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### Creating a Virtual Touch Screen Using MEMS and Flex Sensors: A Survey

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#### Abstract

The objective of this project is to create an interactive virtual touch screen. The technologies used here are micro-electromechanical- systems (MEMS), Flex sensors, Zigbee network protocol. MEM is the technology of very small devices which merges at the Nano-scale into Nano electromechanical systems (NEMS) and nanotechnology. An accelerometer is used to measure the movement of the hand. Accelerometer is an instrument for measuring acceleration, detecting and measuring vibrations, or for measuring acceleration due to gravity (inclination). They can also be used to measure seismic activity, inclination, machine vibration, dynamic distance and speed with or without the influence of gravity. This is controlled by means of microcontroller. The device is placed in our hands, so that by moving our hand we can control the mouse pointer and clicking options also. This movement control is given to the device or the system in which the applications are to be used. This is done in wireless by means of Zigbee protocol. This protocol device provides various features as the communication distance for Indoor/Urban: up to 133' (40 m), at Outdoor line-of-sight: up to 400' (120 m). This has Transmit Power of 2 mW (+3 dB) and its Receiver Sensitivity is about -95 dBm RF and the transmitting and receiving Data Rate is 250,000 bps

**Keywords:** Measuring Acceleration, mouse pointer and clicking options, wireless communication, interactive virtual touch screen

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#### Introduction

MEMS has been identified as one of the most promising technologies for the 21st Century and has the potential to revolutionize both industrial and consumer products by combining Silicon-based microelectronics with micromachining technology. Its techniques and micro system based devices have the potential to dramatically affect of all of our lives and the way we live. Micro sensors and micro actuators are at the very core of a MEMS device or system. A micro sensor detects changes in the system's environment; an 'intelligent' part processes the information detected by the sensor and makes a decision in the form of a signal; and a microactuator acts on this signal to create some form of changes in the environment. Sensors and actuators are broadly termed transducers and are essentially devices that convert one form of energy into another. Many of the MEMS sensors and actuators described have been developed within the microelectronics industry and do not all involve any special micromachining techniques; they are based on conventional integrated circuits that, through inherent mechanisms, sense light, temperature etc.

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However, many of these can be enhanced by the use of MEMS. Basic MEMS mechanisms and structures consist of both in-plane and out-of-plane mechanisms as well as structural members to couple energy between the actuator and sensors as well as with the physical interface of a mechanical system. Mechanisms such as joints, linkages, gears and hinges are very typical.

#### Related works

P. Selvam viswanathan, David lashmet and jari Honkanen [1] demonstrates, single mirror laser pico projectors are enablers of creating a virtual touch screen in an unrestricted manner. Using of simple retro touch we can reflect back to the projector. We take advantages of the mems based scanning single mirror laser pico projector, to enable a virtual touch screen. Combination of pico projection and retro touch we can do any remote control operations in any applications.

Richard Stevenson[2] describes, If we want to display pictures in anywhere, we increasingly having

the options of buying a mobile phone with a pico projector. The quality display will improve by projector lasers. Researches of osram opto semiconductors and Japanese opto electronics giant are claiming to have met the power and color requirements with a single laser chip. the modulation of a display image will be done by the laser modulation. Osram invents pico projector with 516 nanometer green laser. Latest development of pico projector is semipolar and non-polar laser with best results include 525nm devices. However is that completion of pico projectors manufactures are produce a quality projectors.

Ikogami and keiichi[3] shows, The existed pico projectors having the the scan ranges were +12 at 25khz for the horizontal resonance and 60 hz for the the vertical non resonance and power consumption was 100mw or less. Scanned laser pico projectors have an infinite focus that can be projected on to surface and remain in focus. The scanner laser type picco- projectors was developed for demonstrations.

Xiaming zhu[4] describes, micro machined corner cubes[CCRs] can be used as transmitters in free space optical communication links. micromachined CCRs can be two methods to predict the optical performance of CCRs having ideal or non ideal mirrors. Those two methods are based on the ray tracing and scalar diffraction theory. First method and second method is phase shift model under the assumptions that satisfies the misalignment and surface non flatness are small and they do not alter the topology of CCR.

Lixa zhou [5] describes sub millimeter-sized quad corner-cube retro reflectors[CCRs] for free space optical communication provides corner cube reflectors which is used for optical communication application. The modulated CCRs presented have performance substantially better than any presented largely due to accurate alignment.

Khan Aksit, Osman Eldes, Selvan Viswanathan, Mark O Freeman, and Haken Urey [6] demonstrates, A innovative glasses-type stereoscopic pico projector based projection display with an energetic polarization rotator. The prototype operates on source 3D content with a display refresh rate value of 60Hz without any obvious sparkle effect. It was also demonstrates that there are several usable surfaces such a micro lens array screens, silver screens and even duct tape or the surface of a tablet computer. In other word, with a little creativity, one can discover.

David Rozado [7] describes, Gaze pursuing has been optional as an another to outdated computer pointing mechanisms. Using gaze as a widespread pointing mechanism, this study examines the usage of gaze to complement traditional keyboard/mouse cursor positioning methods during standard human-computer interaction (HCI). The results of the user study passed out here on the effects of cursor warping in common computer input operations that involve cursor repositioning when using one or several monitors as well as on its learning dynamics over time display that cursor warping can speed up and/or decrease the physical effort essential to complete tasks such as mouse/track pad target acquisition, keyboard text cursor positioning, mouse/keyboard based text selection, and drag and drop operations. combining the gaze tracking, software logic, and obvious user input can create a truly gaze attentive interface that reacts and adapts dynamically to our gaze during manual input tasks to decrease the effort and time required to complete repetitive manual tasks such as target acquisition, text selection, text cursor positioning, and drag and drop operations. Moreover research will be required to continue discovering how monitoring computer users gaze can further enrich and simplify the HCI experience by designing gaze attentive interfaces that react and accommodate to the behavior, goals, and rational state of the user interacting with them.

Changping Luo and K. W. Goossen [8] shows laboratory demonstration of a free space optical retro communication link exhausting a laser at a wave length of 1.064 m. Formerly exposed that the small etchant hole in the casing effects a slower data rate, which can be fixed by operating the device in a rough vacuum. Placing the array in front of a CCR, we demonstrated an optical link for free-space retro communication with an Nd :YVO laser of 1.064 m. A 40% modulation of reflectance has been succeeded for a data rate of 2.5 kb/s in atmosphere with a laser beam of 1.5 mm in diameter at 30-V peak-to-peak bias. This slow reaction is credited to the small etch hole, which limits the air flow through it. With shutting the device in a 50-mtorr vacuum, a data rate of 100 kb/s is anticipated to be accessible.

D. Pedersen and O. Solgaard, [9] demonstrates an optical link for free-space retro communication based on an optical micro electromechanical system array with a assembly of mechanically energetic antireflection switch using a thin Si<sub>3</sub>N<sub>4</sub> film. The array contains of 215 matching single devices with a

total active area of 36 mm<sup>2</sup> and was invented with the usual surface sacrificial micromachining. A congested reflectance contrast of 3 dB was detected at 6328 Å and a data rate of 100 kb/s exposed in 50 mtorr vacuum.

Utku Baran, Dean Brown, Sven Holmstrom, Davide Balma, Wyatt O. Davis, Paul Muralt and Hakan Urey[10] shows, A resonant piezoelectric scanner is established for high-resolution laser-scanning displays. A novel actuation scheme combines the principle of mechanical amplification with lead zirconate titanate (PZT) thin-film actuation. Interferometry measurements show that the dynamic deformation is at acceptable levels for a large fraction of the mirror and can be improved further for diffraction-limited performance at full resolution. A design variation with a segmented electrode pair illustrated that reliable angle sensing can be achieved with PZT for closed-loop control of the scanner. The presented scanner's performance meets the frequency requirements and with further work will be able to meet all the requirements of full HD resolution picoprojectors working at ambient conditions. Vacuum packaging always comes with a considerable cost and is very desirable to avoid. This record performance can be attributed to ingenuity in the mechanical design, as well as expertise in the PZT and the MEMS process.

### Result and discussion

The modulated CCRs presented here have performance substantially better than any previously presented, largely due to the accurate alignment. Micro machined CCRs can be used to transmit data in free space optical communication systems. Two methods to predict the optical performance of CCRs having ideal or non-ideal mirrors. Touchscreen is created by the MEMS Single mirror Projector and Pico Projectors has emerged that allows sharing of this content in a larger format than the integrated liquid crystal panel display.

### Conclusion

The proposed idea will provide an interactive virtual environment which reduces the other condition and impossibilities. The proposed system based on the microcontroller is found to be more compact, user friendly and less complex, which can readily be used in order to perform. Several tedious and repetitive tasks. Though it is designed keeping in mind about the need for industry, it can be extended for other purposes such as commercial & research applications.

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