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Design and construction of a Digitally Controlled Function Generator

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Many applications in Applied and Experimental Physics require the use of a function generator. These devices, while a staple of most labs, are expensive in nature and limiting in the way they operate. Most off-the-shelf, mid-range function generators will be able to provide a few different wave forms with the frequency and amplitude (voltage) of the wave being variable. The user would control these variables via the use of dials or buttons on the device itself. This analogue method to control the generator greatly limits how it can be used. Higher-end, digitally-controlled function generators are above the price point for many researchers or students

In this project we sought to create a low cost, digitally-controlled function generator. This custom-built generator would output a unipolar square wave that through the use of external filters could be converted into a range of periodic functions.

This custom function generator is built as a standalone device and as a module for the 'Africhino Quasi-Computer'. In future development, the function generator will be able to generate any function required by the user, including non-periodic functions.

Decreasing the cost of scientific endeavour, while maintaining quality, is the central tenant of the 'Africhino Quasi-Computer'. The function generator described above aims to be a part of a complete, low cost, laboratory instrument kit. Through this work we hope to bring advancements to the education, private and commercial sectors by reducing the associated costs and allowing the realisation of previously unattainable ideas.

To practically test the usability of the function generator, we decided to use it to drive Q-Plates in an optical scheme. These plates require specific frequencies and voltages on a bi-polar square wave to function correctly. This ordinarily would be a task suited to an off-the-shelf function generator, however by using our custom built function generator we were able to have a computer control the parameters of the wave, changing them as needed at a speed far faster than a human could in a manual, analogue operated system.

While this function generator is limited in the waves it can generate, it is a step forward towards a cheaper, more widely available scientific future.

Apply to be considered for a student award (Yes / No)?

Yes

Level for award (Hons, MSc, PhD, N/A)?

MSc

Main supervisor (name and email) and his / her institution

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**Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?**

Yes

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