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STUDY ON SENSOR 3D ON DIGITIZATION

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Abstract: Aiming to close the sensing and modelling loop in 3-D digitization. At its core this approach uses a recursive least square method, the kalman filter, to dynamically reconstruct the B-spline surface as the surface data are acquired. That is the acquired data are energetically incorporated into the surface model is then used to dynamically guide further data acquisition. It this enable a closed loop shape sensing and modelling methodology for 3-D digitization. This sensor 3-D digitization enables dynamic parameterization of data points. Dynamic determination of next optimal sensing location, and low difference based efficient sensing and reconstruction.

Keywords: Colour 3d Imaging, Laser Sensors ,Cmos Process, VLSI Integration

I.INTRODUCTION

Digital 3D imaging can benefit from advances in VLSI technology in order to speed its deployment in many fields like visual communication and industrial automation. The NRC and IRST groups are collaborating on a project that is targeted. The integration of key sensors. These sensors include the synchronization photodiodes based on integrated bi-cells and the laser spot position extent sensors.These sensors could become an integral part of future intelligent digitizers that will be capable of measuring precisely and concurrentlycolor (reflectance) and 3D. This, in turns, willhasten the development of hand-held 3D cameras and, multi-resolution random access laser scanners for fast pursuit and tracking of 3D features All these digitizers will require a thorough **VLSI integration** of basic laser camera functionsto achieve size and cost reduction and most importantly, higher performance.

II.COLOUR 3D IMAGING TECHNOLOGY MACHINE VISION:

Machine vision involves the scrutiny of the properties of the luminous flux reflected or radiated by objects. To recoverthe geometrical structures of these objects, either to recognise or to measure their dimension, two basic vision approaches are available. The first strategy, known as passive vision, attempts to analyse the structure of the scene under ambient light. In contrast, the second, known as active vision attempts to reduce the unimportance of scene analysis by structuring the way in which images are formed. By keeping the properties of invariance in rotation and translation of 3D objects, sensors that start on active vision can resolve most of the doubtsstart with 2-D imaging systems. Moreover, with laserbased approaches, the 3D information becomes relatively uninformed to background illumination and surface quality. Completeimages of visible surfaces that are rather featureless to the human eye or a video camera can be generated. Thus, the task of processing the 3D data is greatly simplified. Lidar-based or triangulation-based laser range cameras are examples ofvision systems built around such strategy.Active triangulation is used in applications as diverse as reverse engineering,wood measurement, 3D documentation of cultural heritage sites,assessment of printed circuit boards, and automatic robot welding. Two digital 3D imaging systems were developed and validated at the National Research Council of Canada (NRC). They are the auto-synchronized principle and the BIRIS system.These range cameras provide numberedrange and intensity data for visible surfaces (either monochrome or color). Describes the optical geometry of a range based on triangulation along with some of its position sensors. A 3D surface map is captured by scanning a laser spotonto a scene, collecting the reflected laser light from a different advantage point (triangulation), and finally focusing the beam onto a position detector. A similar geometry can be based upon the projection of a laser line instead of a single laser spot.

III.LASER SENSORS FOR 3D IMAGING

It is within the scope of this project that associate between the two groups was
spectroscopic instruments or wavelength division in telecommunication systems.The result of this work has provided unique sensors that will allow 3D digital imaging technology to face the challenge posed by the many emerging markets. This research and development work will also contribute to the advancement of knowledge in 3D digital imaging.The following sensors are targeted for integration into VLSI:

- ✓ ***Synchronization circuit based upon dual photocells (bi-cell)***
  This sensor ensures the stability and the repeatability of range measurements in environment with varying temperature. Discrete implementations of the so-called organization circuits have posed many problems in the past. A monolithic version of an improved circuit (smart) has been built to relieve those problems
- ✓ ***Smart 3D position sensors***
  Integration of most low level processing steps on a chip using advances in VLSI will allow digital 3D imaging technology to become widely accepted and accessible to research, industries, hobbyists, and, also to the home. Currently, commercial photodiode arrays used in 3D vision sensors are intended for 2D imaging applicationschange according to the evolution of their respective fields and not to digital 3D imaging. For

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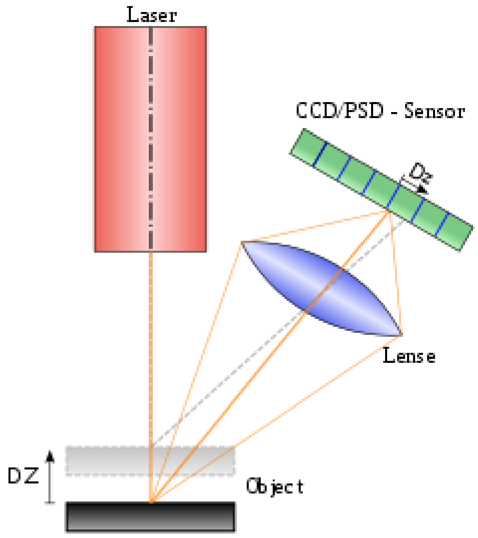
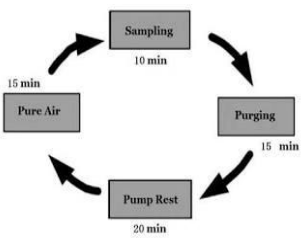
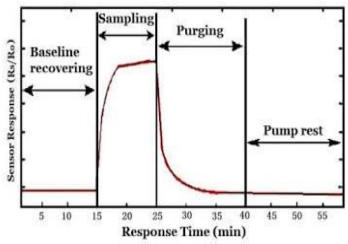
instance,spot noise dictates a large pixel size that is not compatible with current 2D imaging developments (where pixels are getting smaller).



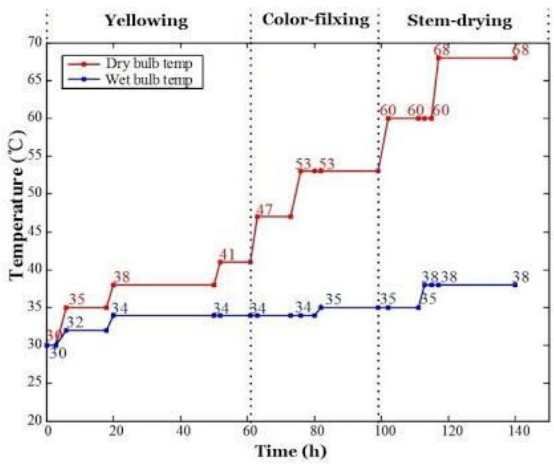
IV.PROPOSED SENSOR

Many devices have been built or considered in the past for measuring the position of a light beam. Among those, onefinds continuous response position sensitive detectors (CRPSD) and discrete response position sensitive detectors (DRPSD). The category CRPSD includes sideways effect photodiode and geometrically shaped photo-diodes.DRPSD on the other hand comprise detectors such as Charge Coupled Devices (CCD) and arrays (1-D or 2-D) of photodiodes equipped with a multiplexer for sequential reading.



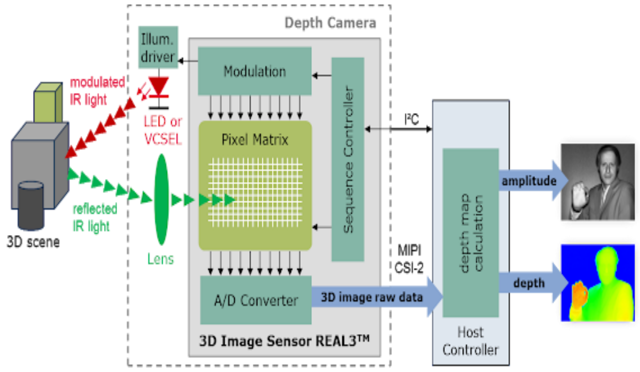


One cannot achieve high measurement speed like found with continuous response position sensitive detectors and keep the same accuracy as with disconnected response position sensitive detectors. We report two basic types of devices that have been proposed in the works. A CRPSD provides the centroid of the light circulation with a very fast response time (in the order of 10Mhz) .On the other hand,DRPSD are slower because all the photo-detectors have to be read sequentially prior to thedimension of the location of the real highest of the light distribution. People try to cope with the detector that they have chosen. In other words, they pick a detector for a particular application and accept the concessionsessential in their choice of a position sensor. The elimination of all lost light in an optical system requires refined techniques that increase the cost of a system. Also, in some applications, background radiance cannot be completely disregarded even with optical light filters. We propose to use the best of both worlds.



V.IMPLEMENTATION AND EXPERIMENTAL RESULTS

We present here the architecture and primary experimental results of a first prototype chip of a DRPSD with selectable readout window. The prototype chip consists of an array of 32 pixels with related readout channels and has been spending a 0.8□m commercial CMOS process. The sensor construction is typical for linear array optical sensors. The applied consist in a variable advantage of the readout channels and a selectable readout window of 16 attached pixels. Both features are necessary to comply with the requirements of 3D single spot vision systems, i.e.a linear dynamic range of at least 12 bits and a fastreadout. Of course, in the prototype, many of the signals which, in the final system are supposed to be generated by the CRPSDs, are now generated by means of external circuitry. As stated above the photosensor array contains 32 pixels with a pitch of 50□ m, each pixel having a sensitive area of 48 x 500 □ m2The large dimensions of the pixel are, required, on one side to cope with spot noise and, on the other side, to facilitate system alignment. Each pixel is provided with its own readout channel for parallel reading. The channel contains acharge amplifier (CA) and a paired sampling circuit (CDS). To span 12 bits of dynamic range, the integratingcapacitor of the CA can assume five different values (CAP). In the prototype chip the properassimilating capacitor value is externally selected by means of the switches C0-C4. In the final sensor, however, the proper capacitance value will be automatically set by an on chip circuitry, on the basis of the total light force as calculated by the CRPSDs. During normal operation all 32 pixels are first reset at their bias value and then left to integrate the light for a period of 12□s. Within this time the CRPSDs and an external processing unit are supposed to estimate both the spot position and its total forceand to feed those limits to the window selection logic, logic a, and to the gain selection logic, logic b, After that, 16 contiguous pixels, as addressed by the window selection logic, are read out in 52□ s, for a total frame rate of 64□s.The window selection logic, logic a, receives the address of the central pixel of the 16 pixel and calculates the address of the starting and ending pixel. The analog value at the output of the each CA within the addressed window is sequentiallyput on the bit line by a decoding logic, DECODER, and read by the video amplifier. Logic a, generates also management andend-of-frame signals which are used from the external processing units.



VI.CONCLUSION

The results obtained so far have shown that optical sensors have reached a high level of development and constancy thatare suited for high accuracy 3D vision systems. The availability of standard skills and the integratedknow-how in the design techniques, allow the operation of optical sensors that are application specific: Opto-ASICs.The trend shows that the use of the low cost CMOS technology leads competitive optical sensors. Furthermore postprocessingmodules, as for example anti reflecting coating film deposition and RGB filter testimony to enhance understandingand for colour sensing, are at the final certification stage and will soon be available in expected skill technologies.

VII.REFERENCES

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