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Maynooth University IEEE Student Branch

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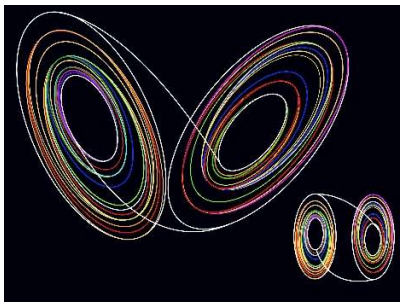
Undergraduate Research Project Proposal

Exploring Temperature-Dependent Bifurcation in Chaotic Circuits: Design and Construction of a Mini Greenhouse for Controlled Chaos Analysis



The study of chaotic circuits has emerged as a pivotal aspect of modern electronics, shedding light on nonlinear dynamics that are both complex and rich in applications, from secure communication to computational modelling.
Within this field, temperature plays a critical role, as even slight variations can significantly affect the behaviour of electronic components, altering key properties such as resistance and capacitance, thus influencing the overall chaotic dynamics.

Method: In this research project, a student will delve into the intricate relationship between temperature and chaotic circuits by designing and constructing a mini greenhouse, equipped with a sophisticated PID temperature control system. This controlled environment will serve as a testing ground for chaotic circuits that the student will design and analyse, focusing on how temperature acts as a bifurcation parameter, leading to diverse chaotic behaviours.

Utilizing the Arduino platform for precise temperature regulation and data collection, combined with MATLAB's analytical tools for a comprehensive examination of bifurcation diagrams and transitions to chaos, the project offers a multifaceted exploration.

Goals: It not only promises academic enrichment but also stands to contribute significantly to the broader understanding of chaos theory and its practical applications in science and industry, making it a substantial and innovative research undertaking.

Special requirements: Matlab/Simulink and Arduino. No ethical approval is required.

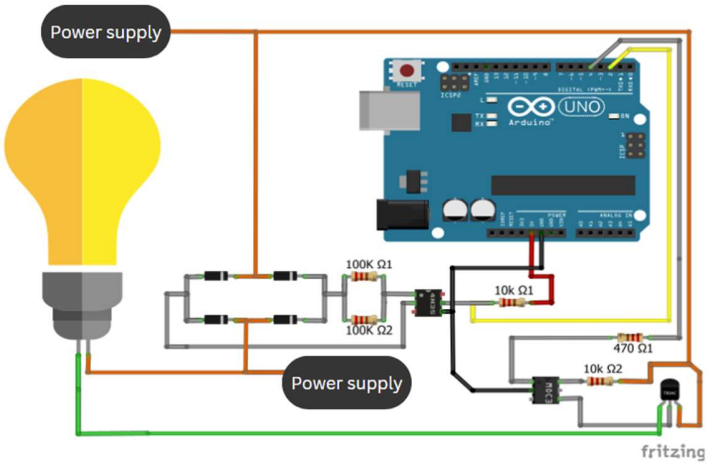


Figure 1. Circuit responsible for activating the actuator.

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