

E1.6 – 3D Tube Bender

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Project Description

- This project is to design an automated 3D tube bender that can bend ¼ inch copper tubing into any geometry that the user inputs.
- Our Electrical Engineering and Manufacturing Engineering design teams will build the portion of the machine that pushes the tube through bending dies that were designed by previous semester teams.
- There are three objectives to complete next semester:
 - Design a pair of clamps, controlled by stepper motors, to successfully grip the tube without creasing it.
 - Have a linear actuator be able to push the gripped tube towards the bending dies.
 - Build sensors to detect if the tube slips or is out of position.



Background Information

Hardware: Stepper Motor, Driven Clamps, Sensors, and Linear Actuator



Software: .NET Framework Using Object-Oriented C# Programming



Requirements:

- The linear feeding mechanism will be able to push ¼ inch copper tubing through a tube bending head
- A system that will integrate with the tube bending head that has already been designed

Goals:

Implement a linear feeding mechanism that can push tubing through the bending head at the necessary speed and strength to allow for a proper bend.

Team Information



Brendan Forsman
Electrical Engineer

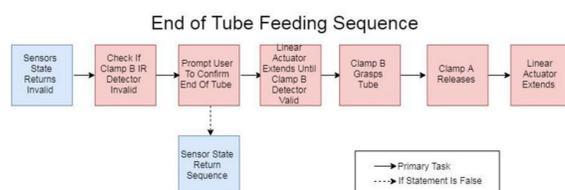
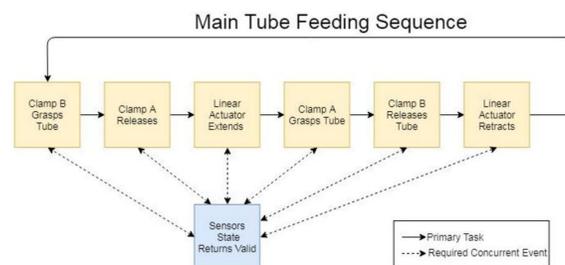
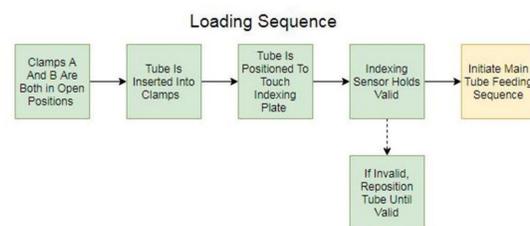
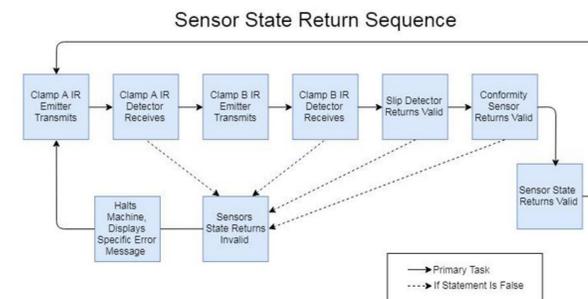
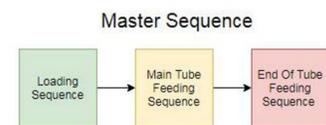
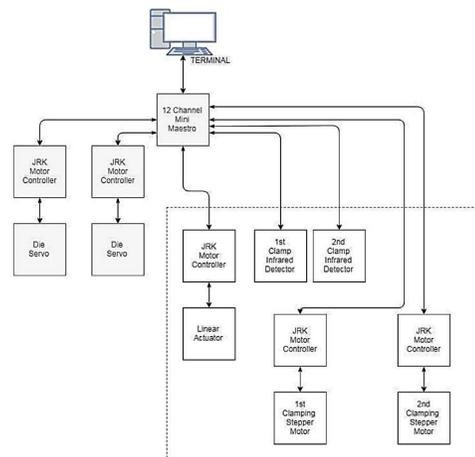


Matthew Heinrich
Electrical Engineer



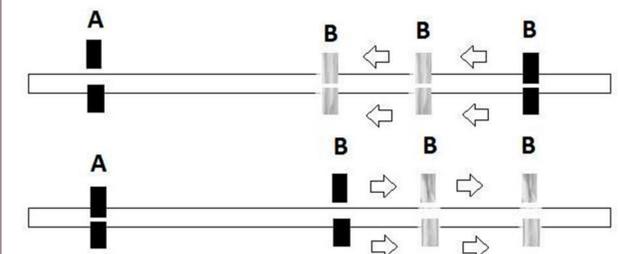
Nicholas Warren
Computer Engineer

Information



Code will be written in C# to allow the devices to communicate using TTL serial protocol so all devices may send and receive data simultaneously. An asynchronous serial protocol is used between devices to perform a desired bend on the tube. The serial commands will be addressed to select a desired motor.

Mechanical Cycle



A simple representation of the mechanical system and the cycle the system uses to feed tubing.

Next Semester

- In the following semester, the electrical engineering design team will write, test, and implement code for the linear feeding mechanism. Since all the components are pre-manufactured, a minimal amount of functional testing will be needed.
- Code will be written in C# to control each piece of hardware. When all code is written for each piece of hardware, it will be brought together to form the controls for the system. The code will then undergo a series of full functionality tests in order to debug any issues that may occur.
- When full functionality is achieved, the motor controls will be exported to the motor controller used in the bending head to synchronize the commands between the bending head and the linear feeding mechanism.

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