**Devices:**

1. Stage

2. Actuator for roller

3. Load sensor

4. Actuator for web (not included yet)

5. Others (tbd)



**Simple schematic of the tool and the devices that will control it**

asdf

**Modes of operation:**

1. *Single-action mode*

2. *Automated mode*

Note: in the following, I include control of the web, but that probably won’t be implemented in the first manifestation of the control system.

1. *Single-action mode*

In single-action mode, the user chooses a single action for the tool to carry out, and the tool carries out that single action. To activate the tool in this mode of operation, the user performs the following actions:

1. Enter values into the input boxes to set the input parameters.
2. Click ‘Go’ (or some such button) to tell the tool to carry out a single action.

-or-

Click and/or hold a button down to activate a device

The following schematic presents example layouts of the panels for *single-action mode*



**Example panels for activating the tool in single-action mode**

asd

Comments - When the ‘Go’ button within a panel is pressed, only the action controlled by that panel is carried out. For example, in the Stage panel, the Go button will cause the stage to move at the inputted speed for the inputted distance. In all panels, when a light-green arrow is clicked, the particular device moves a single step. When the light-green arrows is held down, the device moves continuously at the specified speed until the arrows are released.

2. *Automated mode*

In automated mode, the user sets up the parameters for a transfer test, and the tool carries out an automated sequence of actions. To activate the tool in this mode of operation, the user performs the following actions:

1. Enter values into the input boxes to set the input parameters.
2. Click ‘Go’ (or some such button) to tell the tool to carry out a sequence of actions.

While the tool is carrying out the actions, three graphs will be updated in real time:

* 1. Stage position versus time
  2. Force versus time
  3. TBD – some measure of the behavior of the roller actuator. E.g., current applied to roller actuator, position of roller actuator, … The reason for this is to get a handle on how much work the feedback is doing to maintain the force.

For now, let’s consider two types of *automated mode* – *simple transfer test*, and *customized transfer test*. In all likelihood, all of the transfer testing for the project will fall into the category of *simple transfer test*, but to avoid having to redo the entire software architecture down the road,

I’ll mention some possible scenarios for *customized* transfer testing.

2a. *Simple transfer test*

**I. Control flow I** - simplest transfer test, with passive translation of the web (i.e. no actuator to move the web)

Input parameters:

1. Applied force, Fapp

2. Stage start position, di (this may be a constant later, but let's consider it as an input for now)

3. Stage travel distance, d

4. Stage speed, v

Routine:

0. User clicks a 'Run' or 'Go' button to activate the tool

1. -Stage homes itself

-Roller actuator homes itself

3. Stage movies to position di

4. Roller actuator extends until Fapp is reached

-- system pauses for a period of time (tbd) --

5. Stage translates at v, while roller force is maintained at Fapp via closed-loop control

6. Stage stops at position di+d

-- system pauses for a period of time (tbd) --

7. Roller actuator retracts to Home

**II. Control flow II** - simplest transfer test, with active translation of the web

Input parameters:

1. Applied Force, Fapp

2. Stage start position, di

3. Stage travel distance, d

4. Stage speed, v (note: stage speed and web speed will be the same)

Routine:

0. User clicks a 'Run' or 'Go' button to activate the tool

1. -Stage homes itself

-Roller actuator homes itself

3. Stage movies to di

4. Roller actuator extends until Fapp is reached

-- system pauses for a period of time (tbd) --

5. -Stage and web translate at v, while roller force is maintained at Fapp via closed-loop control

6. -Stage and web stop once stage reaches position di+d

-- system pauses for a period of time (tbd) --

7. Roller actuator retracts to Home

The following schematic presents an example layout of the panel for *automated mode, simple transfer test*



**Example panel for activating the tool in *automated mode* for *simple transfer testing***

2b. *Customized transfer test*

Customized transfer tests would include a more complex sequence of actions for the tool to carry out automatically. The sequences could involve:

1. Carrying out a series of *simple transfer tests* automatically
2. Creating a function for force variation (e.g., sinusoidal) while the stage translates.
3. Translating the stage and web at different speeds
4. Carrying out a sequence of actions involving (i) moving the stage, (ii) applying a force via the roller, (iii) moving the stage, (iv) retracting the roller, repeat…