Wireless Touchpad
Remote Control
For Computer

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ABSTRACT

The wireless touchpad remote basically aims to work as a multipurpose input device for a computer. It can perform all the functions that a wired mouse can, but without any cords or wires. It can be operated from anywhere within the boundaries of a normal room. It works on the principle of infrared transmission and detection. The touchpad works as a transmitter and TSOP, connected to the serial port of computer, works as a receiver. The data received at the computers end is perceived by a software named Girder™ which works as an interface between our mouse and the computer. The circuit mainly consists of a microcontroller ATMega16™ and IR transmitters and receivers. So once manufactured in an application specific nature, this project aims towards providing a wireless mouse and multimedia hotkey remote at much cheaper rates than the existing ones.

INTRODUCTION

With the 21st Century, the gadgets and accessories used by a common man in urban cities have become an absolute necessity. Mobile Phones, Mp-3 Players, portable storage devices ,etc have become a part of our daily lives as engineers, business executives, doctors or as persons in any other field. The number of gadgets connected to one's personal computer itself illustrate this growing need. The project of a wireless remote reduces the difficulty experienced by the user in controlling these gadgets and other programs in the computer. But a remote still offers limitations because it only comprises buttons for different applications. If one can possibly interface an input device like a mouse or a keyboard with such a remote then the project will get higher usability and scope. It becomes a general wireless input device which can be used for many applications. This project is an interfaced wireless input device including a mouse and other hotkeys similar to a multimedia keyboard. With a cheap infrared transceiver this project is an ideal device for daily usage as its cost is cheaper than the wireless devices available in the market. With the design of an application specific micro-controller the device cost can be reduced magnanimously. With a slight sacrifice of accuracy a huge cost benefit can be obtained through this project while simultaneously serving the same purpose.

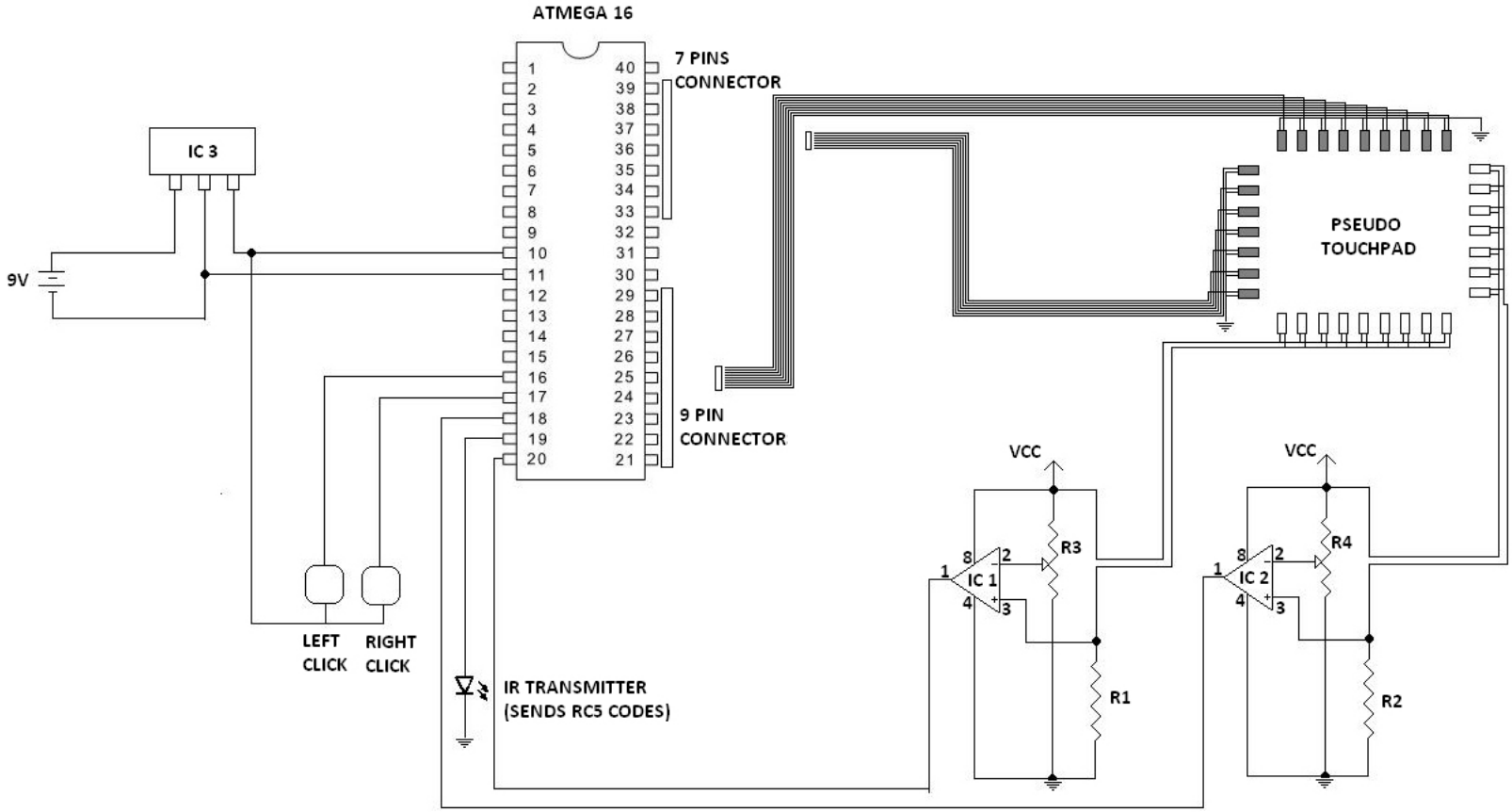
AIM

The aim of this project is to build an infrared remote for the computer. This remote will be able to perform all the functions that a pc user can ask for. It is specially designed for media and gaming applications.

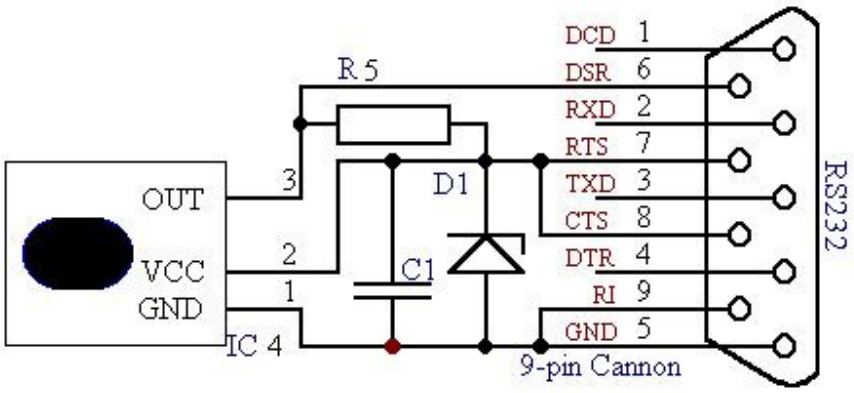
PRINICPLE

The main part of this project is the remote itself, and the challenge lies in converting a simple surface into a touchpad. For convenience the project can be divided into three parts, the touchpad, the transmitting part and the receiver part. The touchpad is not the usual touchpad that we see in laptops and other similar gadgets. The concept used for touchpad here is entirely different and very unique(to the best of our knowledge). Here a matrix is created using optical lights (infrared). The matrix is of 9x7 dimensions. Each line of the matrix is created by an ir led and photodiode pair. The output of the photodiode is constantly checked. When the finger cuts any of the line, the

microcontroller will come to know of the co-ordinate. If we assign a button for that co-ordinate then we can program the microcontroller to send ir codes analogous to that of pressing that button manually. The transmitter part consists simply of an ir led which will send the codes in rc5 format as programmed in the microcontroller. The receiver part includes hardware as well as software stuff. The hardware part includes a TSOP and a demodulator circuit. At the software part a software Girder v3.3 ® which is especially made for remote pc control. It has been programmed to do specific tasks when it receives corresponding codes. The interface between the hardware receiver part and the software is done using a serial port.

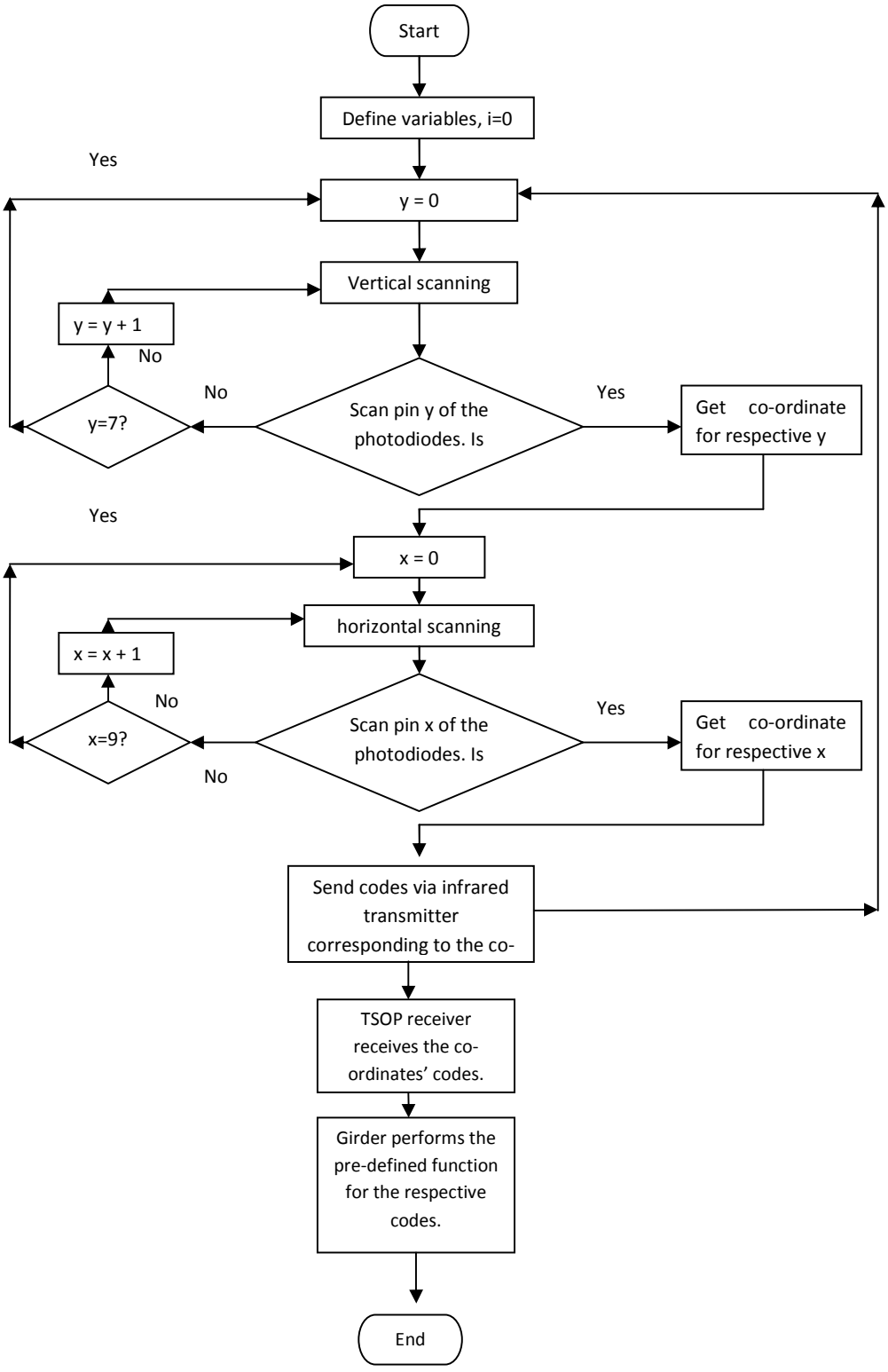


CIRCUIT DIAGRAM



RECEIVER CIRCUIT

FLOWCHART:


Start
Define variables, i=0
Yes
y = 0
Vertical scanning
y = y + 1
No
No
Scan pin y of the photodiodes. Is
Yes
Get co-ordinate for respective y
y=7?
Yes
x = 0
horizontal scanning
x = x + 1
No
Scan pin x of the photodiodes. Is
Yes
Get co-ordinate for respective x
x=9?
No
Send codes via infrared transmitter corresponding to the co-
TSOP receiver receives the co-ordinates' codes.
Girder performs the pre-defined function for the respective codes.
End

WORKING (LOGIC)

Scanning

The IR transmitters, once set to logic 1, transmit infrared rays which are picked up by the photodiode. The photodiodes are made to work on negative logic. So when the IR rays are blocked, a logic 1 is sent to the controller. Now, the programming of microcontroller ATMega16™ is done with a software named BASCOM-AVR™. Pins 21-29 and 33-39 are used as inputs for 9 horizontal and 7 vertical IR transmitters respectively. The programming of controller is done in such a way that it produces logic 1 and logic 0 at individual pins of the 9 horizontal receivers at a very fast rate of ms. The time is so chosen that even if the finger blocks the 2nd transmitter and at that instant the 3rd transmitter is on, before one tries to move his finger, one cycle is completed and the 2nd IR pair gets blocked. Such cycles are run for infinite loops before a finger blocks one of the pair. When a horizontal line is blocked, horizontal scanning stops, the value of a variable x used as a counter or flag (for the LEDs) is stored and vertical scan takes place. The value of the counter is chosen as a coordinate. The vertical scanning proceeds and the vertical array of LEDs and photodiodes are put into action. Again a vertical co-ordinate is measured corresponding to counter variable y used for the blocked LED beam and the photodiode response. In this way, the exact co-ordinates on the 9x7 matrix are obtained. The horizontal and vertical photodiodes send signals to the opam amplification circuits which send a logic 1 to the controller through pins 20 and 18 respectively. At this instance the microcontroller obtains the values of two variables x & y used as counters for the numbers of the LEDs in horizontal and vertical directions respectively.

Transmitting

This signal is then transmitted by the micro-controller via an infrared LED that follows a coding pattern similar to the RC-5™ coding used in Television remote controls. The information code of each RC-5™ Code sent to the receiver on the computer contains information of the direction of movement of the user's finger and consequently the 'pressed button'. At this moment one cycle of the scanning process is successfully completed. With an infinite loop a new scanning process begins and another signal is generated sending the new commands to the computer.

Receiving

The receiver part includes hardware as well as software stuff. The hardware part includes a TSOP and a demodulator circuit. At the software part a software Girder v3.3 ® which is especially made for remote pc control. It has been programmed to do specific tasks when it receives corresponding codes. The interface between the hardware receiver part and the software is done using a serial port.

LIMITATIONS:

The project still being at an initial stage suffers from a few limitations. Due to extensive usage of LEDs the battery consumption is quite high. As mentioned earlier the project lacks a certain grade of accuracy because the resolution obtained by a touchpad using a continuous array conductive surface cannot be duplicated by LEDs and photodiodes. Moreover, if the alignment of these LEDs and photodiodes is disturbed by some mechanical stress or shock then the device may not work properly. As the photodiodes and TSOP receivers are highly sensitive to infrared rays they gather redundant codes from infrared light emitted from other light sources like tube lights and sunlight. Due to the use of expensive multipurpose microcontrollers in this project the prototype still remains a bit costly. These limitations only exist in the prototype. As mentioned earlier, application specific programmed ICs can easily reduce the cost factor to a very low price. The problem of power consumption can also be removed if the ICs have less current ratings and if resistance is added before the LEDs to reduce the current ratings. If proper light insulation is

used then both the resolution can be improved and the sensitivity to other light sources can be reduced. A sturdy chassis or body can make the device more shock proof and less sensitive to mechanical shocks and the alignment can stay undisturbed. Thus these limitations can be removed quite easily and the project can indeed have scope of a profitable market product.

CONCLUSION:

The Project becomes an ideal wireless device with many imaginable applications. If applications specific ICs can be manufactured to replace the microcontrollers then a cheaper device can be constructed. Moreover this remote project can be used for direct operation of accessories and equipment. If an RF transceiver is used, the range of the device can be extended in magnified proportions consequently removing the limitation of line of site. Digital computer systems connected to machines in industries, vehicles, home appliances, etc can be controlled via such a remote and operated with simplicity. The idea of James Bond driving a car by using a remote touchpad in his hands may not seem fictitious after this project. The device can be used in a wide array of almost any systems controlled by a computer system even in the fields of defense and security purposes. With an elaborate knowledge of interfacing languages like Visual Basic one can reduce the limitations and dependencies and again the applications multiply. In the end the most prominent advantages of this touchpad device are its simplicity of design and cost benefit. It is more ideal for a daily use in commercial or home purposes due to its limitation of accuracy and range. Like all productive and constructive applications of science and electronics it aims at making life easier for the common user.