

Novel Design of Mobile Projector with Wireless Flex Sensor Keypad & Photo Sensor Keypad

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ABSTRACT: This paper is aimed to propose a cost effective mobile based projector. Which is mostly applicable for video conferencing, representing seminar and gaming purpose (motion based games using flex sensor). The main frame of the proposed mobile based projector is divided into three parts. First one is lightning part which helps to increase the brightness of the projected screen. Second, is the LCD screen and finally, the combination of lenses. When the high intensity light passes through the LCD panel, the characters of the LCD screen are projected on the projector screen in an enlarged version with the help of the combination of lenses (i.e. three convex lenses and a Fresnel lens). The proposed mobile based projector can be operated in two modes; Motion based and virtual keypad based. Motion based keypad works with the help of flex sensor and the virtual keypad is nothing but the photo sensor based keypad which works with the help of infrared LED transmitter & receiver pair.

INDEX TERMS: mini projectors, mobile, flex sensor, photo sensor, lenses.

INTRODUCTION:

Due to rapid growth of modern communication system, the demands of consumer changes day by day. New technical innovation is required to overcome the challenges faced by designer and scientists to meet the requirement of consumers. The concept of mobile projection is brought about just with an attempt to innovate the concept of projection with the help of cell phones [1][2]. The flex sensor and photo sensor keypad adds to the novelty of the project.

The mobile projector with flex sensor consists of a cabinet section in which a mobile motherboard (Samsung C3322-[3] providing all the functions of the mobile), screen of the mobile, combination of lenses (Fresnel's Lens and Convex Lens) to amplify the screen size, resolution & picture quality[4,5,6] and light sources (silicon led's having 50 watt and 30 watt power with 50 and 30 watt Choke (Led Driver)) for visibility and adjusting the required brightness are present.

Switching board is placed at the top of the cabinet section with two pairs of proximity sensor and 24 push-to-on switches to perform all the functions of the mobile projector without using the flex. Switching Board is used to operate the mobile projector having a Photo Diode Sensor with 2 pairs of LED Transmitter which has the capability to sense the object for the visibility of the switching board for any individual.

For portable operation flex sensor is used through which we can perform only few functions; namely, select, up, down, left and right [7].

The major component of the project is the use of flex sensor which is based on the movement of the body that can change the resistance value according to the bending position of the body. When the sensor is bent, it produce the resistance value correlated to the bending radius, smaller the radius, smaller is the resistance. This sensor uses the graphite powder to accomplish the task with great degree of accuracy [8]. The flex sensor works with the help of transmitter and receiver having digital circuit [9].

The final portion in this project is the keyboard using the photo sensors. As discussed earlier, for portable operation of the projector using flex sensor isn't of complete utility unless we have a portable keyboard because of the limited operations the flex sensor is capable of performing. The supreme reason to include a photo sensor based keyboard is to perform all the tasks of the projector.

Here instead of keys as in normal keyboards we are using photo sensor (i.e. the IR LED photo sensor pair) which can detect and react in the presence of any obstacle (say nail tips) close to the sensor [10]. This sensor is directly connected to the transmitter receiver module. Relays along with relay drivers are directly connected to the infrared transmitter and receiver.

The main concept of this project is portraying towards gaming purpose, video streaming and net surfing which are few of the basic needs of today's era.

MECHANISM:

CABINET SECTION:

This section is designated for the main frame of the projector formation, which consists of the main motherboard, LCD panel and the screen of the handset. This section also consist of two led of 50 & 30 watt to focus the mobile images on projector screen with the help of combination of convex & Fresnel lenses and in the bottom of this cabinet, a 12volt exhaust fan is attached as a heat sink to reduce the heat generated in the cabinet. Use of the lens is to magnify the image [11].



This device consists of transmitter and receiver circuit with encoder IC (HT12E) and decoder IC (HT12D) to encode and decode the respective RF signal with the help of transmitter and receiver module (R434A / A434 respectively).

MECHANISM:

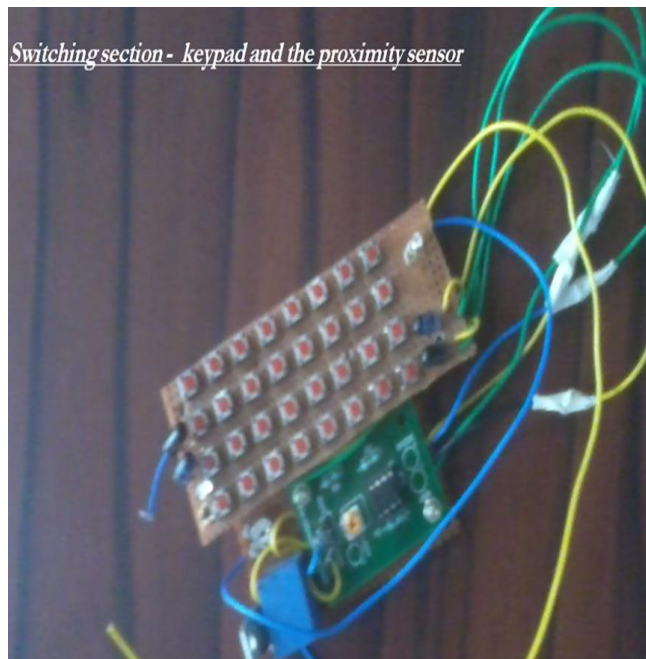
In the transmitter section the flex sensor is directly connected to the data bus of HT12E (Encoder IC). In this case the flex sensor works as a switch. When we bend our finger both the terminal of the flex sensor is sorted and the switch is activated.

At the receiver section the receiver module receives the transmitted signal and activates the corresponding relay (which works as an electrical switch in our project).

Mechanism of the mobile projector

IMMOBILE SWITCHING SECTION:

It is the section where all the operation of the mobile projector is carried out. It consists of several push-to-on switches that operate all the mobile functions and two pairs of proximity sensor that can sense any object in a very short range which helps us to visualize the keypad in dark.

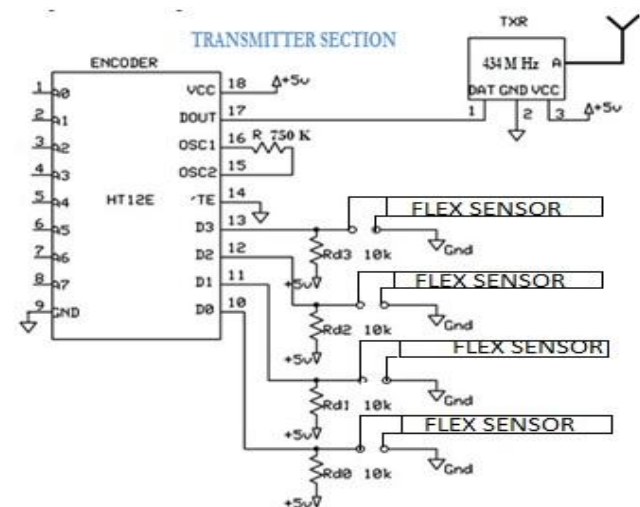


Switching section - keypad and the proximity sensor



Flex sensor based keypad

The schematic diagram for transmitter and receiver section as used for the flex sensor in the portable switching section is shown below.



Immobile key board

PORTABLE SWITCHING SECTION:

In this switching section we are using flex sensor with transmitter and receiver module to operate our projector from some distance (say around 20 meters) by the movement of our fingers.

RECEIVER SECTION

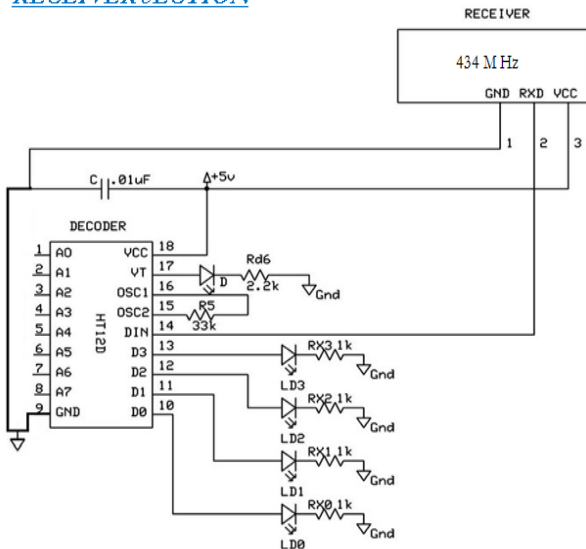


PHOTO SENSOR KEYBOARD:

It is the section where all the key functions of the projector are done through wireless keypad using some sensors, especially designed for operating this mobile projector. This unique designed keypad does not use any type of switches for performing their task in fact it works on the basis of several photo sensors.

WORKING:

It consists of IR LED Transmitter & Receiver pair (photo sensors) for each & every function of the projector. This IR LED pair is commonly used in the field of robotics for making obstacle avoider robotic car and in many other applications.

In the same manner in our project when we place an obstacle (say finger) near the sensor that can sense the impediment and activate the corresponding relays, which are used as a switch in our project. The outputs of the Relays are connected to the input pins of the transmitter circuit. The transmitter transmits the data corresponding to the activated Relay to the receiver section; where the received data activates the corresponding function of the projector.

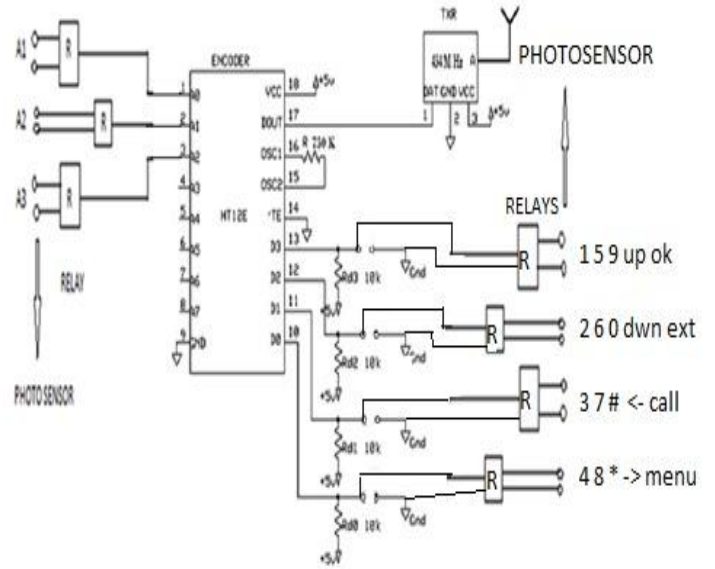


Photo sensor based keyboard

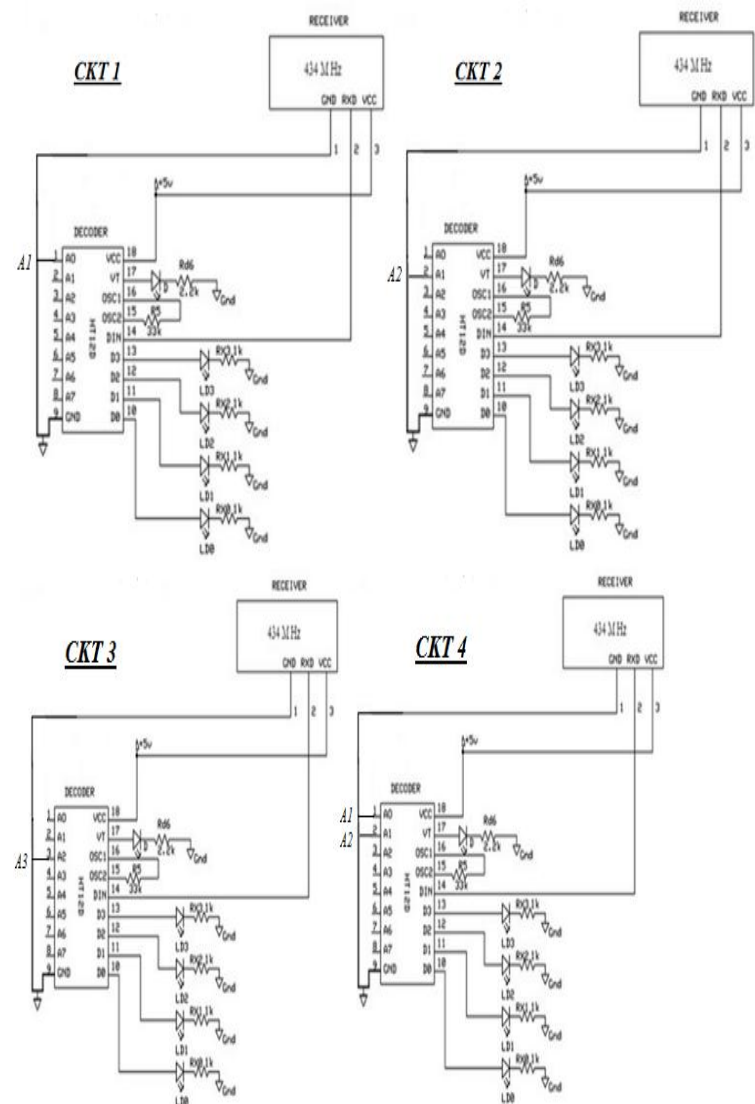
The transmitter and receiver portion of this section is in correspondence to that in the portable switching section but with some minimal changes in it.

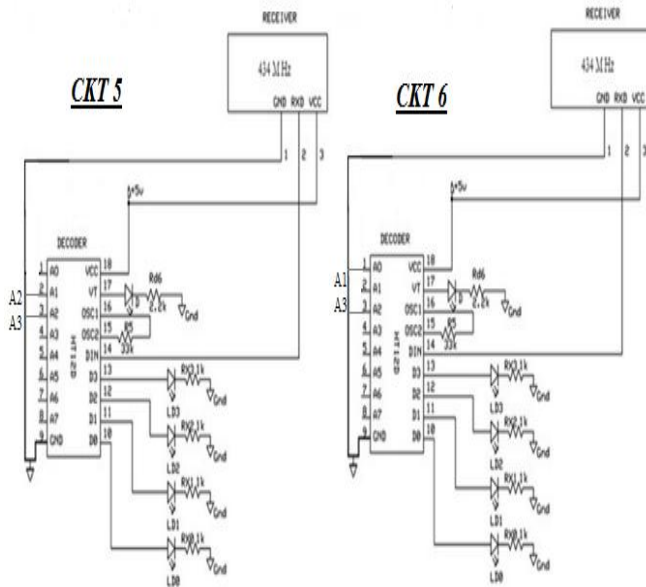
The schematic diagram for transmitter and receiver section as used for the photo sensor switching section is shown below.

TRANSMITTER SECTION



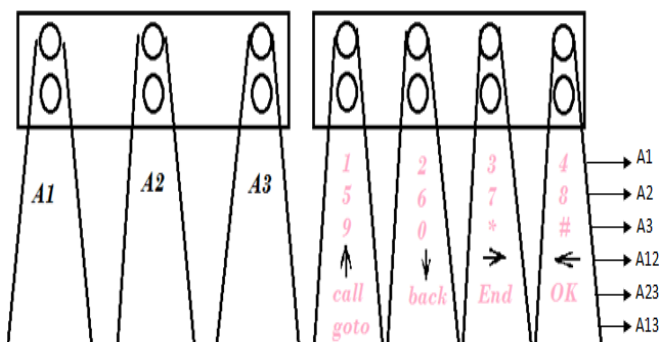
RECEIVER SECTION





The receiver section consists of six (6) decoder circuit connections which almost resemble each other excluding their address lines, which are connected uniquely for operating each sensor connected to the receiver section differently.

Block diagram of the virtual keypad is shown in figure below:



When the photo sensor A1 is active, it states that the 1st row of photo sensors containing 1, 2, 3 & 4 are activated automatically. As this is an old version of handset hence, the keypad is not a QWERTY keypad where the numeric value 2 not only means ‘2’ rather it means ‘a, b, c & 2’. In the similar way, ‘3’ means, ‘3, d, e & f’ and so on....

WORKING PRINCIPLE:

The Main cabin has to be switched on to start our projector. Along with that the flex and the photo sensor has to be switched on for exact execution of the functions.

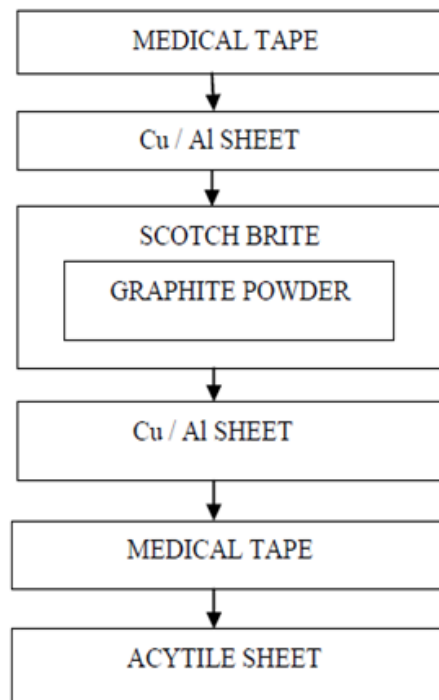
When we switch on the projector the back light (or source light) of the projector, which is focused on the projected screen, passes through the mobile LCD panel and the combination of lenses (the three convex and a Fresnel’s lens). The Mobile LCD panel projects the character on the projected screen and the combination of lenses helps us to magnify the characters.

There is an immobile switch board which is directly connected to the switching portion of motherboard of the used handset that can operate all the function of the designated mobile. Hence, the projector can be controlled just by pressing the push-to-on switches in the keypad.

There are two types of wireless controller to operate the projector from a comfortable distance. The Modes of operation are motion based and virtual keypad based.

Motion based keypad basically works with the help of some flex sensor.

Flex sensor is based on the movement of the body that can change the resistance value according to the bending position of the body. When the sensor is bent, it produce the resistance value correlated to the bending radius, smaller the radius, smaller the resistance. This sensor can use the graphite powder to accomplish the dedicated task with great degree of accuracy. This sensor consists of two conductive layer of thin copper plate or aluminum foil and at the middle of these it have resistive material such as abrasive cleaning pad (by 3M) with some graphite powder (work as a variable resistor) and a acetate sheet or you can also use thin channel file sheet for flexibility.



Structural layout of the designed flex sensor

Virtual keypad can work same as that of the flex sensor but instead of flex sensor we are using photo sensor. Actually basic circuit of both the controller is almost same which includes the use of the transmitter and receiver module. The only difference is in their sensors that can create and change the whole pattern for activating the keys of the projector.



Experimental setup of mobile projector

CONCLUSION:

The mobile projector is bringing a new dimension in the world of projectors. The project, discussed, a novel technique to design a mobile projector using commonly found electronic devices in the market for controlling the mobile functions in an enlarged version.

The proposed projector can also be used in industrial purpose for presenting seminars, gaming device, video streaming and net surfing. The projector with the advantage of the flex sensor is used for the motion control capability.

So, using the proposed technology, we can enhance the use of conventional cell phones by adding human intelligence as decision are taken by operator and working capability of the cell phones.

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