Plate Reader Turbidostat

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Who is the Customer?

Eric Klavins
Assistant Professor
Control and Robotics

Project Goals

- Monitor the evolution of bacteria in plate by sampling the optical density of the broth and interfacing with liquid handler software.
- Custom design and create fully enclosed box to fit plate and to avoid light disturbances during scan.
- Implement micro controller to control all the components of the plant.

Block Diagram of System

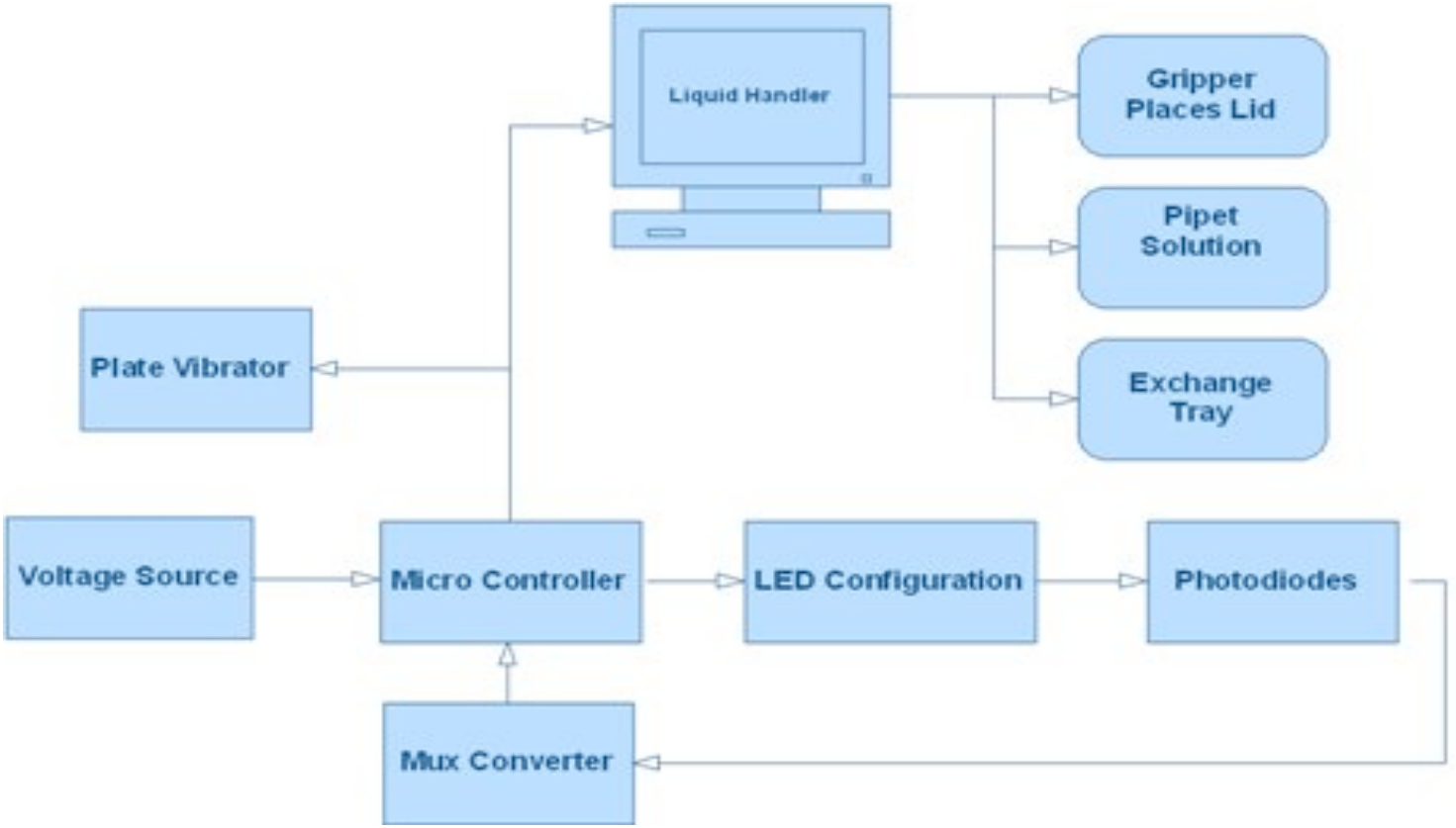
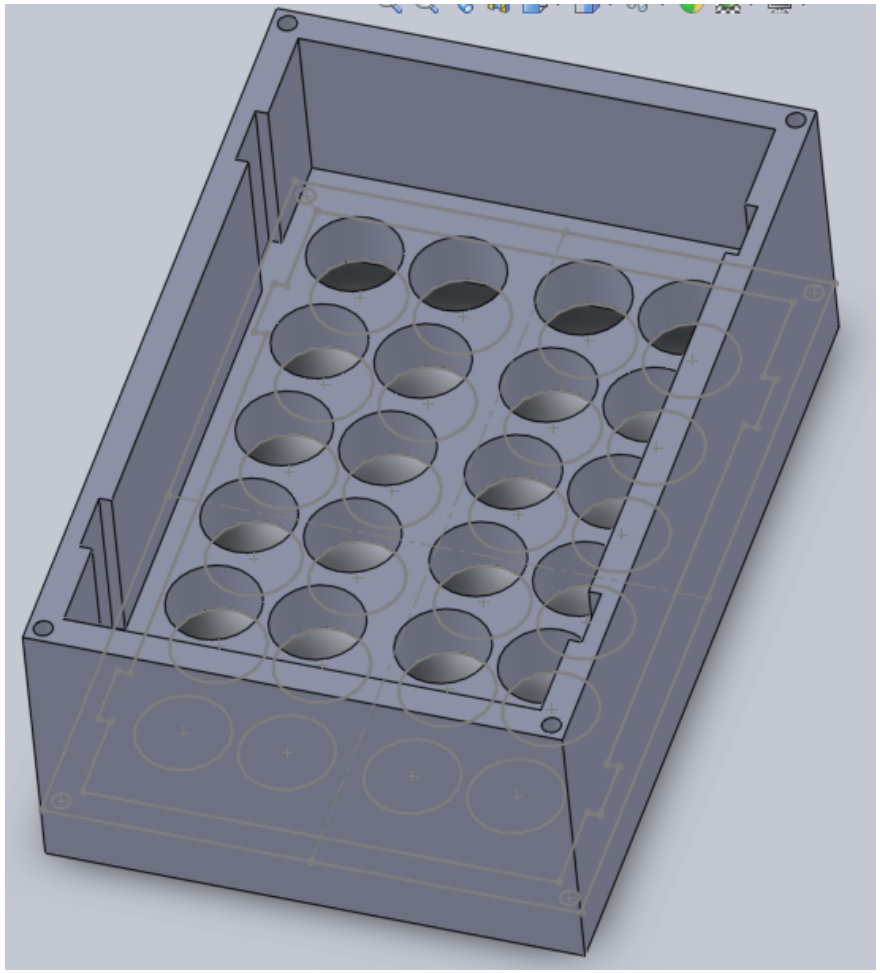


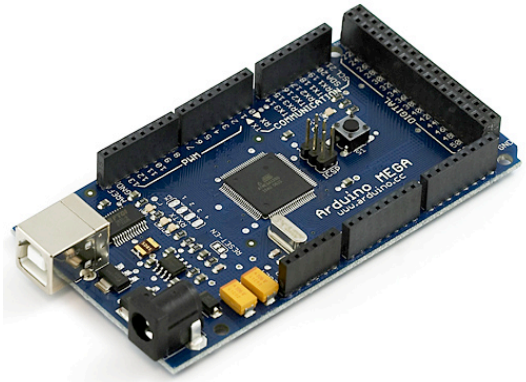
Plate Holder Design

- Multiple Parts
  - Lid with embedded PCB board and photodiodes
  - Body (as shown)
  - Base containing LED configuration.

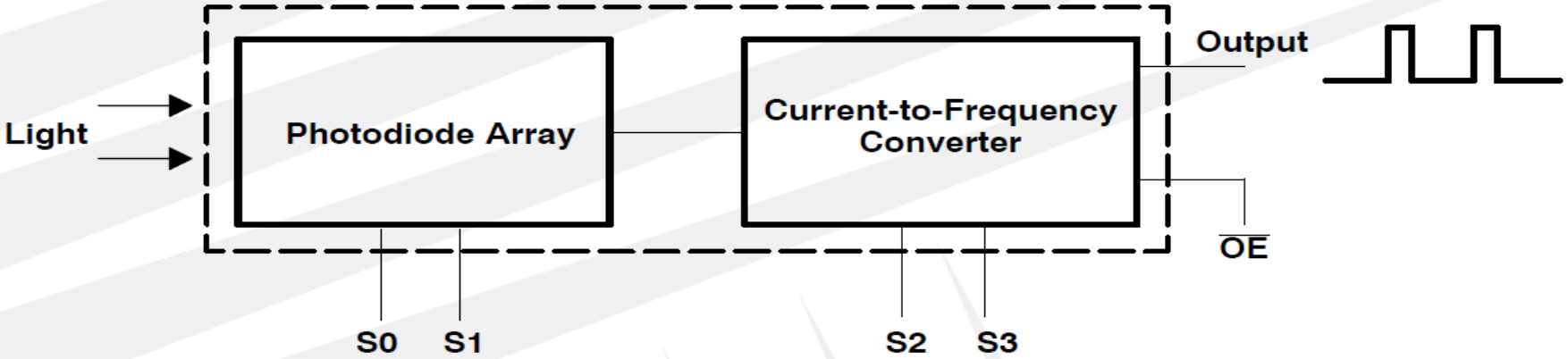


Additional Parts

- Arduino computing platform i/o board
- Light Intensity to Frequency IC (320nm-1050nm response range)
- 3mm 600nm Orange LEDs

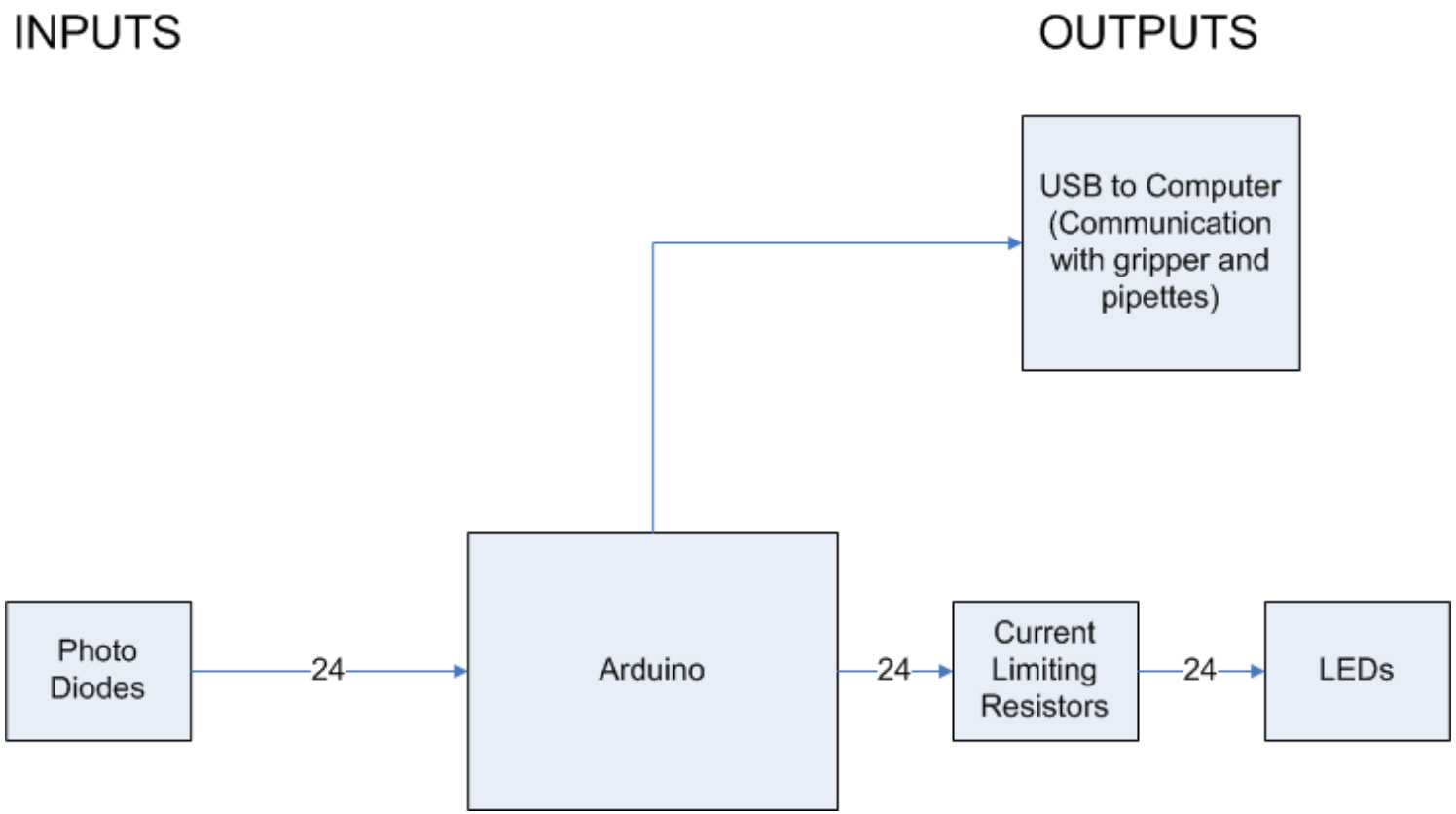


Converting Light to Frequency

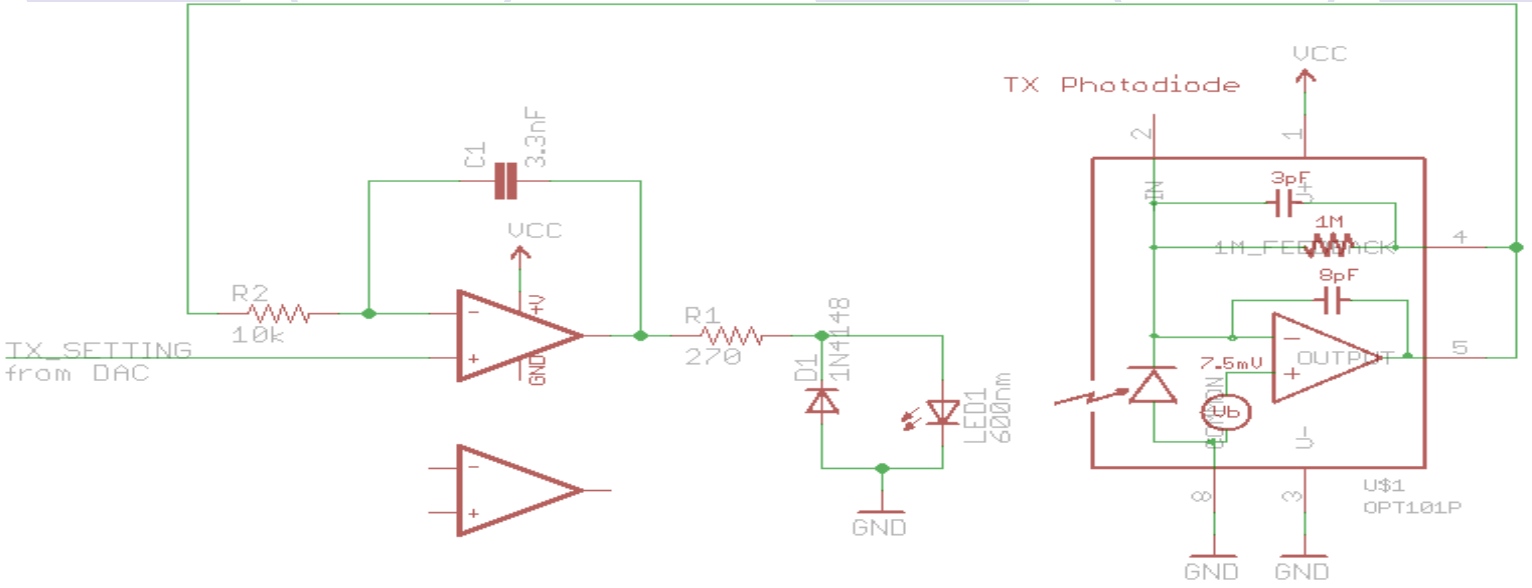


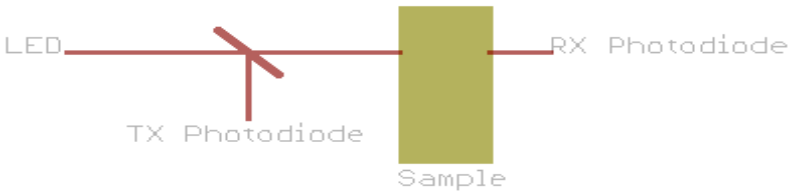
- Takes light intensity as an input and outputs a pulsed wave
- Communicates directly with micro controller

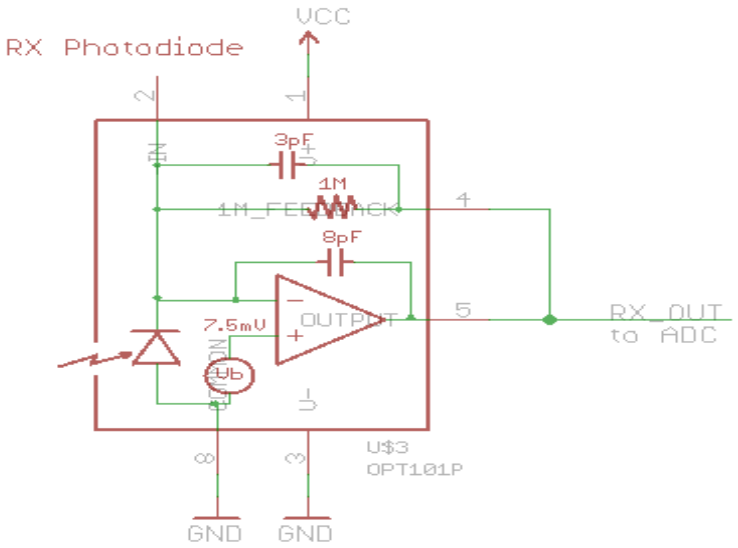
System Inputs and Interfaces



Related Work by Alex Leone

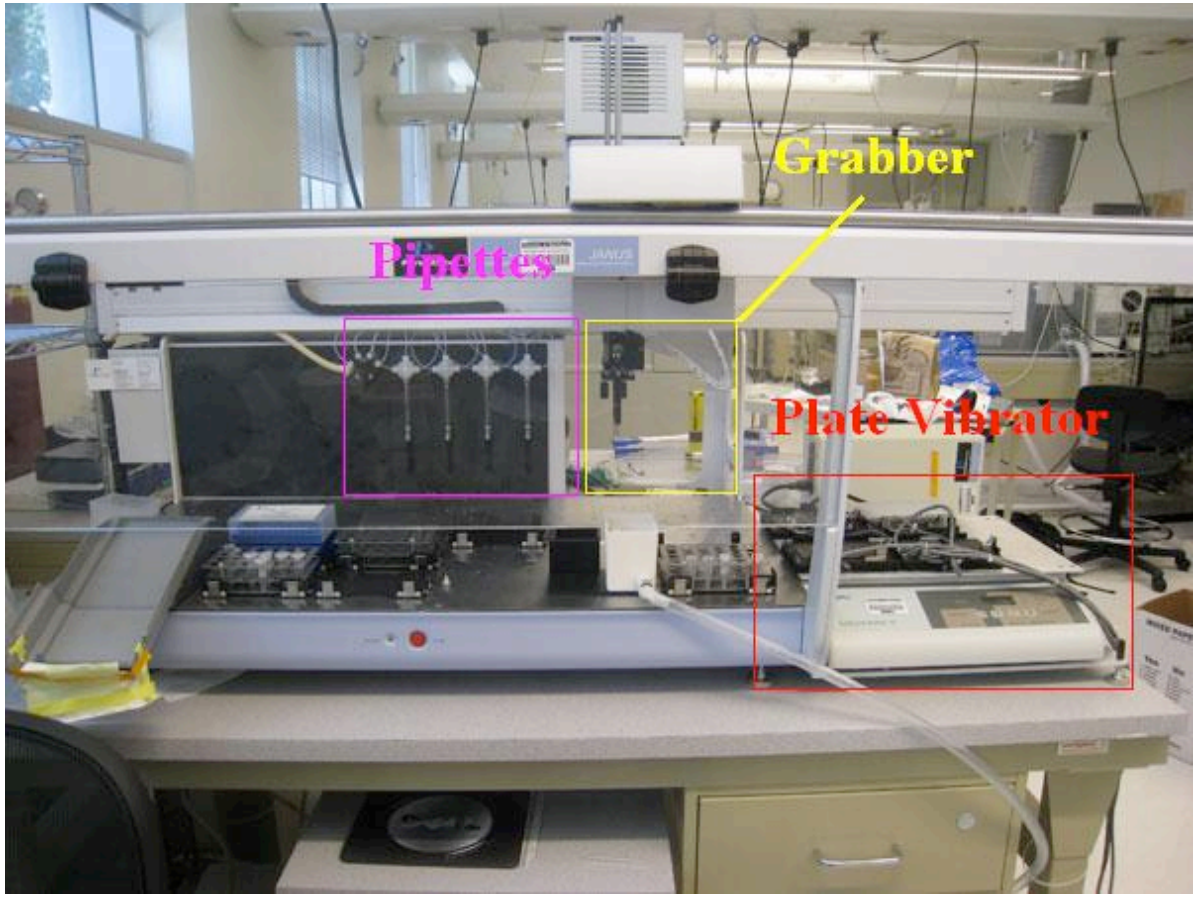






How will this be used?

- Placed and attached to plate vibrator for continued bacterial growth
- Optical density measured ~10 min intervals (TBD)
- Feedback to liquid handler for broth addition / plate replacement
- Resume mixing and measurement intervals



*University of Washington – Heinecke Laboratory

Buget and Cost

Description	Quantity	Total price
Programmable light to frequency IC (Photodiode)	30	160.80
Arduino Mega – Microcontroller	1	64.95
5mm 598nm Amber LEDs	5	1.12
5mm 605nm Orange LEDs	5	1.08
3mm 600nm Orange LEDs	5	2.90
Servo Motor - Full Rotation	1	13.95
Printed Circuit board	2	50 - 150
Various manufactured plastic housing parts	1 - 2	25 - 100
Most compatable LEDs (pending testing)	26	6 – 20
Additional Servo Motor (optional)	1	13.95

Buget Constraint:

$1000.00

Total Estimated Cost:

$326 - $529

Timeline

Week 2	- Speak with advisors and client, order sample LEDs, photodiodes, microcontroller
Week 3	- Build test equipment to determine efficient LED wavelength. - Test functionality of microcontroller / liquid handler compatibility - Model System
Week 4	- Use test equipment to sample photodiode / LED optical density readings using blue food coloring in plate well
Week 5	- Order Printed circuit board for Photodiodes - Build / order designed housing container using Solidworks
Week 6	- Build housing container with PCB and test measurement capabilities. - Order another PCB if necessary
Week 7	- ↓Continue testing equipment ↓
Week 8	- Access efficiencies with feedback control and design requirements
Week 9	- Possible upgrades (servo motor opening of housing, heat influence on LED output, etc.) - Final Report
Week 10	- Final Report (cont.) - Lab Visits
Week 11	- Turn in full Report and suggestions - Patent and make millions $$$