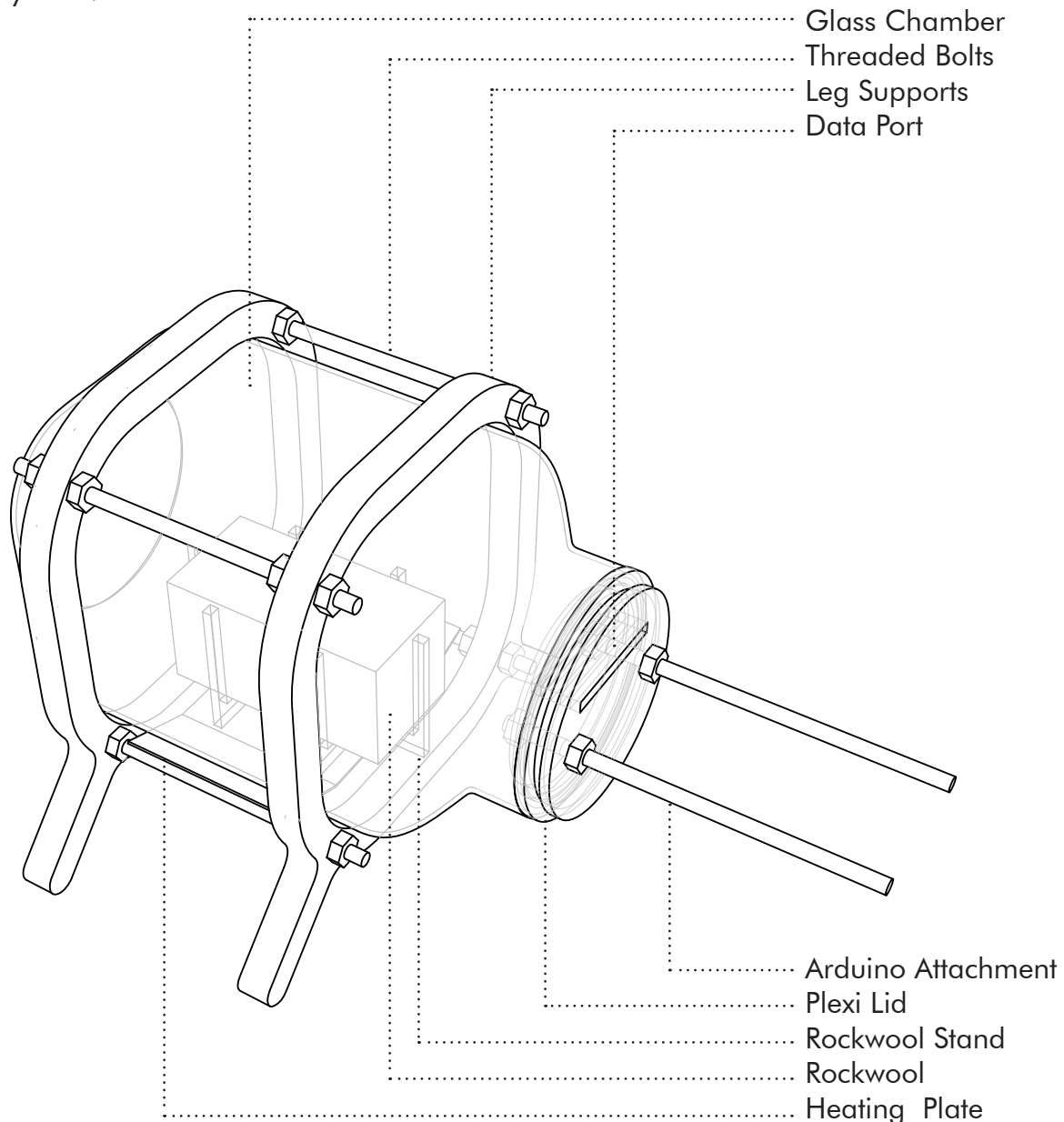


Germination Apparatus

Designing Associativity
By: Alexander Dolan

For my studio project we are researching plant growth with an intent to generate fabrication strategies that for the KUKA. The first step is to start germinating seeds. Seed can germinated at a variety of temperatures and humidity's. By building a germinating apparatus we will be able to closely monitor the environment and adjust it based on the needs of the seeds. This will create a loop system where information can be gathered which in turn is fed back into the system to adjust the output.

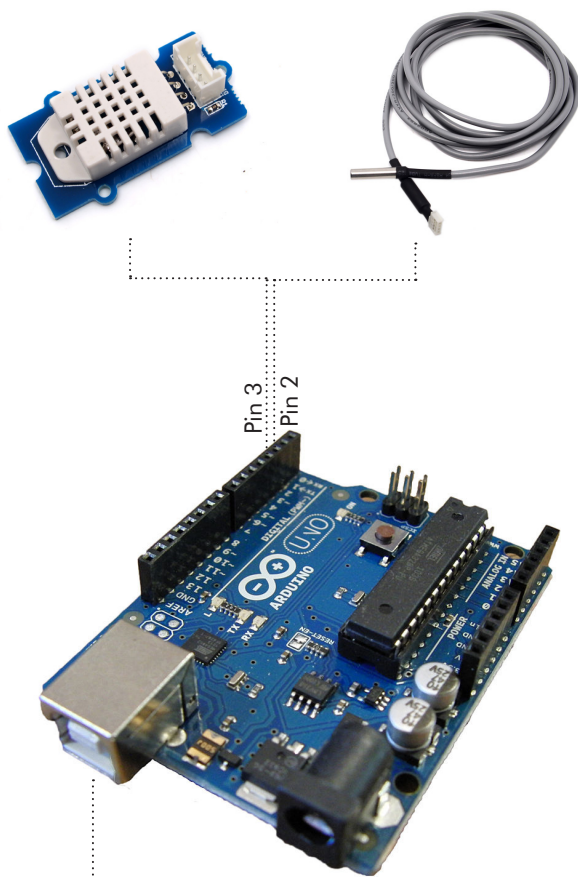
However before germination occurs we need to test the apparatus understand how it functions. By controlling a heating element that is located underneath the chamber the air temperature inside can be adjusted. The unknown element is the humidity level.



Generating Data

Using an Arduino with an exterior temperature sensor located on the heating element, interior temperature sensor and an interior humidity sensor data was written into file. Initial findings between the interior and exterior were a degree difference between the two. This may have come from the exterior sensor being a digital sensor while the interior sensor was built into the humidity sensor which was analog. The arduino took a reading from every sensor every 10 seconds which was printed to the serial.

The test was to turn the heating element for one hour then turn it off for one hour. This function could have been connected to the arduino however the heating element uses 220v and the relay that was available couldn't handle that voltage. The element was manually turned off after an hour.



3400.22.00.22.56	9400.26.00.42.50	9300.27.00.42.69	9500.24.00.26.81	9500.22.00.24.12
3400.22.00.22.62	9400.26.00.42.50	9300.27.00.42.69	9500.24.00.26.75	9500.22.00.24.12
3500.22.00.22.62	9300.27.00.42.56	9300.27.00.42.75	9500.24.00.26.69	9500.22.00.24.06
3600.22.00.22.62	9300.27.00.42.63	9300.27.00.42.75	9500.24.00.26.69	9500.22.00.24.06
3700.22.00.22.81	9300.27.00.42.63	9300.27.00.42.81	9500.24.00.26.62	9500.22.00.24.06
3800.22.00.23.12	9300.27.00.42.63	9200.29.00.42.81	9500.24.00.26.82	9500.22.00.24.06
3900.22.00.23.50	9300.27.00.42.69	9300.27.00.42.75	9500.24.00.26.56	9500.22.00.24.06
4000.22.00.23.87	9300.27.00.42.69	9200.29.00.42.75	9500.24.00.26.56	9500.22.00.24.00
4200.22.00.24.25	9300.27.00.42.75	9300.27.00.42.75	9500.24.00.26.50	9500.22.00.24.00
4300.22.00.24.43	9300.27.00.42.81	9200.29.00.42.81	9500.24.00.26.50	9500.22.00.24.00
4500.22.00.25.06	9300.27.00.42.88	9300.27.00.42.94	9500.24.00.26.44	9500.22.00.24.00
4600.22.00.25.44	9300.27.00.42.94	9200.29.00.43.00	9500.24.00.26.44	9500.22.00.24.00
4700.22.00.25.81	9300.27.00.42.94	9300.27.00.43.00	9500.24.00.26.37	9500.22.00.24.00
4800.22.00.26.19	9300.27.00.42.81	9300.27.00.43.00	9500.24.00.26.37	9500.22.00.24.06
4900.22.00.26.56	9300.27.00.42.75	9200.29.00.42.94	9500.24.00.26.31	9500.22.00.24.06
5200.22.00.26.87	9300.27.00.42.63	9300.27.00.42.94	9500.24.00.26.31	9500.22.00.23.94
5600.22.00.27.25	9300.27.00.42.56	9300.27.00.42.94	9500.24.00.26.25	9500.22.00.23.94
5800.22.00.27.62	9300.27.00.42.50	9200.29.00.42.94	9500.24.00.26.25	9500.22.00.23.94
6000.22.00.27.94	9300.27.00.42.38	9200.29.00.42.94	9500.24.00.26.19	9500.22.00.23.94
6200.22.00.28.31	9300.27.00.42.38	9300.27.00.42.94	9500.24.00.26.12	9500.22.00.23.87
6300.22.00.28.69	9300.27.00.42.31	9200.29.00.42.88	9500.24.00.26.12	9500.22.00.23.87
6400.22.00.29.12	9300.27.00.42.25	9200.29.00.43.00	9500.24.00.26.12	9500.22.00.23.81
6500.22.00.29.44	9300.27.00.42.25	9200.29.00.43.13	9500.24.00.26.06	9500.22.00.23.81
6600.22.00.29.75	9300.27.00.42.19	9300.27.00.43.13	9500.24.00.26.06	9500.22.00.23.81
6800.22.00.30.19	9300.27.00.42.19	9300.27.00.43.19	9500.24.00.26.00	9500.22.00.23.81
6900.22.00.30.37	9300.27.00.42.19	9300.27.00.43.19	9500.24.00.26.00	9500.22.00.23.75
7000.22.00.30.69	9300.27.00.42.13	9300.27.00.43.13	9500.24.00.26.00	9500.22.00.23.75
7100.22.00.31.00	9300.27.00.42.06	9300.27.00.43.06	9500.24.00.26.00	9500.22.00.23.75
7200.22.00.31.31	9300.27.00.42.00	9200.29.00.42.94	9500.24.00.25.94	9500.22.00.23.75
7300.22.00.31.62	9300.27.00.42.75	9300.27.00.42.75	9500.24.00.25.94	9500.22.00.23.75
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7600.22.00.32.50	9300.27.00.41.94	9300.27.00.41.88	9500.24.00.25.81	9500.22.00.23.69
7700.22.00.32.81	9300.27.00.41.94	9300.27.00.41.56	9500.24.00.25.81	9500.22.00.23.69
7800.22.00.33.06	9300.27.00.42.00	9200.29.00.41.75	9500.24.00.25.75	9500.22.00.23.69
7800.22.00.33.31	9300.27.00.42.00	9200.29.00.40.88	9500.24.00.25.75	9500.22.00.23.69
7900.22.00.33.63	9300.27.00.42.00	9300.27.00.40.56	9500.24.00.25.69	9500.22.00.23.69
8100.22.00.33.88	9300.27.00.42.06	9200.29.00.40.19	9500.24.00.25.69	9500.22.00.23.69
8100.22.00.34.13	9300.27.00.42.06	9300.27.00.39.81	9500.24.00.25.62	9500.22.00.23.69
8200.22.00.34.43	9300.27.00.42.06	9300.27.00.39.44	9500.24.00.25.62	9500.22.00.23.62
8300.22.00.34.56	9300.27.00.42.06	9200.29.00.39.06	9500.24.00.25.56	9500.22.00.23.62
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8400.23.00.35.94	9300.27.00.42.50	9300.28.00.37.44	9500.23.00.25.37	9500.22.00.23.56
8400.23.00.36.19	9300.27.00.42.50	9300.28.00.37.19	9500.23.00.25.37	9500.22.00.23.56
9000.23.00.36.31	9300.27.00.42.50	9300.28.00.37.00	9500.23.00.25.31	9500.22.00.23.56
9000.23.00.36.44	9300.27.00.42.50	9400.26.00.36.75	9500.23.00.25.31	9500.22.00.23.56
9000.23.00.36.63	9300.27.00.42.50	9300.28.00.36.56	9500.23.00.25.31	9500.22.00.23.56
9000.23.00.36.75	9300.27.00.42.56	9300.28.00.36.38	9500.23.00.25.25	9500.22.00.23.56
9000.23.00.36.88	9300.27.00.42.56	9400.26.00.36.19	9500.23.00.25.25	9500.22.00.23.56
9000.23.00.36.94	9300.27.00.42.56	9300.28.00.36.00	9500.23.00.25.25	9500.22.00.23.56
9000.23.00.37.06	9300.27.00.42.56	9300.28.00.35.81	9500.23.00.25.25	9500.22.00.23.56
9000.23.00.37.19	9300.27.00.42.56	9300.28.00.35.63	9500.23.00.25.25	9500.22.00.23.56
9000.23.00.37.31	9300.27.00.42.63	9400.26.00.35.44	9500.23.00.25.25	9500.22.00.23.56
9000.23.00.37.38	9300.27.00.42.69	9300.28.00.35.25	9500.23.00.25.25	9500.22.00.23.56
9000.23.00.37.44	9300.27.00.42.75	9300.28.00.35.06	9500.23.00.25.25	9500.22.00.23.56
9200.23.00.37.69	9300.27.00.42.69	9300.28.00.34.88	9500.23.00.25.19	9500.22.00.23.56
9300.23.00.37.69	9300.27.00.42.75	9300.28.00.34.69	9500.23.00.25.19	9500.22.00.23.56
9300.23.00.37.75	9300.27.00.42.81	9300.28.00.34.44	9500.23.00.25.25	9500.22.00.23.56
9300.23.00.37.88	9300.27.00.42.88	9300.28.00.34.25	9500.23.00.25.25	9500.22.00.23.56
9300.23.00.38.00	9300.27.00.42.94	9300.28.00.34.06	9500.23.00.25.31	9500.22.00.23.56
9300.23.00.38.06	9300.27.00.42.50	9300.28.00.33.88	9500.23.00.25.31	9500.22.00.23.56
9300.23.00.38.13	9300.27.00.43.06	9300.28.00.33.69	9500.23.00.25.31	9500.22.00.23.56
9300.23.00.38.25	9300.27.00.43.13	9300.28.00.33.50	9500.23.00.25.31	9500.22.00.23.56
9300.23.00.38.38	9300.27.00.43.19	9300.28.00.33.38	9500.23.00.25.31	9500.22.00.23.56
9300.23.00.38.56	9300.27.00.43.19	9300.28.00.33.19	9500.23.00.25.31	9500.22.00.23.56
9300.23.00.38.69	9300.28.00.43.25	9300.28.00.33.00	9500.23.00.25.31	9500.22.00.23.56
9300.23.00.38.81	9300.28.00.43.25	9300.27.00.32.88	9500.23.00.25.31	9500.22.00.23.56
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9300.23.00.39.00	9300.28.00.43.31	9300.27.00.32.44	9500.23.00.25.37	9500.22.00.23.56
9300.24.00.39.06	9300.28.00.43.38	9300.27.00.32.31	9500.23.00.25.37	9500.22.00.23.56
9300.24.00.39.06	9300.28.00.43.38	9300.27.00.32.19	9500.23.00.25.37	9500.22.00.23.56
9400.24.00.39.13	9300.28.00.43.25	9300.27.00.32.06	9500.23.00.25.31	9500.22.00.23.56
9400.24.00.39.13	9300.28.00.43.19	9300.27.00.31.94	9500.23.00.25.37	9500.22.00.23.56
9400.24.00.39.19	9300.28.00.43.06	9300.27.00.31.75	9500.23.00.25.31	9500.22.00.23.56
9400.24.00.39.19	9300.28.00.43.06	9300.27.00.31.69	9500.23.00.25.25	9500.22.00.23.56
9400.24.00.39.25	9300.28.00.42.94	9300.27.00.31.56	9500.23.00.25.25	9500.22.00.23.56
9400.24.00.39.25	9300.28.00.43.00	9300.27.00.31.44	9500.23.00.25.19	9500.22.00.23.56
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9400.24.00.39.38	9300.28.00.43.13	9300.27.00.31.25	9500.23.00.25.19	9500.22.00.23.56
9400.24.00.39.44	9300.28.00.43.25	9300.27.00.31.19	9500.23.00.25.19	9500.22.00.23.56
9400.24.00.39.50	9300.28.00.43.31	9300.27.00.31.06	9500.23.00.25.19	9500.22.00.23.56
9400.24.00.39.50	9300.28.00.43.31	9300.27.00.30.94	9500.23.00.25.12	9500.22.00.23.56
9400.24.00.39.56	9300.28.00.43.25	9300.27.00.30.87	9500.23.00.25.12	9500.22.00.23.56
9400.24.00.39.56	9300.28.00.43.13	9300.27.00.30.81	9500.23.00.25.06	9500.22.00.23.56
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9400.24.00.39.63	9300.28.00.43.13	9300.27.00.30.56	9500.23.00.25.00	9500.22.00.23.56
9400.24.00.39.63	9300.28.00.43.19	9300.27.00.30.50	9500.23.00.25.00	9500.22.00.23.56
9400.24.00.39.69	9300.28.00.43.19	9300.27.00.30.44	9500.23.00.25.00	9500.22.00.23.56
9400.24.00.39.69	9300.28.00.43.13	9300.27.00.30.31	9500.23.00.24.94	9500.22.00.23.56
9400.24.00.39.75	9300.28.00.43.19	9300.27.00.30.25	9500.23.00.24.94	9500.22.00.23.56
9400.24.00.39.75	9300.28.00.43.25	9300.27.00.30.12	9500.23.00.24.94	9500.22.00.23.56
9400.24.00.39.81	9300.28.00.43.31	9300.27.00.30.06	9500.23.00.24.94	9500.22.00.23.56
9400.24.00.39.88	9300.28.00.43.44	9300.27.00.29.94	9500.23.00.24.87	9500.22.00.23.56
9400.24.00.39.94	9300.28.00.43.50	9300.27.00.29.87	9500.23.00.24.87	9500.22.00.23.56
9400.24.00.40.00	9300.28.00.43.56	9300.27.00.29.81	9500.23.00.24.87	9500.22.00.23.56
9400.24.00.40.00	9300.28.00.43.56	9300.27.00.29.75	9500.23.00.24.94	9500.22.00.23.56
9400.24.00.40.06	9400.26.00.43.50	9300.27.00.29.62	9500.23.00.24.94	9500.22.00.23.56
9400.24.00.40.13	9300.28.00.43.44	9300.27.00.29.56	9500.23.00.24.94	9500.22.00.23.56
9400.24.00.40.13	9300.28.00.43.31	9300.27.00.29.50	9500.23.00.24.94	9500.22.00.23.56
9400.24.00.40.19	9300.28.00.43.19	9300.27.00.29.37	9500.23.00.24.94	9500.22.00.23.56
9400.24.00.40.19	9300.28.00.43.19	9300.27.00.29.31	9500.23.00.24.94	9500.22.00.23.56
9400.24.00.40.25	9300.28.00.43.19	9300.27.00.29.25	9500.23.00.24.94	9500.22.00.23.56
9400.24.00.40.31	9300.28.00.43.31	9300.27.00.29.19	9500.23.00.24.87	9500.22.00.23.56
9400.24.00.40.44	9300.28.00.43.38	9300.27.00.29.12		

