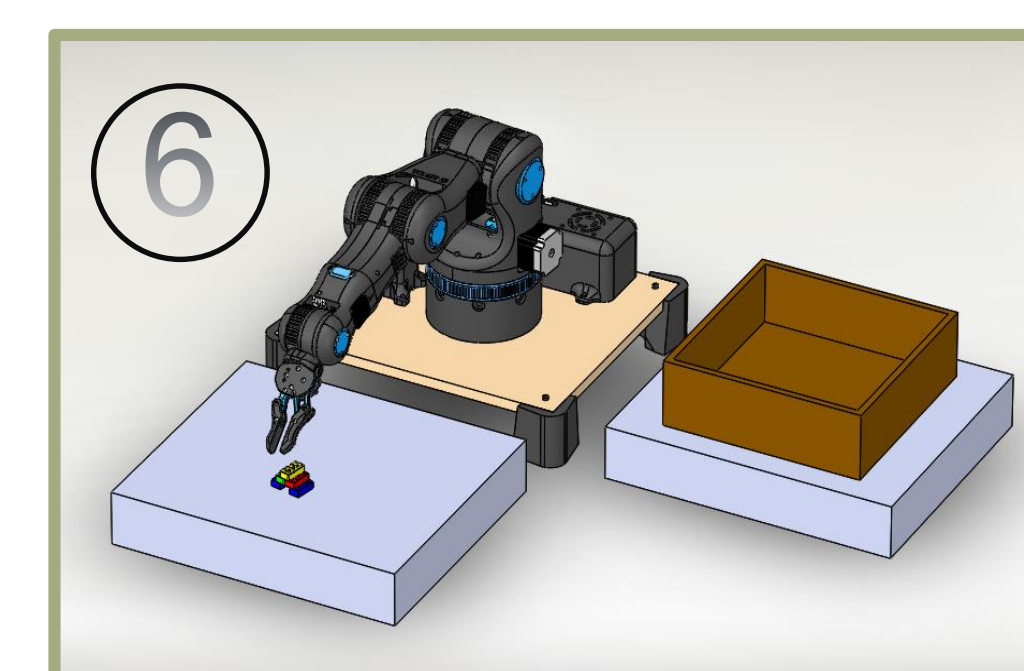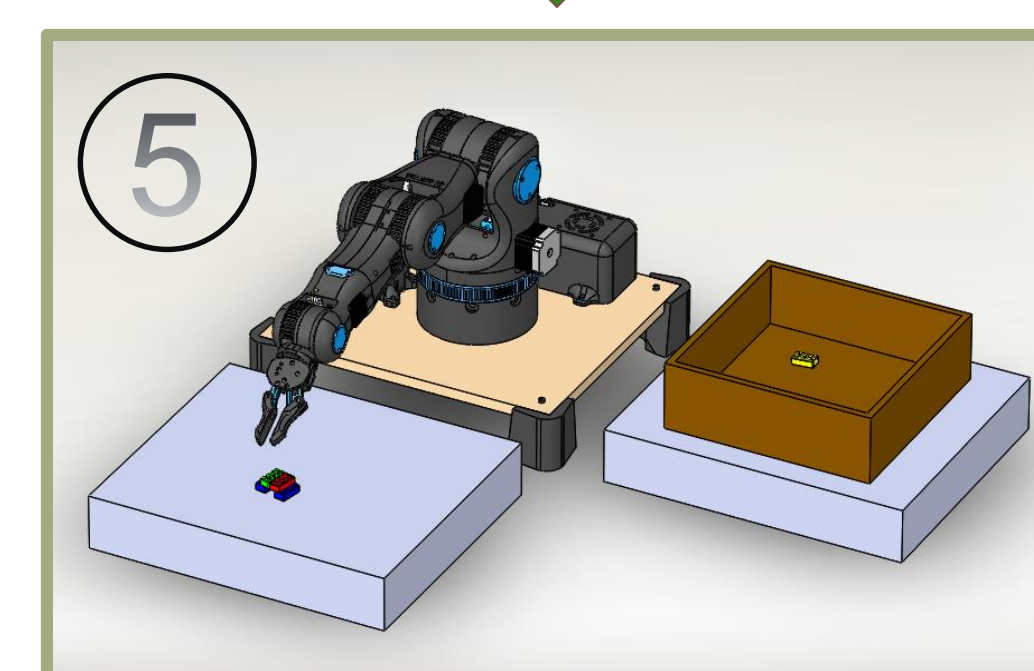
Methodology

Design of parts using the 3D modeling software Solidworks → Creating a Simulation in Solidworks → The physical assembly of the robot

Image source www.flaticon.com
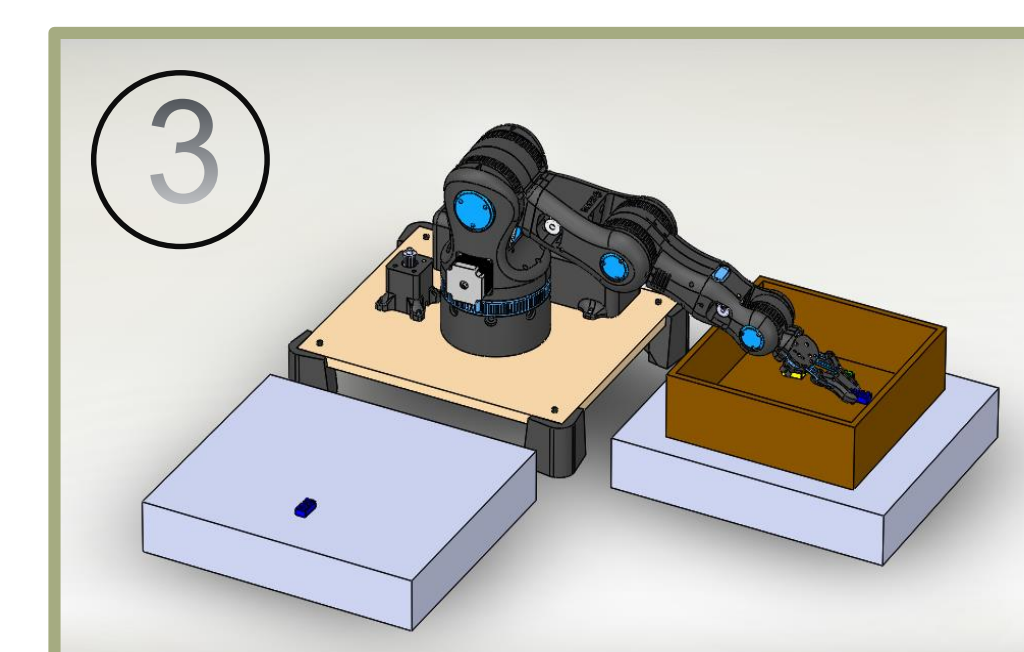
Research Progress

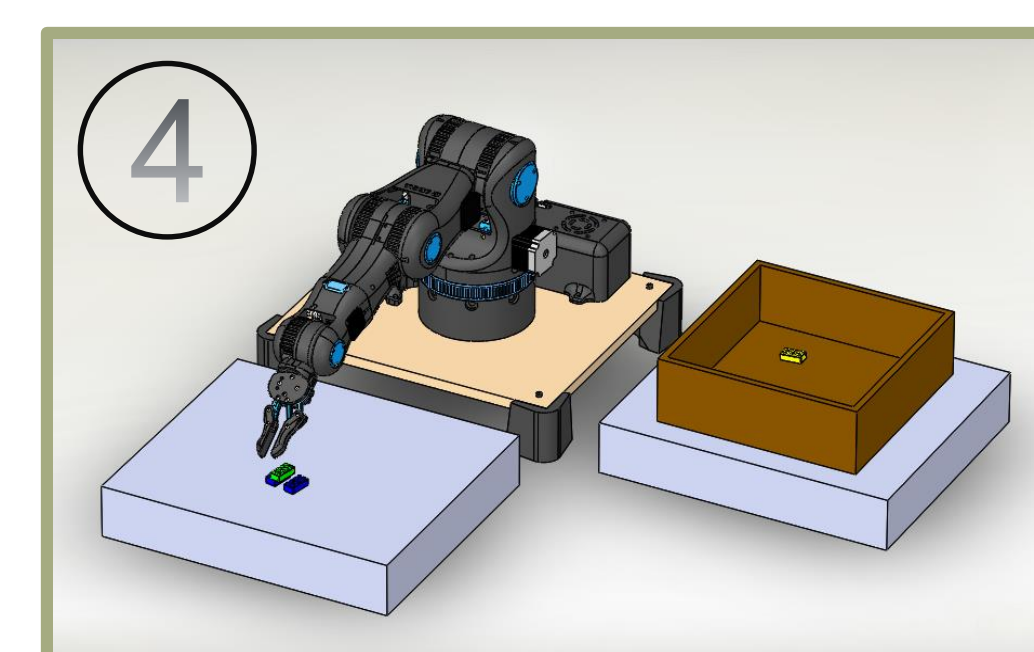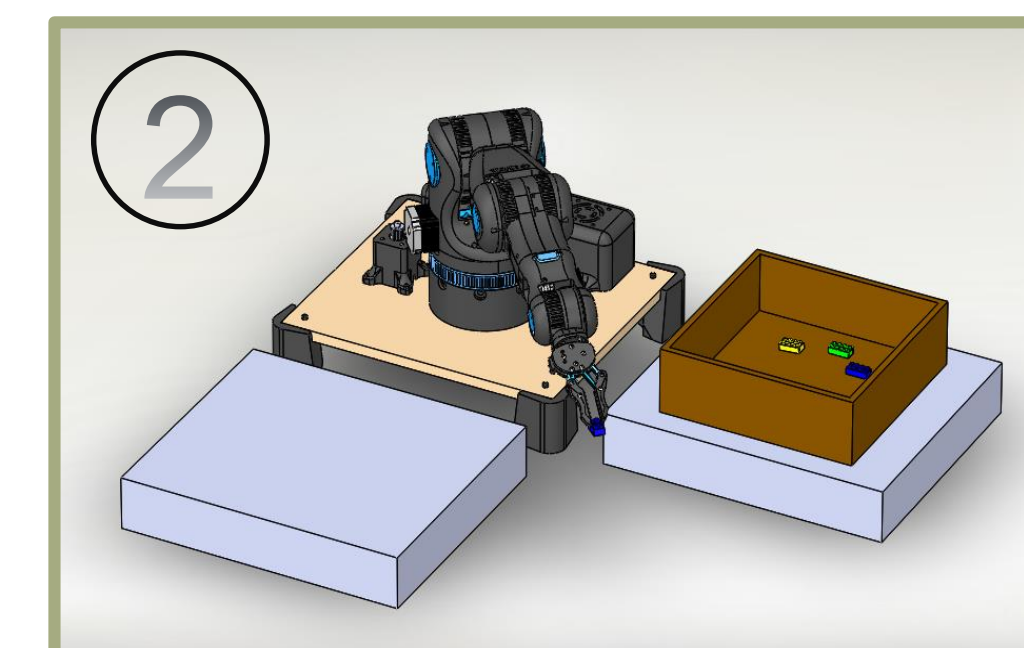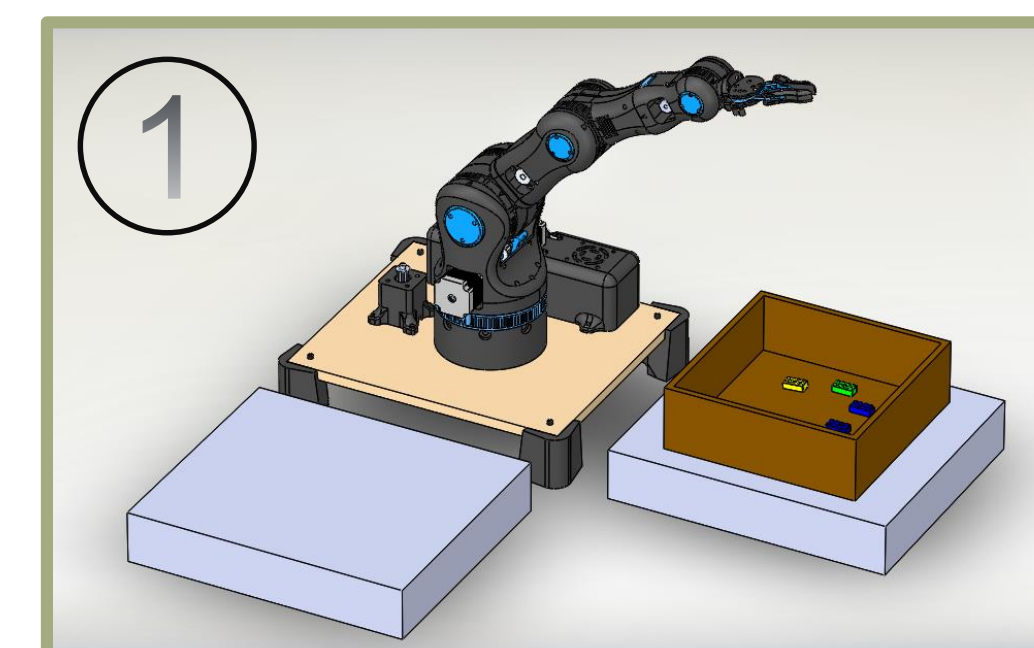### CAD Design of Parts

Assembly of Robot

Final cost: $3000

Simulation: Assembly of Lego Blocks

Future Work

- Integrating the developed robot to other robots for Master and Slave operations.

- Enhance the sensory recognition capabilities of a robot through RGB-D sensors.

- Use of robot for educational purposes in AllFactory designed at the University of Alberta.

- Use of the robot for future pick-and-place research in the automotive and food industries.

- Investigate further ideas to reduce the cost of the robot.

- Exploring other Dull, Dangerous, and Dirty operations for robot application.

Acknowledgements

I would like acknowledge all the help provided by the Laboratory of Intelligent Manufacturing, Design and Automation (LIMDA) team members and principle investigator. I would also like to thank the Faculty of Engineering for sponsoring my participation in the program.

References

- Mikell P. Groover (2015). Automation, Production Systems, and Computer-Integrated manufacturing. Pearson Publishing. Fourth Edition, 220-241.
- "How Much Do Industrial Robots Cost?" Industrial Robots, RobotWorx, 1 Jan. 2017. Retrieved on August 8, 2017 from: www.robots.com/faq/show/how-much-do-industrial-robots-cost
- Yanjiang Huang, Ryosuke Chiba, Tamio Arai, Tsuyoshi Ueyama, and Jun Ota. (February 2015) Robust multi-robot coordination in pick-and-place tasks based on part-dispatching rules. Robotics and Autonomous Systems. Volume 64, 70-83. Retrieved on August 8, 2017 from: http://www.sciencedirect.com/science/article/pii/S0921889014002395
- Rodrigo Méndez Perez, Fernando Auat Cheein, and Joan R. Rosell-Polo. (June 2017) Flexible system of multiple RGB-D sensors for measuring and classifying fruits in agri-food Industry. Computers and Electronics in Agriculture. Volume 139, 231-242. http://www.sciencedirect.com/science/article/pii/S0168169916305968