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Author: Ms. Rubí Janet Núñez Dorantes
School of Engineering, National Autonomous University of Mexico, Mexico

Dr. Saul De la Rosa Nieves
School of Engineering, National Autonomous University of Mexico, Mexico
Dr. Boris Escalante Ramírez
School of Engineering, National Autonomous University of Mexico, Mexico
Dr. Jose Luis Garcia Cordero
CINVESTAV, Mexico

# DESIGN OF AN ARTIFICIAL VISION SYSTEM FOR BIOLOGICAL EXPERIMENTATION UNDER MICROGRAVITY EFFECTS ON BOARD A NANOSATELLITE

**Abstract**

This proposal describes the project that aims to study the cellular alterations induced by microgravity in eukaryotic cells, specifically in the yeast Saccharomyces cerevisiae, where an experiment to be conducted during the "Microlab" mission arises, in which it is pretended to design and build a nanosatellite 3U standard containing an independent laboratory for biological experiments.

Experimentation is to analyze replicative life span, for which the population is separated into various cultures, each with a different genetic modification. Each experimental culture is in a microfluidic device, comprising 100-500 traps which can trap cells in order to be analyzed.

Because there is the need to make a qualitative analysis of each cell, in this project a machine vision system is proposed, which through a picture is able to detect the characteristics of aging and other important information for this study, in order to do processing on board, which has several advantages in reducing resources.

The vision algorithm works with fluorescence imaging. This way we can monitor the cell, and determine when it is reproducing. Once the cell morphology was characterized at different stages of maturation is proceeded to design and develop the machine vision algorithm.

Fluorescence imaging offer a high contrast, allowing the algorithm was implemented from a binarization of data and then a more accurate analysis developing a technique of statistical learning to know the average size of each cell and the distance from the nucleus which a yeast begins to generate a daughter cell, all of which is described in an FPGA to generate a specific application architecture and allows the implementation of fault tolerance techniques that meet the reliability requirements for space systems.