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DESIGNING HOME SECURITY SYSTEM AND RECEIVING NOTIFICATION USING CELL PHONE

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ABSTRACT

Home security system which gives notification using cell phone is a security system that when implemented in a certain house or room can alert the owner of the house or room when an intruder enter the house without his/her awareness, owner of the house receive a short message from the system as alert that there is an intruder in his/her house or room. The system first have to compare image captured at instant using a digital camera installed on the door with existing images of member of the house stored in the database and if the system after comparing images find that it is not a member of the house then the home security system using cell phone system send a short message to the owner as a signal that there is an intruder at the door's house/room and if the home security using cell phone system after comparing the images find that it is a member of the house then the owner of the house he/she cannot receive a short message because a person is recognized by the security system installed, that is a member of the house.

This project therefore aims at introducing security system at homes when the owner of the house or tenants go out in their daily works and left their homes without any alternative security then this system can secure their families and valuables things in his/her absence by alerting the owner of the house in case there is an intruder in his /her house, the owner of the house receive a short message as a signal that there is an intruder in his /her house so as owner of the house to take further security measures.

The system take advantage of the wide spread acceptance of cell phones in today's society to introduce security system using cell phone at homes so that it can be easy to know if there is an intruder in the house or not and all the valuables property are safe.

KEY WORDS: *Intruder, Security system, Cell phone*

Abbreviations

C -Capacitor
CPU -Central Processing Unit
DC -Direct Current
DB-Decibel
EEPROM -Electrically Erasable Programmable Read Only Memory
GSM -Global System for Mobile Communication
GND -Ground
IR LED -Infrared Light Emmiting Diode
IR -Infrared Sensor
KHz -KiloHertz
LED -Light Emitting Diode
LDR -Light Dependent Resistor
MHz -MegaHertz
Mv -Millivolt
PWM -Pulse Width Modulation
RISC -Reduced Instruction Set Computer
R -Resistor
SPI -Surface Peripheral Interface
SMS -Short Message Service
TCRA -Tanzania Communication Regulatory Authority
µA -Microampere
µs -Microsecond
RAM -Random Access Memory
TMR -Timer
RF -Radio Frequency

1.0 INTRODUCTION

The home security system using cell phone is the result of a fusion of creative ideas with an attempt to motivate change in security systems that used in securing our families and valuables. Even though modern technology has allowed for the automation of many domestic lifestyles from automatic motion sensing lights to automatic garage door openers, home security has not seen much benefit from this revolution [1]. The system takes advantage of the wide spread acceptance of cell phones in today's society to introduce security system using cell phone at homes so that it can be easy to know if there is an intruder in the house or not and all the valuables are safe.

1.1 Problem statement

In Tanzania society there is a problem of theft where thief steal property of citizens in their homes or residences, when the citizens of a certain place/residences go out in their daily works and this occur due to the lack of alternative security in their homes or residences that can alert the owner of the house or tenants when there is an intruder enter his/her house without his/her awareness. This project aim at developing home security circuit system using cell phone that can alert the owner of the house in case the system find that there is a person enter the house and he/she is not member of the house .The case study of this project is Ikuti, located at Iyunga ward in Mbeya region. Through observation at Ikuti there is also a behavior of stealing the property of residents in their room/house so a home security system using cell phone is needed there to improve the security of families and the valuables at Ikuti street area.

2.0 PROPOSED SYSTEM

The proposed system is the home security circuit system that give an alert to the owner of the house immediately after the system perform image processing to compare and check whether it is a member of the house or not, if it is a member of the house then the system cannot send any SMS to the owner of the house but if it is not a member of the house the system send SMS to the owner of the house as a signal that there is an intruder inside the house or room

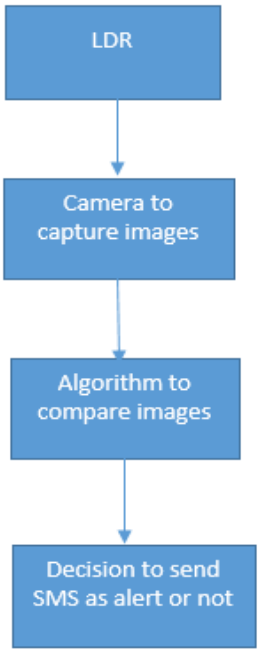

Figure 1. Block diagram to show how the system will work.

2.1 Operation of the proposed system

The light dependent resistor in this home security system using cell phone is used as the sensor that detect the presence of a person when is closed to door's house/room and before any further action it trigger digital camera to capture picture of that person, then a picture is processed to compare and check if it is a member of the house or not ,if it is a member of the house system cannot send any SMS to the owner of the house but it is not the member of the house system automatically send SMS to the owner of the house to alert the owner of the house that there is an intruder inside the house. Based on the literature review, Light dependent resistor is the suitable sensor for this project and each sensor discussed in this project have its advantage and disadvantages, also LDR is the suitable sensor for this project because it is easy to understand how it operate based on variation of light with resistance [2], it is available in the market, it is cheap cost in Tanzania market .There are several types of sensor that can be used in detecting presence of object such are ambient light ignoring motion detector, Infrared Light Emitting Diode, Microwave Motion Detector, Ultrasonic Motion Detector.

3.0 METHODOLOGY

In this project, Rapid Application Development (RAD) is used as the methodology.
Framework type: Iterative

3.0 Introduction

The key objective is for fast development and delivery of high quality system at a relatively low investment cost. The aim is to produce high quality systems quickly, primarily through the use of Prototyping (at any stage of development), active user involvement, and computerized development tools.

3.1 Hardware and software requirement

3.1.1 Hardware requirement

Below is the list of electronic components and the other material that support to complete the project.
PIC microcontrollers
PIC 16F84A microcontroller
PIC 16F627 microcontroller
PIC 16F676 microcontroller
PIC 16F877A microcontroller
GSM module

Resistors

R1 -10K ohm resistor
R2 -10k ohm potentiometer
R3 -330 ohm
R4 -100 ohm
R5 -33K ohm
R6 -10K ohm

Sensors

Light Dependent Resistor (LDR).
Infrared motion sensor.
Infrared LED sensor
Passive Infra-Red
Digital camera
Power supply 3-9V
Crystal
Capacitor

High-Performance RISC CPU

Only 35 single word instructions to learn
All instructions are single cycle (1µs) except for program branches
Operating speed: DC - 20MHz clock input
1 Kbytes Flash Program Memory
68 Byte RAM Data Memory
68 Byte EEPROM Data Memory
In-circuit Serial Programming
Four Interrupt Sources

Peripheral Features

One 8-bit timer/counter (TMR0) with 8-bit programmable prescalar
One 16 bit timer/counter
High current source/sink for direct LED drive
Watchdog Timer (WDT) with Separate RC Oscillator

Special Microcontroller Features

Power-On Reset
Power-up Timer (PWRT) and Oscillator Start-Up Timer (OST)
1,000 erase/write cycles Enhanced Flash Program Memory
1,000,000 typical erase/write cycles EEPROM Data Memory
Selectable Oscillator Options.

CMOS Technology

Low power, high speed CMOS FLASH technology
Low Power Consumption
< 2mA @ 5V, 4MHz
15µA typical @ 3V, 32 kHz
< 0.5µA typical standby current
I/O and Packages
13 I/O pins with individual direction control
(i) 18-pin DIP

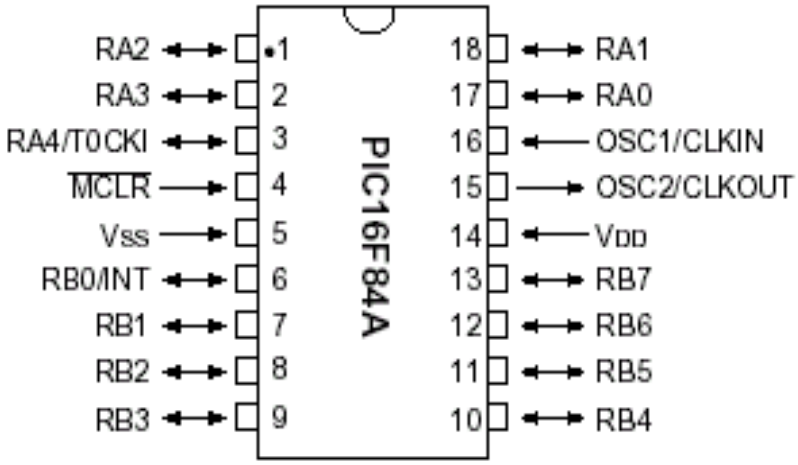

Figure 2. PIC16F84A

(ii)PIC16F627 features
18-pin Microcontroller with USART
Flash Program Memory: 1024 bytes
EEPROM Data Memory: 128 bytes
SRAM Data Memory: 224 bytes
I/O Pins: 16
Analog Comparator: 2
Timers: Two 8-bit / One 16-bit
Internal Oscillator: 4MHz

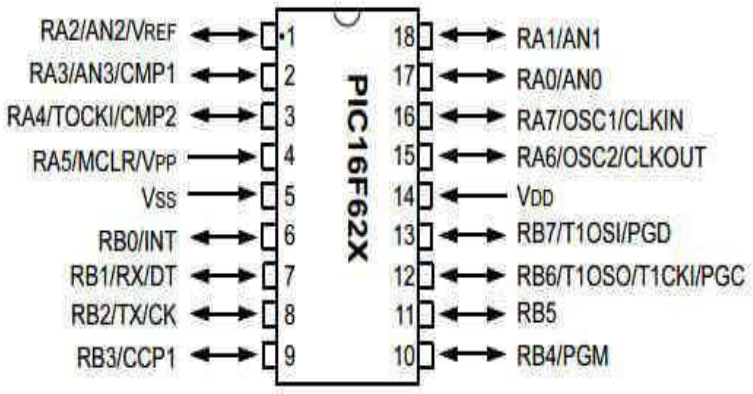

Figure 3. PIC16F627

(iii) PIC16F676
High-Performance RISC CPU
Only 35 single word instructions to learn
All instructions are single cycle (1µs) except for program branches
Operating speed: DC - 20MHz clock input
1 Kbytes Flash Program Memory
64 Byte RAM Data Memory
128 Byte EEPROM Data Memory
In-circuit Serial Programming [3]

Peripheral Features

One 8-bit timer/counter with 8-bit programmable preclear
One 16 bit timer/counter
High current source/sink for direct LED drive
Watchdog Timer (WDT) with Separate RC Oscillator
Analog Comparator
Eight Channel, 10-bit Analog to Digital Converter

Special Microcontroller Features

Power-On Reset
Power-up Timer (PWRT) and Oscillator Start-Up Timer (OST)
1,000 erase/write cycles Enhanced Flash Program Memory
1,000,000 typical erase/write cycles EEPROM Data Memory
Selectable Oscillator Options

CMOS Technology

Low power, high speed CMOS FLASH technology
Fully Static Design
Low Power Consumption

I/O and Packages

12 I/O pins with individual direction control
14-pin DIP

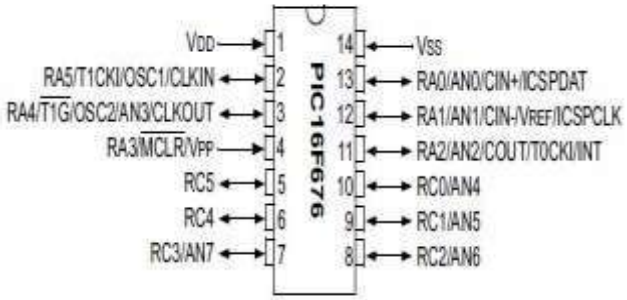

Figure 4. PIC16F676

(iv) PIC 16F877A features

High-Performance RISC CPU

Only 35 single word instructions to learn
All instructions are single cycle (1µs) except for program branches
Operating speed: DC - 20MHz clock input
8 Kbytes Flash Program Memory
368 Byte RAM Data Memory
256 Byte EEPROM Data Memory
In-circuit Serial Programming
Interrupt Capability (up to 10 sources)

Peripheral Features

Two 8-bit timer/counter (TMR0, TMR2) with 8-bit programmable prescalar
One 16 bit timer/counter (TMR1)
High current source/sink for direct LED drive
Watchdog Timer (WDT) with Separate RC Oscillator
Synchronous Serial Port with SPI and I²C

Eight Channel, 10-bit Analog to Digital Converter
Universal Synchronous Asynchronous Receiver Transmitter (USART)
Special Microcontroller Features
Power-On Reset
Power-up Timer (PWRT) and Oscillator Start-Up Timer (OST)
1,000 erase/write cycles Enhanced Flash Program Memory

CMOS Technology
Low power, high speed CMOS FLASH technology
Fully Static Design
Low Power Consumption
I/O and Packages
33 I/O pins with individual direction control
40-pin DIP [4].

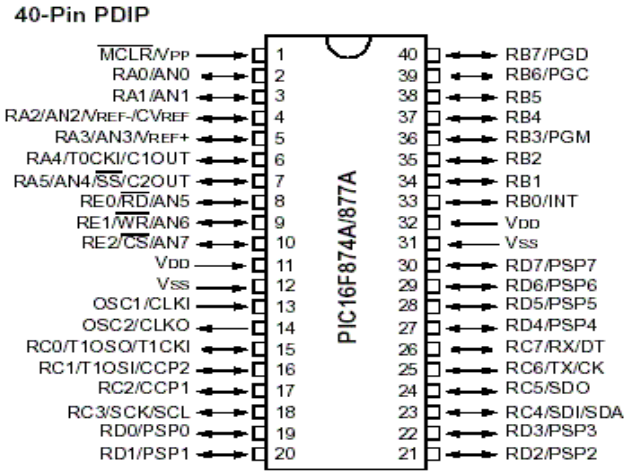

Figure 5. PIC16F877A

GSM MODULE

Designed for global market, SIM300 is a Tri-band GSM/GPRS engine that works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS1900 MHz SIM300 provides GPRS multi-slot class 10/ class 8 (optional) capability and support the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4.With a tiny configuration of 40mm x 33mm x 2.85 mm, SIM300 can fit almost all the space requirement in application, such as Smart phone, PDA phone and other mobile device .The physical interface to the mobile application is made through a 60 pins board-to-board connector, which provides all hardware interfaces between the module and customers boards except the RF antenna interface [8].

- The keypad and SPI LCD interface will give you the flexibility to develop customized applications.
- Two serial ports can help you easily develop your applications.
- Two audio channels include two microphones inputs and two speaker outputs. This can be easily configured by AT command

Figure 6. GSM Module

Features:
Support wide range of frequencies (from 850 MHZ to 1900 MHZ) for different classification of GSM
Supports integration with RS232 cable (serial cable, 25 pins).
Can be interfaced to system using USB cables.

Input voltage varies from 5v to 30v.
Very less weight in few grams.
Provided with SIM holder and antenna connector.
Programmable with AT commands. [7].

3.1.2 Software requirement

- MATLAB programming languages is the languages that can be used specifically for developing algorithm to perform image processing of the picture captured by the digital cameras in order for the home security system using cell phone to make decision whether a person is a member of the house or not [5].
- PYTHON programming language also is high level programming language that can be used to develop algorithm for image processing.
- PROTEUS software-it is an electrical suit that can be used for circuit simulation.

4.0 DESIGN

An image histogram is a type of histogram that acts as a graphical representation of the tonal distribution in a digital image. It plots the number of pixels for each tonal value. By looking at the histogram for a specific image a viewer is able to judge the entire tonal distribution at a glance [6]. Image histograms are present on many modern digital cameras. Photographers can use them as an aid to show the distribution of tones captured, and whether image detail has been lost to blown-out highlights or blacked-out shadows.

4.1 Algorithm to compare image using MATLAB

The following are the MATLAB code used to develop the algorithm.

```
>>Image1 = imread('1.jpg');
>> Image2 = imread('2.jpg');
>> Imaged1 = im2double(Image1);
>> Imaged2 = im2double(Image2);
>> Imageg1 = rgb2gray(Imaged1);
>> Imageg2 = rgb2gray(Imaged2);
>> hn1 = imhist(Imageg1)./numel(Imageg1);
>> hn2 = imhist(Imageg2)./numel(Imageg2);
>> subplot(2,3,1);subimage(Image1);
>> subplot(2,3,2);subimage(Image2);
>> subplot(2,3,4);plot(hn1)
>> subplot(2,3,5);plot(hn2)
```

4.2 Image comparison

Two images compared using histogram

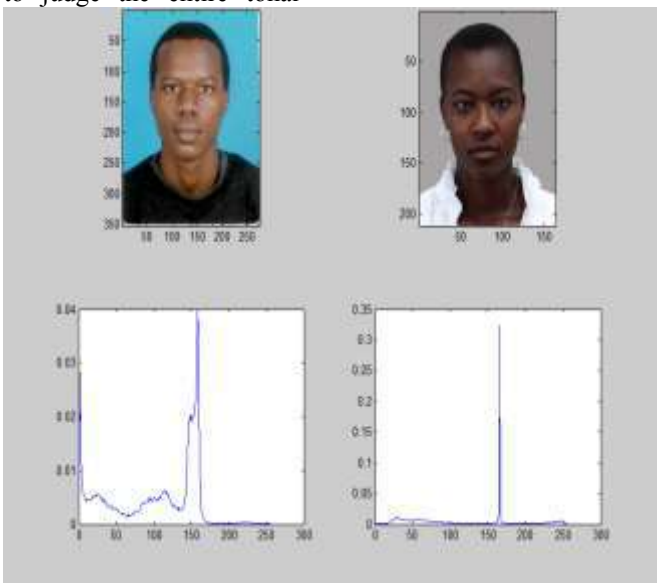

Figure 7. Image comparison

When the two images is compared and they are not the same, the result on the histogram show the images are different .When the algorithms find that the two images are the same the image histogram show the same histogram diagram.

4.3 Circuit diagram design

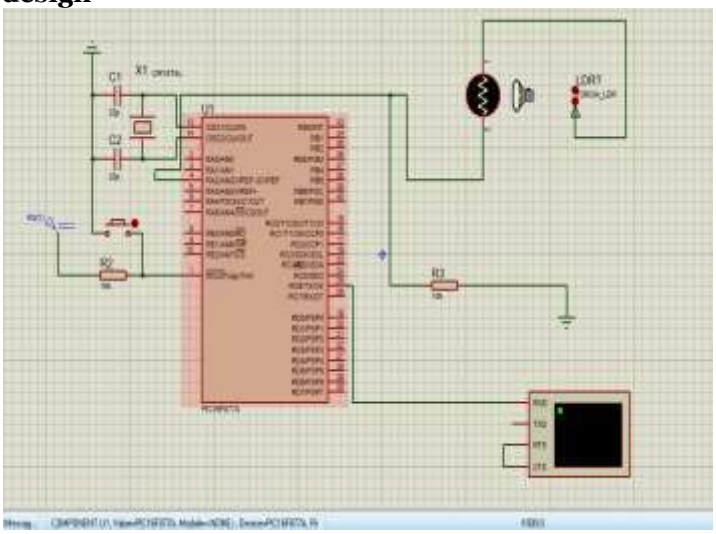

Figure 8. Circuit diagram

5.0 RESULTS

5.1 Circuit Operation

When light shines on LDR its resistance decreases hence no SMS sent to the owner of the house or room. When the light is cutoff by the door which is opened by the intruder the LDR resistance increases which result the GSM to send SMS to the owner of the house or room.

6.0 CONCLUSION AND RECOMMENDATION

6.1 Conclusion

Due to the increase in number of mobile users in Tanzania and due to the fact that most of the Tanzanians both in rural and urban can afford to own and operate a mobile phone, the system can be used by all over the people in Tanzania who are leaving in both rural an urban areas.

6.2 Recommendation

Any part of this system can be improved so as to obtain a more reliable, quality and more efficiency system due to changes in technology and also availability of the components for building the system, someone can start in extending the project on the part of comparing picture so that it can compare one picture of the intruder with many picture stored in the house or room database, also to enable the system to send picture of the intruder to the owner of the house or room cell phone. The project is open for any person who is interested to improve this system more from where I ended out.

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