

Design and Development of an in-Vitro Cell Stretching Bioreactor

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INTRODUCTION

- One of the most important physiological and pathological stimuli affecting the growth, development, differentiation, interaction and functioning of an organism tissue cells, the biomechanical environment is mechanical stress.
- This project aims to develop a low-cost equibiaxial cell stretching device to simulate mechanical stress on cells in laboratory environment to study cellular mechanobiology.

SPECIFICATIONS & DESIGN REQUIREMENT

APPLICATION AREAS







Biochemical Experiments

Cell Biology Experiments

Cell Physiology Experiments

RESULTS & DISCUSSION

Cell stretching device works properly with its' own interface.

It is to design a device that will expand on the PDMS Membrane in real time according to the frequency and strain distance received from the user.

This device should apply strain equally to every surface on the PDMS membrane.

 \checkmark The movements of the four motors should be syncronized with a real-time clock with a frequency of minimum 100Hz.

✓ The user interface should read the stretching profiles from a file and regulate the movement of the device accordingly.

SOLUTION

• According to the given inputs strain and period by the user, we calculated the frequency of the PWM Signal via the following formula. After the frequency calculation of the PWM Signal, we generated PWM by

- User can choose between 2 modes as sinusoidal and square mode.
 - Speed range for motors is 4cm/s to 0.1cm/s which enables different kind of stretch mechanisms on target membrane.
 - Strain for motors to pull membrane at maximum is 1.5 cm.
 - After the start motors bring
 - membrane to its' initial condition with the feedback from limit switches.

Cell stretching device released it can different with work inputs anddifferent modes without any delay or problem.

METHODOLOGY







Development of Microscope Stage BioStretch. Available:

https://preserve.lehigh.edu/cgi/viewcontent.cgi?article=2621&context=etd

