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INDUSTRIAL DEVICE CONTROL USING HOLOGRAM TECHNOLOGY

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Abstract

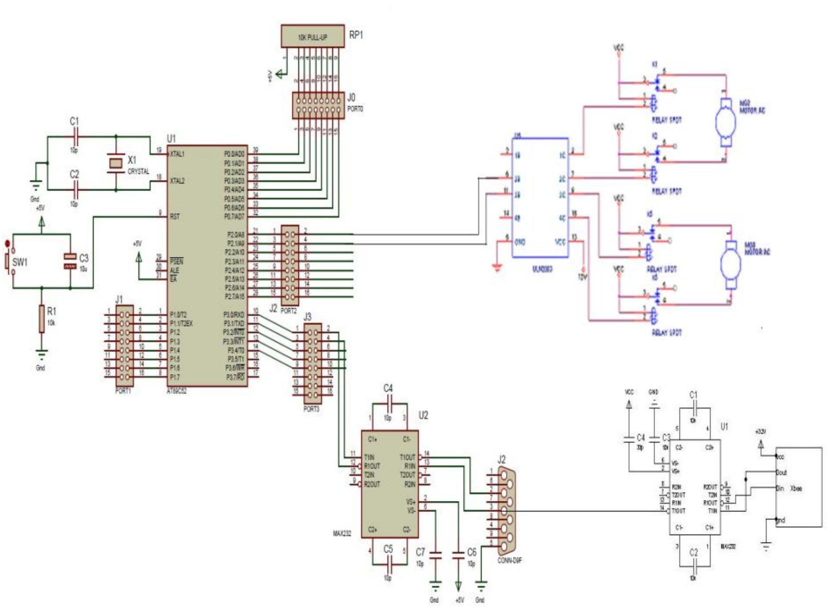
Hologram is a physical structure that diffracts light into image and the hologram refers both encoded material and resulting image. A holographic image can be seen by looking into an illuminated holographic print or by shining a laser through a hologram and projecting the image onto a screen. Holography is the science and practice of making holograms. Typically, a hologram is a photographic recording of a light field, rather than of an image formed by a lens, and it is used to display one dimensional image of the holograph subject, which is seen without the aid of special glasses or other intermediate optics. Dynamic vision sensor (DVS) detects temporal contrast of brightness and has the fastest response time compared to conventional frame-based sensors which detect static brightness per every frame. In this paper, a design of proximity sensing utilizing DVS is proposed. It can estimate the distance from DVS to an object by analyzing the spatial information of the reflection of additional light source. It also uses a pattern recognition based on time domain analysis of the reflection during turning on of the light source to avoid wrong proximity detection by noises such as other light sources and motions.

Keywords: DVS, Holographic Image, Hologram

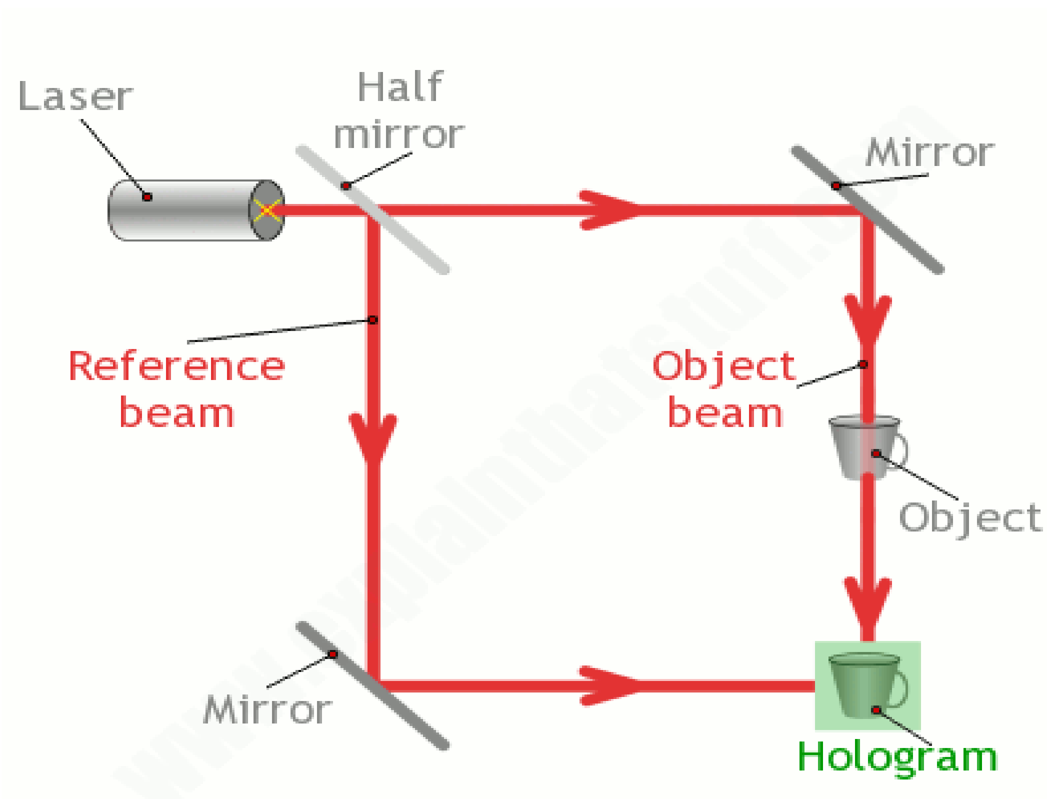
INTRODUCTION

The mobile phone has evolved from an electrical device which had only a purpose of communication to an essential device with an important role to manage all of our daily needs. Especially, market share of Smartphone that are mobile phones with computing functions has increased over the world because of its various properties such as communication, internet media, mass media, video camera and etc. In addition many sensors are being used in the mobile phones to provide more useful features such as motion recognition. Dynamic Vision Sensor (DVS) which mimics human optic nerve has been researched as a power efficient and fast responding sensor by Lichtsteineretal. It detects only the changes of brightness, and has the fastest response speed among image sensors so far. Its fast response time enables DVS to be used in various applications such as motion recognition. Meanwhile, a proximity sensor is also equipped to avoid wrong operations by unintended contacts with skin while calling in a touch screen-based Smart phone. Among various proximity sensors, optical proximity sensor is commonly used. And a research has been proposed to expand its functionality for additional features such as motion recognition. It outputs infrared light for certain periods and measures the absolute amount of the lights coming back by reflection. The proposed proximity sensing design which utilizes time domain analysis is robust to the environmental noises, and can decrease fraction defective in production process.

CIRCUIT DESIGN



HOLOGRAM PROCESS



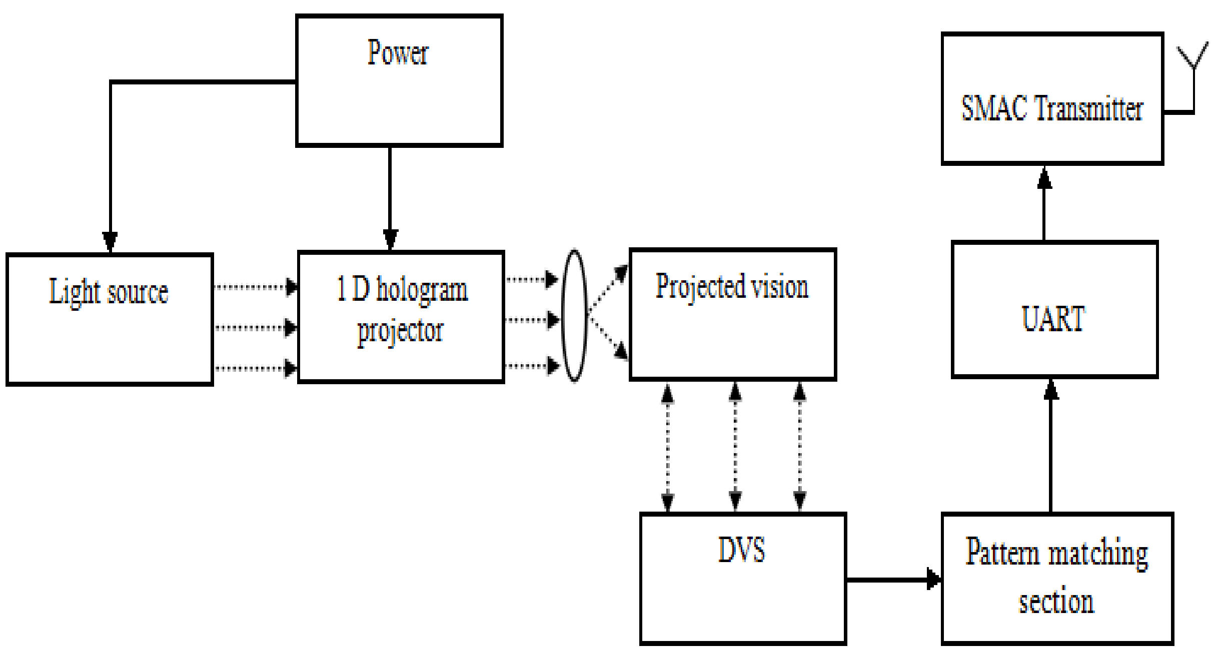
Laser light is much purer than the ordinary light in a torch beam. In a torch beam, all the light waves are random and jumbled up. Light in a torch beam runs along any old how, like schoolchildren racing down a corridor when the bell goes for home time. But in a laser, the light waves are coherent: they all travel precisely in step, like soldiers marching on parade.

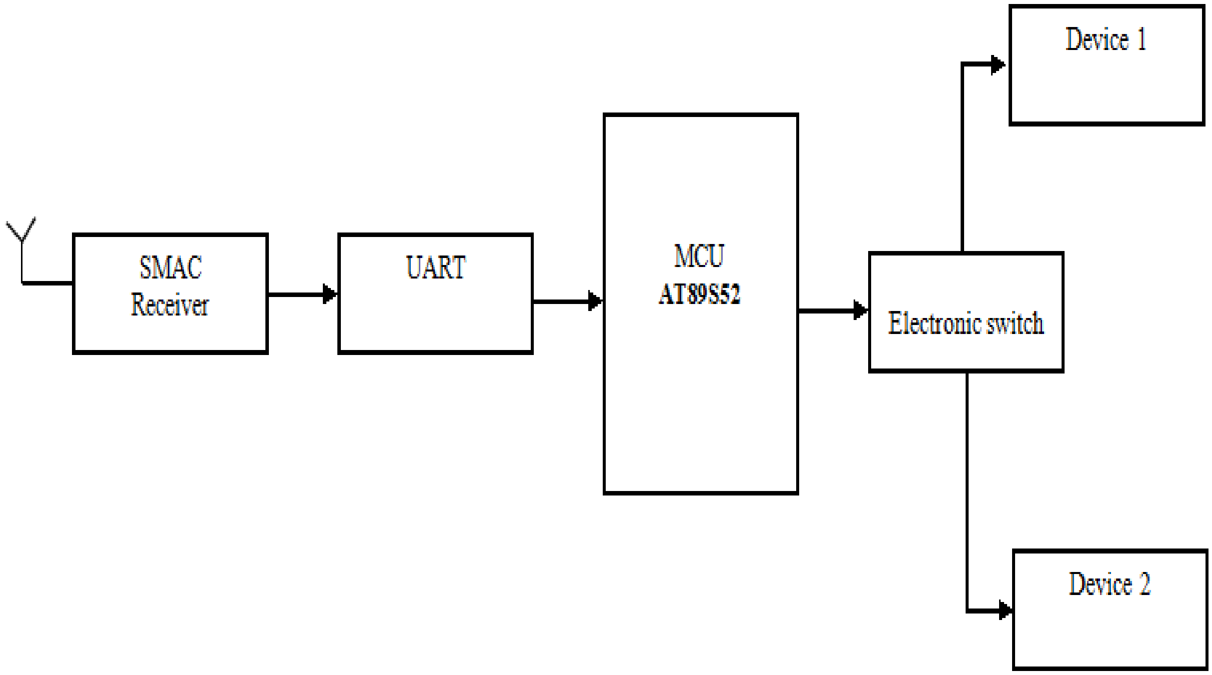
When a laser beam is split up to make a hologram, the light waves in the two parts of the beam are traveling in identical ways. When they recombine in the photographic plate, the object beam has traveled via a slightly different path and its light rays have been disturbed by reflecting off the outer surface of the object. Since the beams were originally joined together and perfectly in step, recombining the beams shows how the light rays in the object beam have been changed compared to the reference beam. In other words, by joining the two beams back together and comparing them, you can see how the object changes light rays falling onto it—and that's simply another way of saying "what the object looks like.

RECEIVING SECTION & MCU UNIT:

Dynamic Vision Sensor is used to sense the reference image with that of the image obtained after giving signal. The sensor compares the reference image and obtained image and gives the output signal to the S-MAC receiver via S-MAC transmitter. The S-MAC receiver passes the signal to the microcontroller unit. The MCU unit is controlled by the crystal oscillator by providing clock pulse. The output signal from MCU unit is given to the relay unit. The input supply of the relay ranges between 5V to 12V. The relay is used here as a protective device. The ON and OFF signal is been monitored by the MCU unit. The output voltage from the relay is 230V which is capable of running the single phase appliances. There are two relays provided to operate two different industrial loads. These two different loads can be either operated separately or together by the controlling mechanism.

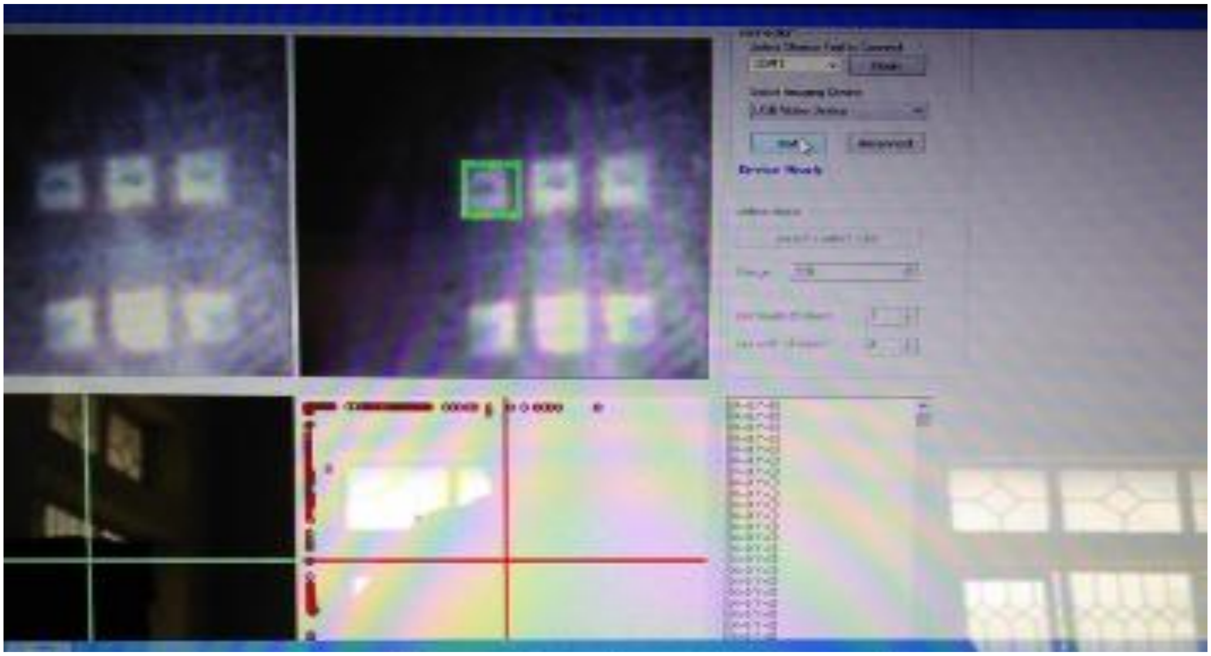
BLOCK DIAGRAM



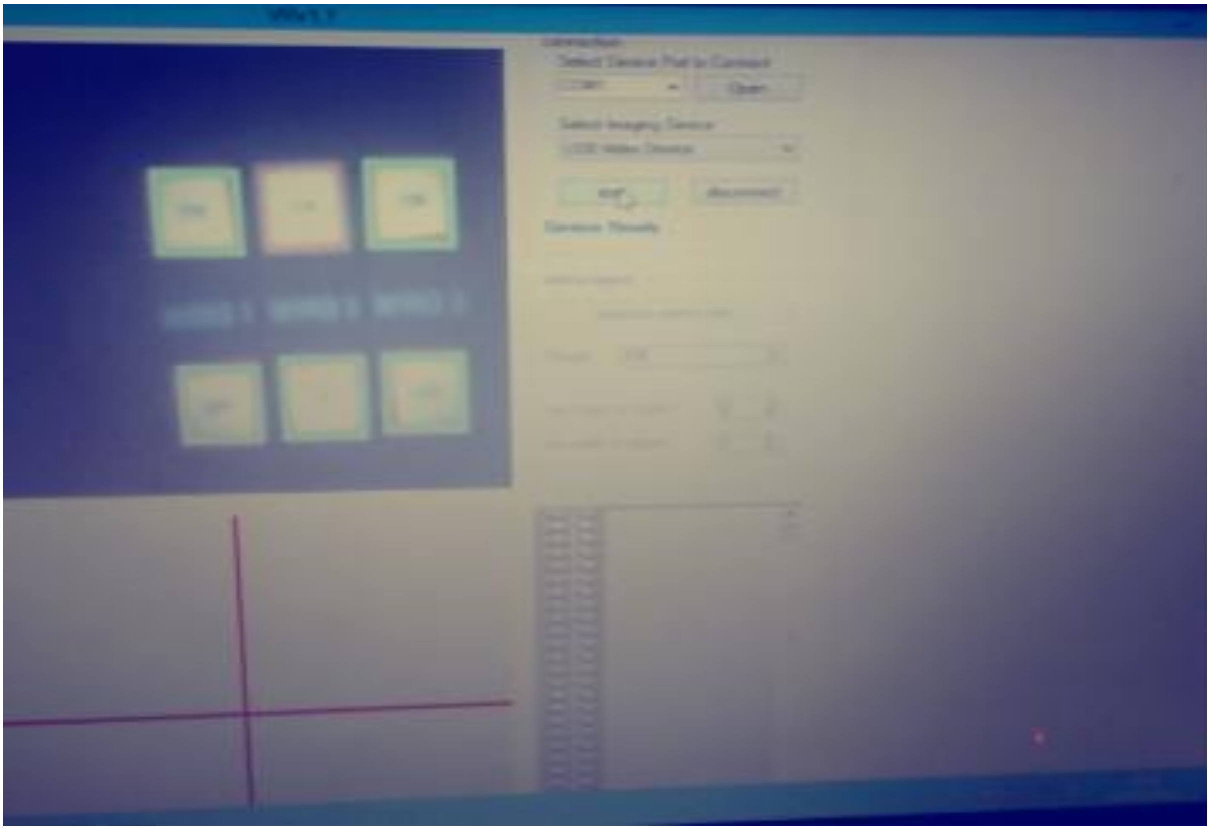


Block diagram

SIMULATION RESULT



Simulation DEVICE 1 ON



HOLOGRAM PATTERN MATCHING

CONCLUSION

In this paper,an industrial device control mechanism is done based on the hologram technology which uses the dynamic vision sensor to sense the new pattern and compares with the reference image(i.e., pattern matching criterion) and gives the obtained output to the microcontroller unit which performs the controlling of devices according to the input commands ON and OFF. The MCU UNIT is then connected to the relay which is a protective device and gives the single phase supply(230V) to the industrial loads. By this method, we can reduce the usage of hardware and thereby increasing the processing efficiency and speed. The replacement of controlling unit is made easy and consumes low power compared to other technologies. Thus, the industrial loads controlling mechanism is achieved.

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