

Team 6: Cloud Device for 3D Cell Culture, Observation and Manipulation

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Cell culture and monitoring is a crucial part in most tissue engineering experiments. However, this process can become tedious and, sometimes, problematic. In many experiments, it is necessary for researchers to study cell behaviors in various conditions. Some of these conditions can endanger the cells, requiring proper attention to be given and adjustments to be made in order for the cells to survive. This level of involvement makes it so that researchers will have to be present in the laboratory. However, this is not always conducive due to many limiting factors such as geography, accessibility, incommmodity, or finance, and hence give rise to the need of wireless monitoring system. To facilitate this process, a device that is able to create an ideal, sustainable and controlled environment for cell culturing as well as provide wireless adjustment, manipulation, and monitoring is highly desirable.

In this project, we want to focus on creating an affordable and simple cell culture system that is accessible to students and researchers. The goals are to allow all users, whether members of a lab or students, to have the ability to study cell behavior in various culture conditions, and under physical stimulation by built-in micromanipulator over the web. Magnets control the manipulator movement, shown on the bottom left, and the legs can be moved in directions shown by the arrows. When the legs move outward, the probe rises. When the legs move inward, the probe lowers. Using a Raspberry-Pi and an Arduino, a web server is created that has live video feed and command window where user can control the micromanipulator and view the auto-regulated temperature and CO2 concentration inside of the incubator. In addition to those features, the device is also incorporated with an inverted microscope which will allow the cells to be viewed and manipulated safely outside of the lab.

