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Passive Infrared (PIR) Sensor Based Security System using PSOC

N.Yugandhar Reddy
M.Tech Student,
Arjun College of Technology & Sciences.

K.Sridevi, M.Tech
Asst Professor,
Arjun College of Technology & Sciences.

Abstract:

Security is primary concern for everyone.This Project describes a design of effective intelligent security system which can monitor a particular area, if any thing comes near to it, the sensor can senses particular object and gives the analog signal to the PSOC MCU, the on-chip ADC converts this analog values and converts into digital.With unique array of configurable digital and analog blocks, the Programmable System-on-Chip (PSoC) is a true system level solution, offering a modern method of signal acquisition, processing, and control with exceptional accuracy, high band width, and superior flexibility. This project senses the human movement using PIR Motion sensor. Whenever security system is activated the PSoC Controller will continuously monitor the PIR output. The change in the PIR Motion sensor will be detected and alarming circuit will be activated.

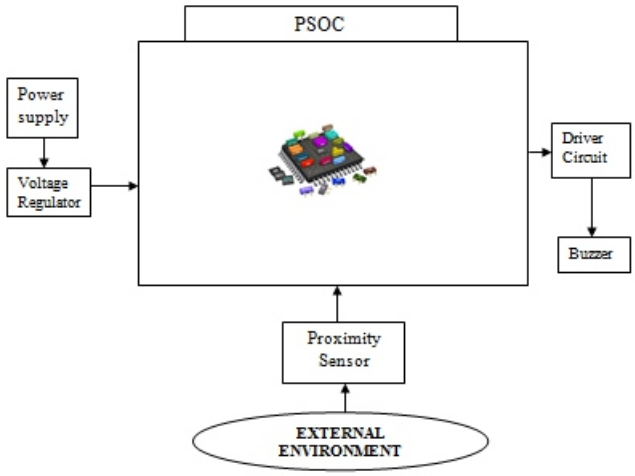
Keywords:
PIR sensor, , lighting system,Psoc.

I. INTRODUCTION:

Due to increasing number of crime and burglary, the needof security system is very essential. The security system thatmonitors the area throughout the time and reacts effective tothe treat is in need. We have lots of security systems in themarket for both indoor and outdoor applications such asultrasonic detectors, CCTV, microwave detectors,photoelectric detectors, infrared detectors etc. [1]. Howeverone or the other systems have the limitations of beingexpensive, more electrical power consumption, more memoryspace utilization of the recording system and complexcircuitry, etc.A solution to overcome these problems could be by using asensor of low cost which has the ability to detect the intrudersas they come within the sensor's detection range and generatesan output.

This output can be used for further signalprocessing or activating other devices like alarm system,lighting system, recording system and similar devices. Thiscould at least save some power consumptions as somecomponents get actuated only when there are intruders in thesensors detection range. Passive Infrared Sensor is a low cost,low power and reliable sensor [2].

BLOCK DIAGRAM:



The proposed system basically consists of two parts viz.hardware part and software. These two parts are interfaced towork with each other according to the response of the PIRsensor.

A. Hardware parts:

The hardware part consists of PIR sensor, power supply,amplifier, window detection circuit, webcam and the computer.

1) PIR Sensor: The PIR sensor is the core part of thesystem. The system basically function based on infrared radiation, which is emitted from human body [3]. PIR sensoris widely used in security system to detect the motion ofhuman [4]. Infrared (IR) light is electromagnetic radiationwith a wavelength between 0.7 and 300 micrometres.

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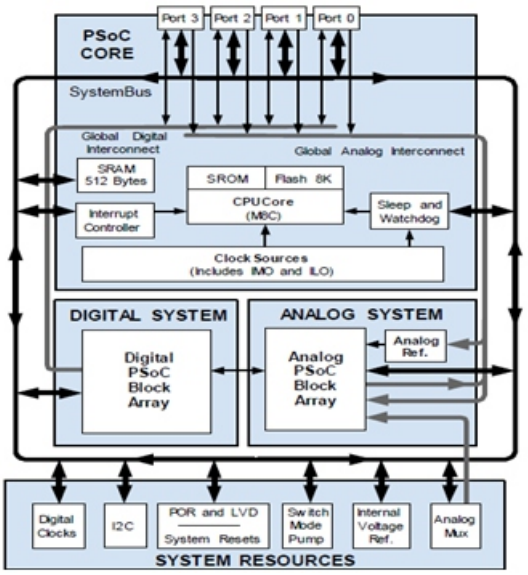
Humanbeings are the source of infrared radiation. It was found thatthe normal human body temperature radiate IR at wavelengthsof 10 micrometre to 12 micrometre [5][6].PIR sensors are passive electronic devices which detect motion by sensing infrared fluctuations [7]. It has three pins(gate, drain and source). After it has detected IR radiationdifference, a high is sent to the signal pin.PIR sensor is made up of crystalline material that generatesa surface electric charge when exposed to heat in the form ofIR [5]. This change in radiation striking the crystalline surfacegives to change in charge. The sensor elements are sensitive toradiation of wide range but due to the use of filter window thatlimits the sensitiveness to the range 8 to 14 micrometre whichis most suitable to human body radiation [5].

Fig. 3 Working of PIR sensor.

PSOC MIXED SIGNAL ARRAY :

PSoC (Programmable System-on-Chip) is a family of integrated circuits made by Cypress Semiconductor. These chips include a CPU and mixed-signal arrays of configurable integrated analog and digital peripherals PsoC Block Example Using configurable analog and digital blocks, designers can create and change mixed-signal embedded applications. The digital blocks are state machines that are configured using the blocks registers. There are two types of digital blocks, Digital Building Blocks (DBBxx) and Digital Communication Blocks (DCBxx). Only the communication blocks can contain serial I/O user modules, such as SPI, UART, etc. Each digital block is considered 8-bit resources that designers can configure using pre-built digital functions or user modules (UM), or, by combining blocks, turn them into 16-, 24-, or 32-bit resources. Concatenating UMs together is how 16-bit PWMs and timers are created.

There are two types of analog blocks. The continuous time (CT) blocks are composed of an op-amp circuit and designated as ACBxx where xx is 00-03. The other type is the switch cap (SC) blocks, which allow complex analog signal flows and are designated by ASCxy where x is the row and y is the column of the analog block. Designers can modify and personalize each module to any design.



Piezo Electric Buzzer:

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or electronic. Typical uses of buzzers and beepers include alarms, timers and confirmation of user input such as a mouse click or keystroke. A piezoelectric element may be driven by an oscillating electronic circuit or other audio signal source. Sounds commonly used to indicate that a button has been pressed are a click, a ring or a beep.

SOFTWARE ARCHITECTURE AND IMPLEMENTATION:

Orcad:

OrCAD is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly to create electronic prints for manufacturing of printed circuit boards, by electronic design engineers and electronic technicians to manufacture electronic schematics. The name OrCAD is a portmanteau, reflecting the software's origins: Oregon + CAD.

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Program:

```
#include <m8c.h>                /* part specific constants
and macros */
#include "PSoCAPI.h"            /* PSoC API definitions
for all User Modules */
#include "stdio.h"

/* Macros for Port numbers */
#define PORT_0                  0x00
#define PORT_1                  0x01
#define PORT_2                  0x02

/* Macros for LED pin */
#define LED_PORT                PORT_0
#define LED_PORT_DR             PRT0DR
#define LED_PORT_DM0            PRT0DM0
#define LED_PORT_DM1            PRT0DM1
#define LED_PORT_DM2            PRT0DM2
#define LED_PORT_PIN            0x01
#define LED_PORT_SHADOW         Port_0_Data_SHADE

#define RESOLUTION 12           /* ADC resolution */
#define SCALE_BG   (( 1 << RESOLUTION)/55) /* Bar-
Graph scale factor */

/* Shadow register used for SW port */
extern BYTE Port_0_Data_SHADE;

int  iResult,i1,i2;             /* ADC result variable */
char Res;
char buffer1[20];

voidconv(unsigned int a)
{
charbuf[20];
unsignedint a1,a2,a3,a4;
 a1=a/100;
 LCD_1_WriteData(a1);
 a2=a%100;

a3=a2/10;
 LCD_1_WriteData(a3);
 a4=a2%10;
 LCD_1_WriteData(a4);
 LCD_1_WriteData('\');
 LCD_1_WriteData('C');
}

void main(void)
{
        charlBuff[10];
  /* variable to get the LED pin drive mode */
        BYTE ledPinState;

        BYTE bgPos;             /* BarGraph position
*/

   PGA_1_Start(PGA_1_MEDPOWER);     /* Turn on
PGA power */
  ADCINC12_1_Start(ADCINC12_1_MEDPOWER); /* Turn
on ADC power */
   ADCINC12_1_GetSamples(0);        /* Sample forever
*/

   LCD_1_Start();               /* Init the LCD */
   LCD_1_InitBG(LCD_1_SOLID_BG);
   LCD_1_Position(0,0);
        LCD_1_PrCString("PSoC INTELLIGENT");
        LCD_1_Position(1,0);
        LCD_1_PrCString("SECURITY  SYSTEM");

for(i1=0;i1<=100;i1++)
        {
        for(i2=0;i2<=1000;i2++);
        }

       /* SW is connected in between Vcc and Pin, so
drive mode = Res_Pull_Down;
          Make the pin to '0' and Make it resistive pull
down;
          So whenever the SW is pressed the input on
Pin is high and when it is
        released the pin is pulled to 0 */
        SW_PORT_DR &= ~SW_PORT_PIN;

        /* Initialize shadow register to 0 as the SW pin
should be 0 always for it
        to act as input pin with res_pull_down */
        SW_PORT_SHADOW = 0;

while (1)// Main loop
  {
if (ADCINC12_1_fIsDataAvailable() != 0) /* If ADC sam-
ple is ready... */
    {
iResult = ADCINC12_1_iGetData() ; /* Get result, convert
to unsigned and clear flag */
      ADCINC12_1_ClearFlag();
```

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```
iResult=iResult/10;

    }
        LCD_1_Position(0,0);
        LCD_1_PrCString("SECURITY SYSTEM");
        LCD_1_Position(1,0);
       if(iResult<40)
        {

       SET_PIN_wSHADOW(LED_PORT_DR, LED_
PORT_PIN, LED_PORT_SHADOW);

       LCD_1_PrCString("STATUS: SAFE  ");
        }
       else
        {

                              C L E A R _ P I N _
wSHADOW(LED_PORT_DR, LED_PORT_PIN, LED_
PORT_SHADOW);

                        LCD_1_PrCString("STATUS: IN-
TRUDER");

       }


  }
}
```

CONCLUSION:

This project presents a Proximity Sensor Based Intelligent Security System Using Psoc Mixed Signal Array is designed and implemented with PSOC Controller in embedded system domain. Experimental work has been carried out carefully. The result shows that higher efficiency is indeed achieved using the embedded system. The proposed method is verified to be highly beneficial for the security purpose and industrial purpose.

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