New Developments for Mosaic CCDs

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Abstract

The imaging areas of currently available optical detectors are relatively small to cope with large image areas such as telescope focal planes. One possibility to obtain large detection areas is to assemble mosaics of Charge Coupled Devices(CCDs) and drive them simultaneously. Parallel driving of many CCDs together rules out the possibility of individual tuning; however such optimisation is very important when the ultimate low light level performance is required particularly for new devices. In this work, a new concept has been developed for an entirely novel approach where the drive waveforms are multiplexed and interleaved. This simultaneously reduces the number of leadout connections and permits individual optimisation efficiently. The controller has been designed to include one electronic component produced by CAD software where most of the digital circuits are integrated to minimise the component count and improve the efficiency of the system greatly. The software has an open architecture to permit convenient modification by the user to fit their specific purposes. The design of controller allows great flexibility of system parameters by the softwa re, specifically for the compatibility to deal with any number of mixed CCDs and in any format within the practical limit. The system has been integrated to test the performance and the result is discussed for readout noise, system linearity and cross-talk between the CCDs. The system developed in this work can be applicable not only for astro nomical observation with a telescope but also in other related fields for low light level detection systems such as spectroscopic application, remote sensing and X-ray detection systems with large sensing areas and high resolution.