DOWNLOAD PDF MOEMS DISPLAY AND IMAGING SYSTEMS

Chapter 1 : Design and Simulation of Electromagnetic Two-Dimensional MOEMS Scanning Mirror

Chapter 8 DISPLAY AND IMAGING SYSTEMS Hakan Urey, David L. Dickensheets Introduction MOEMS technology combining MEMS and micro-optics is well suited for mani-.

These combine electronics with mechanical and optical components. Examples include digital light-projection devices and minispectrometers, with applications such as projection systems, 3D printers, and instrumentation. MOEMS promise better systems and solutions, but there is a need for further improvement and innovation to address integration and cost. It is almost five percent CAGR [compound annual growth rate] in value. Today, micromirror devices hold a commanding position in such applications as cinema. Future growth prospects for this and other types of MOEMS lie elsewhere, including automotive applications, and also with ultrashort throw laser TV or mobile TV , where a small, portable projector is used to create a large viewing screen on a nearby surface. Wafer-level packaging A big challenge for MOEMS is lowering the cost of packaging and integration, Mounier said, as is the case with other optical systems. MOEMS devices, such as the one shown here, are fabricated in a cleanroom. The smaller the pixel size, the smaller the form factor for a given pixel count, and the faster the device micromirrors can be switched from on to off, or vice versa. The micromirrors themselves are aluminum-based, which means they offer optical capabilities across a broad spectrum. Micromirror-based optical systems are beginning to be used in automotive applications, such as smart adaptive lighting left , that change lighting based on the situation and for head-up displays right. Courtesy of Texas Instruments. The desired pattern of connecting traces on a board are loaded into a lithography system and translated into an array of mirrors, on or off. This is then projected onto the photopolymer on the board and eventually through processing, into the final metallic traces. A key advantage of this approach is that it eliminates the need for masks. Thus, changes to the circuit board layout can be done on the fly, and smaller or more customized board runs become more economical. UV, visible, and IR are also being used in high-volume 3D printing. The ability to get the right wavelength needed to photoactivate or sinter a material is important for this application. The spectral range possible with a given device is a function primarily of the window that sits above the mirror and lets the photons in, Mignardi said. By changing the antireflective and other coatings on the window, TI sets the spectral response of the device to different bands in the UV, visible, and IR. The lower end is about nm; the upper end is roughly nm. The cost of the finished product breaks down to the device, package, and testing, Mignardi said. For packaging, TI is using a wafer-level approach â€” an entire wafer, which may contain many hundreds of devices, is packaged in one operation. TI is just starting to get into the automotive market, where MOEMS devices can be used for a head-up display so that drivers can get information and directions without having to take their eyes off the road. The technology can also be used for smart adaptive headlights, where the beam is directed as needed. This may mean that it is aimed away from oncoming cars, allowing bright headlights to be used without fear of blinding other drivers. The technology has other uses, too. As TVs swell to 70 in. Our interactivity solution enables a wide range of possible input, from classic touch to gesture control. Courtesy of Bosch Sensortec. Potential applications include smart speakers, home applications, and others. The augmented reality uses involve projecting data onto surfaces, objects, or even into the eye. This allows data to be overlaid on top of a scene, thereby presenting the user with information about nearby objects of interest. MOEMS technology could be used to do more than simply generate images and pictures. Three-dimensional sensing, for instance, could be an application that would benefit from the ability to steer light in precise patterns to enable structured illumination. Measuring the distortion of a known light pattern, such as beams that intersect to form squares, can yield 3D information about a surface or object. Machine vision is also a possible application. In response to changing voltages, these waveguides bend and move, redirecting light. Aeponyx is bringing a product based on this approach to market in with a micro-optical switch intended for use in telecom access networks and data center applications. He added that their approach also offers a tenfold reduction in cost and a smaller size for their solution. The technique requires the use of stress compensation and management in the MOEMS structures, which consist of silicon nitride in a silicon dioxide sandwich sitting atop a silicon-on-insulator wafer. The arrangement leads

to stress in the films â€” this must be accounted for. The deflection of the ribbons is electrostatically controlled, making the product a programmable diffraction grating or what the company calls a grating light valve. Light, typically a laser beam, can be attenuated, modulated, and switched as desired. A grating light valve, which is a spatial light modulator, in an optical engine. The device can modulate, attenuate, and switch light. Courtesy of Silicon Light Machines. It could be used for materials processing, for example, to mark parts with an identifying pattern or designation. Research and development is also underway â€” one goal is a power capability of up to 10 kW.

Chapter 2 : Microscanner - Wikipedia

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The deflection movement is either resonant or quasi-static. Many applications requires that a surface is addressed instead of only a single line. For double resonant operation, which results in sinusoidal scan motion, a Lissajous pattern is written. For high end display applications the common choice is raster scanning , where a resonant scanner for the longer display dimension is paired with quasi-static scanner for the shorter dimension. In practice, the relevant principles for driving such a mirror are the electromagnetic , electrostatic , thermo-electric and piezo-electric effects. Specifically, the mechanical solutions required for resonant and quasi-static scanning, respectively, are very different from each other. Thermo-electric actuators are not applicable for high frequency resonant scanners, but the other three principles can be applied to the full spectrum of applications. For resonant scanners one often employed configuration is the indirect drive. In an indirect drive a small motion in a larger mass is coupled to a large motion in a smaller mass the mirror through mechanical amplification at a favorable mode shape. This is in contrast to the more common direct drive, where the actuator mechanism moves the mirror directly. Indirect drives have been implemented for electromagnetic , [6] electrostatic , [7] as well as piezo-electric actuators. In contrast to an electromagnetic drive, the resulting drive force between the drive structures cannot be reversed in polarity. For the realization of quasi-static components with positive and negative effective direction, two drives with positive and negative polarity are required. Nevertheless, the highly non-linear drive characteristics in some parts of the deflection area can be hindering for controlling the mirror properly. For that reason many highly developed microscanners today utilize a resonant mode of operation, where an Eigenmode is activated. Resonant operation is most energy efficient. For beam positioning and applications which are to be static-actuated or linearized-scanned, quasi-static drives are required and therefore of great interest. Magnetic actuators offer very good linearity of the tilt angle versus the applied signal amplitude, both in static and dynamic operation. The working principle is that a metallic coil is placed on the moving MEMS mirror itself and as the mirror is placed in a magnetic field, the alternative current flowing in the coil generate Lorentz force that tilts the mirror. Another characteristics of the magnetically actuated MEMS mirror is the fact the low voltage is required below 5V making this actuation compatible with standard CMOS voltage. An advantage of such actuation type is that MEMS behavior does not present hysteresis, as opposed to electrostatic actuated MEMS mirrors, that make it very simple to control. Power consumption of magnetically actuated MEMS mirror can be as low as 0. The actuator has to be thermally well insulated from the environment, as well as being pre-heated in order to prevent thermal drift due to environmental influences. That is why the necessary heat output and power consumption for a thermal bimorph actuator is relatively high. One further disadvantage is the comparably low displacement which needs to be leveraged to reach usable mechanical deflections. Also thermal actuators are not suitable for high frequency operation due to significant low pass behaviour. Piezo-electrical drives produce high force, but as with electro-thermal actuators the stroke length is short. Piezo-electrical drives are, however, less susceptible to thermal environmental influences and can also transmit high-frequency drive signals well. To achieve the desired angle some mechanism utilizing mechanical amplification will be required for most applications. This has proven to be difficult for quasi-static scanners, although there are promising approaches in the literature using long meandering flexures for deflection amplification. Applications for tilting microscanners are numerous and include:

Chapter 3 : CiteSeerX â€" Citation Query Application of MOEMS Display and Imaging

*Moems Display and Imaging Systems (Proceedings of Spie) [Hakan Urey] on calendrierdelascience.com *FREE* shipping on qualifying offers.*

The flow field in three-dimensional hermetic chamber of sensitive element of airflow level posture sensor is calculated, FEM analysis has been obtained. The numerical results show that under the buoyancy lift affecting, the direction of nature convection gas always keeps the vertical upward in two-dimensional enclosure, nature convection gas has the pendulum characteristic, and when the dimensional enclosure is inclined, temperature distribution at the several points in dimensional enclosure will change with the tilt angle. The pendulum characteristic can be utilized to measure the level posture by the airflow level posture sensor. This paper presents a novel precision three-dimensional platform based on vertical scanning that has practical application in surface topography measurement. The three-dimensional precision platform is composed of a two-dimensional platform with metrology system and a vertical scanning platform. When the work piece is measured, the closed loop control system controls the two-dimensional platform. Meanwhile, the Z direction servo motor and the piezoelectric actuator drive the vertical scanning platform to move vertically to realize the fine displacement. The diffraction grating displacement sensor detects the vertical relative displacement of the vertical scanning platform. In this paper, seismic behaviors of the frame-shear wall structure, which are composed of the concrete filled steel tubular CFST column, have been studied. Dynamic behaviors and earthquake responses of the CFST under rare earthquake are analyzed. Comparing the calculation results, the earthquake resistant behavior of the CFST structure has been appraised synthetically, which may be referential for structural design. In this paper, a miniature, low cost, high reliability, easy installation and maintenance communication power supply that based on electromagnetic coupling has been designed, it also can provide a lasting and stable power output. A three-dimensional coil was used as the receiving coil, optimization results show that load power is It achieves the objective of the miniature and low-cost. Optical coherence tomography is a non-invasive cross-sectional imaging technology for inhomogeneous samples. Spectral-domain optical coherence tomography is introduced to measure film and Silicon dovetail groove in this paper. A novel method is used to deal with the interference spectrum to improve the quality of the two-dimensional cross-sectional image. The experimental result shows the microstructure of the two samples can be clearly seen as expected. From the visualized two-dimensional cross-sectional imaging, the film thickness and the dimension of the Silicon dovetail groove are obtained with this technique. It is experimentally demonstrated that this system is useful for imaging the microstructure of the internal and surface of film and semiconductor. It can be further developed for other material detection in industrial fields.

Chapter 4 : MOEMS: Micro-opto-electro-mechanical Systems - M. Edward Motamedi - Google Books

Significant progresses have been made in MOEMS for display, imaging, telecommunication, and bioinstrumentation applications. This talk will first provide an overview of th e recent advances in micromir ror technologies.

Chapter 5 : CiteSeerX â€" Novel Applications of MOEMS Display and Imaging

MOEMS Display and Imaging Systems II. Edited by Urey, Hakan; Dickensheets, David L.. Proceedings of the SPIE, Volume , pp. (). (SPIE Homepage).

Chapter 6 : Table of contents for Micro-opto-electro-mechanical systems (MOEMS)

MOEMS Display and Imaging Systems III. Edited by Urey, Hakan; Dickensheets, David L.. Proceedings of the SPIE, Volume , pp. (). (SPIE Homepage).

Chapter 7 : For Small MOEMS, Big Opportunities Lie Ahead | Features | Jun | Photonics Spectra

The combination of micro-optics and MEMS, referred to as micro-opto-electromechanical systems (MOEMS), makes a new opportunity for innovation in the EAP field. There is a lot of pioneering work on optical beam deflection by electromechanically driven digital micromirrors.