

# Autonomous Refrigerator Robot with Pick and Place Operation

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## Abstract

One of the most common pieces of equipment found in all biomedical and research laboratories are the specimen refrigerator. While seeming not as glamorous or fancy as some of the other laboratory equipment, the specimen refrigerator plays a crucial role in laboratory research. Almost all experiment involving living cultures or specimens require them to be maintained at a specific temperature. Sometimes the temperature change can be for preservation purposes and sometimes it might be to simulate an actual environmental condition. Nevertheless, temperature control of experiments is of outmost importance in any modern research facility. When working with specimens in a laboratory it is often necessary to process samples at specific temperatures and times. In a busy biomedical lab, managing and handling all the samples can be an overwhelming and daunting task. Different materials with varying densities can have different heat transfer coefficients as well as specific heats. With each sample put into the fridge at a different time there is almost no way to know when each sample will reach its ideal temperature. Some samples might be required to be chilled to near freezing while some might just need their temperatures reduced by a few degrees. Thus, there is a need for the device that could both measure the temperature of the samples, as well as retrieve them from the refrigerator. The goal of our Mechatronics final project is to design and create a device capable of managing a biomedical laboratory's refrigerated sample inventory. To achieve this, the device needed to be able to completely operate on its own without needing the operator's input or commanding. The device would operate autonomously within an enclosed refrigerator and monitor the samples and vials being studied in the lab. When called upon to, the device would be able to retrieve a required sample based either on the time of day, time the specimen was required to be in the refrigerator or even have it removed at a set temperature point.

**Keyword:** Refrigerator, Robot, Bio-Medical Laboratory, Sample Specimen, Micro Controller, Density

