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MINIATURISED VISION SYSTEM FOR SPACE EXPLORATION

Abstract

3D PLUS company, in collaboration with CNES french Agency, has developped a miniaturised camera head based on a 4 Mpixel sensor, fully qualified and suitable for different space applications. This sensor is currently used on Perseverance Rover, in the frame of DART mission, for LUNA RESURS moon exploration, as well as on satellites for earth observations. Recently, 3D PLUS launched the development of the future generation of this camera head, based on a 12 Mpixel sensor, with superior performances both optically and electronically. The purpose is to offer an off-the-shelf, rad-tolerant high performance camera for the world space industry, with applications as diverse as planetary science, earth observation, platform monitoring, etc. Collaboration with european partners to offer different optics is also ongoing, as well as launch of a new development based on a SWIR sensor. In the frame of this development, particular attention has been paid to ensure a good radiation tolerance while maintaining great overall performances of the Camera in order to widen the range of applications covered by 3D PLUS Space Cameras. This microcamera has been designed based on 3D PLUS technology and includes 4 stacked electronics levels in order to obtain a 3D cube with a reduced volume of 50x50x30 mm3. The top level contains a 4096x3000 pixels global shutter CMOS image sensor, able to provide up to 70 full resolution frames per second. It also provides an innovative mechanical/thermal interface developed from the 4Mpixel camera head, allowing easy integration in the system and efficient thermal regulation of the sensor. The microcamera architecture is designed around a high performance 500K logic cells FPGA and its processing and storage memories (8 Gb DDR3 SDRAM and 48 Gb synchronous NAND Flash) allowing control of the sensor and interfacing of the microcamera, as well as integrated image processing such as compression, binning, or specific algorithms depending on the application. All voltages needed by the camera internal components are internaly generated using only one 5V input power supply. The bottom level of the microcamera provides a PGA array where a flex can be connected to insure the link to the system and able to cover a wide range of connections, such as SpaceWire and CameraLink.

Engineering models are expected for the Summer 2021, and Flight models beginning of 2022.