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DEVELOPMENT OF AN IMPROVED RANDOM POSITIONING MACHINE TO SIMULATE  
ORGANIC GROWTH IN MICROGRAVITY**Abstract**

As the challenge of turning humanity into an multiplanetary species becomes more pressing, other not-so-obvious issues are raised: plant growth and manufacture of organic-based pharmaceuticals in microgravity or gravities lower than that of our planet create the need for research and, especially, experimentation, which at first seems impossible here on Earth. The Random Positioning Machine (RPM) allows for results that do not require expensive testing outside of Earth.

This paper intends to give an overview of the different design parameters and features that make up an RPM, such as angular speed, number of axes of rotation or algorithms to avoid heterogeneousness in the resulting gravitational field. For such purpose, two machines with two and three axes will be built and their corresponding measurements compared.

Once the study is done, it will be possible to improve the design and performance of an RPM, so that optimal results are achieved when conducting cutting-edge research in fields like botany or microbiology. Furthermore, proper optimization of the device will lead to a decrease in the time that it takes the sample to reach a microgravity-like state, thus making it possible to use the RPM in other fields that have shorter characteristic times.

Finally, once the RPM is fully functional, our team will investigate potential future improvements, as well as a number of features like camera processing or control algorithms that make the instrument automatic so that it does not require constant supervision, in order to make it more useful for laboratories and researchers.