

Group 5

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Abstract

The goal of the Grobotic Bio-Incubator is to meet all the customer needs whilst trying to keep cost as low as possible. The system is divided into five different subsystems. The Chassis subsystem is designed to hold all the other subsystems. The Data Acquisition and User Interface subsystem is designed to connect to the sensors in the other subsystems so the user can set system parameters, read and interpret data, and receive system warnings about culture failures. This subsystem primarily consists of a tablet that is connected to a Data Acquisition Device (DAQ) which connects to the other subsystems. The Bioreactor subsystem consists of two different types of bioreactors, a conical tube bioreactor that can seal four different conical tubes at once in separate environments, and a well plate bioreactor that can seal four different well plates at once in separate environments. Each of these environments are temperature-controlled via Peltier Plates can be sealed from the outside world but have a lid that can be removed for the addition of liquids and has a valve that can be used to add and remove gases. The Liquid Handling subsystem is designed for fully automated liquid dispensing via a rack and pinion syringe connected to a motor. This subsystem can also make OD readings as well as remove the lid of the bioreactor itself. The Liquid Transfer subsystem is designed to move and align the Liquid Handling subsystem via a series of motors connect to wheels on a track.

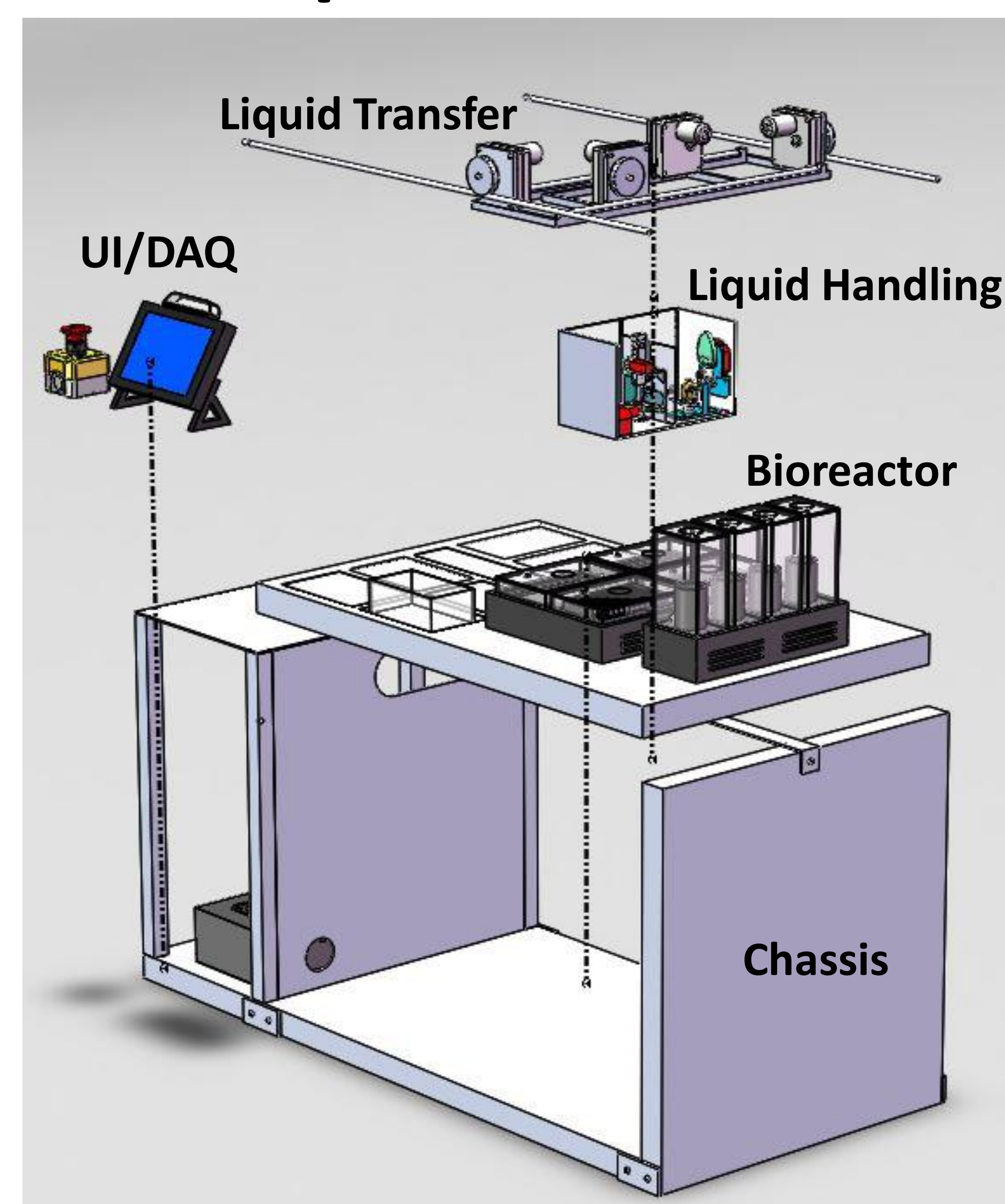
Costs

Overall Costs of System	
OTS Parts	\$5720.93
Modified OTS Parts	\$0
Manufacturing, MFG Labor, Energy, and Materials	\$4163.91
Assembly Labor	\$100
Total	\$9984.84

Proposed Function

The Microbioreactor can be split into 5 subsystems: the bioreactor itself, a chassis, liquid handling, liquid transfer, and the display. The full assembly will be able to autonomously move and culture living cells as well as wanted reagents. The bioreactor is an enclosed environment where the temperature and humidity are fully programable to create the wanted conditions. The system also has the option to add additional sensors such as a pH/pOH reader. Its light weight and ease of assembly allows it to be used in a variety of locations, not only in a lab setting. The Grobotic can track the progress and condition of each individual bioreactor and this information can be monitored on a mobile device. A notification is sent to the mobile device when the operations are complete or if an error occurs. This way, the cultures can be monitored from a distance while they sit in the reactor for up to two weeks.

Exploded View



Overall Configuration

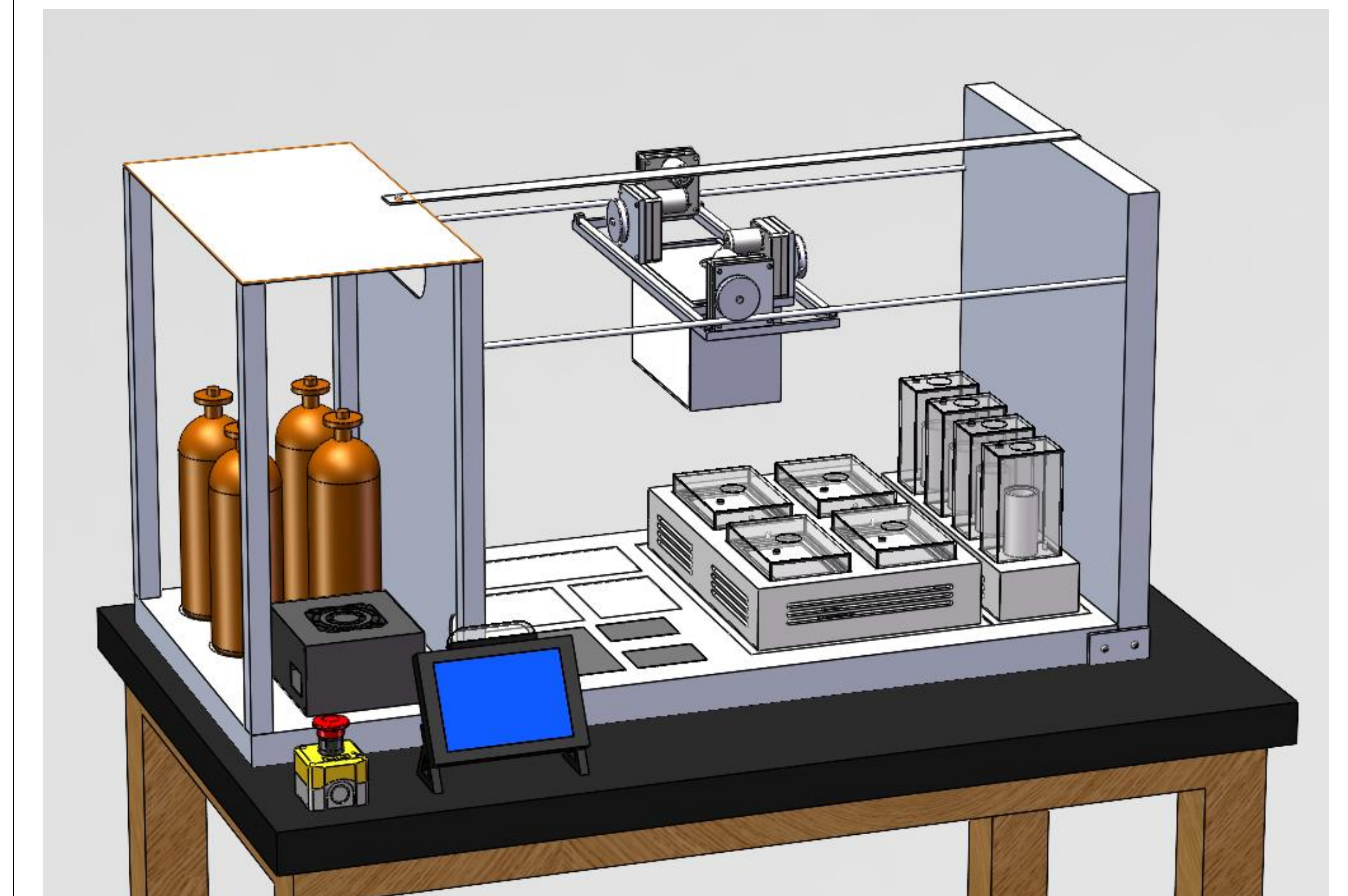


Figure 1: Utilizes a robotic manipulator for liquid handling of various culture cells and reagents. A small robotic vehicle is responsible for moving the well plates to a desired location within the bioreactor. All processes are controlled via the laptop situated to the left of the bioreactor.

References

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