HOME SECURITY SYSTEM

Submitted in partial fulfillment
of the requirements for the degree of

BACHELOR OF TECHNOLOGY
(CSE & / IT)

by

By

Kailash Sharma (071323)
Anuj Sharma (071305)
Aditya Pratap (071346)
Gaurav Pathania (061242)

Under the Supervision of
Mr. Brig.(Retd.) S.P.Ghrera

DEPARTMENT OF CSE & / IT
JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY WAKNAGHAT, SOLAN, HIMACHAL PRADESH

CERTIFICATE

This is to certify that the thesis entitled '**HOME SECURITY SYSTEM'** is submitted in the fulfillment of the award of degree of Bachelor of Technology (Computer Science & Engineering) by **JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT.**

Signature in full of Supervisor:

Name in Capital block letters: Brig.(Retd.) S.P.GHRERA

Designation: Associate Professor & Head, Department of Computer Science & Engineering and IT.

ACKNOWLEDGEMENT

The project entitled as **"HOME SECURITY SYSTEM"** is to provide maximum possible security at home or office when the user is at home or away.

No venture can be completed without the blessing of Almighty .We consider it our bounded duty to bow to Almighty whose kind blessings always inspire us on the right path of life This project is our combined effort and realizes the potential of team and gives us a chance to work in co-ordination.

Science has caused many frontiers so has human efforts towards human research. Our revered guide '**Mr. Brig.(Retd.) S.P.Ghrera'** ,Head, Department of Computer Science and IT, JUIT, has indeed acted as a light house showing us the need of sustained effort in the field of network security to learn more and more. So we take this opportunity to thank him, for lending us stimulating suggestions, innovative quality guidance and creative thinking. He provides us the kind of strategies required for the completion of a task.

Signature of the Student ……..

Name of Student ……..

Date ……..

SUMMARY

In 2001, there were 383,500 home fires in the United States, resulting in 3,110 deaths, 15,200 injuries, and $5.5 billion in direct property damage. Also, there are an estimated 2,329,950 annual burglaries, with an annual loss by victims of approximately $3.1 billion Homes without security systems are 2.7 times more likely to be targeted by a burglar and 60% of residential burglaries occur during the daylight. The Home Security System, HSS, is intended to provide a full security for houses when house owners are either home or away. We developed a system that monitors the house with sensors and informs the house owners and fire department when it detects a fire with gas (smoke) sensor, house owners and police department when it detects a thief with PIR sensors.

The HSS, consists of four different types of sensors which are gas/smoke, aqua, PIR, temperature; some cameras; a GPRS modem; a PC on which the main software that operates on data acquired from sensors runs. Gas/smoke sensor invokes the main software when it detects a smoke in room. As soon as this occurs, the system sends SMS to house owners and tells about the smoke detected at home it also calls the Fire Department. Aqua sensor causes the same action to be taken when it detects water flood in room. PIR sensors are placed to windows and doors, GPRS modem is also connected to PC. The HSS runs in two different modes: "*home"* and "*away"*. In *away* mode, signals produced by all sensors in the system cause the corresponding actions to be taken. However, in *home* mode some of those actions are not taken. The HSS enables users to configure *home* mode according to their desires. The mode of the system can be changed by the users from web or wap via their wap-enabled mobile phones. As a result, by adding a number of sensors, a number of cameras, and a GPRS modem to a PC we turned it to a low-priced full security system for homes and offices and we called it the *Home Security System* which is supported by web, WAP, and some GSM properties like SMS.

Signature of Student	Signature of supervisor
Name	Name
Date	Date

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1. INTRODUCTION

Protect our family and valuables with this microcontroller based security system knowing that should anyone trying to break into our home, an alarm will go ON and the police will be alerted immediately.The microcontroller based security system consists of transmitter, receiver, phase locked loop and processing section.

The transmitter section continuously transmits IR rays which are received by the receiver section. The received signal is further amplified and given to the PLL section, where its frequency is locked to the transmitted frequency. The transmitter and receiver are arranged such that the transmitted IR rays fall directly onto the phototransistor LI4GI of the receiver. The signal received by T2 is amplified by transistor T3 and operational amplifier µA741 (IC2). Series input resistor R8 and feedback resistor R9 determine the gain of op amplifier IC2. The amplified single so applied to pin 3 of PLLLM567 (IC3) through capacitor C4.

ICLM567 is highly stable PLL with synchronous AM lock detection and power output circuitry it is primarily used as frequency decoder which drives a load whenever a sustained frequency falling within its detection band is present in its self biased input. The centre frequency of the determined by external components. In the absence of any input single, the center frequency of PLL's eternal free running, current control oscillator is determined by resistor R12 abed capacitor C8.

Preset VR2 is used for tuning IC3 to the desired center frequency in the 6-10 kHz range,

Which should match the modulating frequency of the transmitter? Capacitor C6 and C7 are used as low pass filter. Ned out filter respectively when the received signal is locked to frequency of transmitter signal pin 8 of IC3 goes low and LED 1 glows. Since pin 8 is connected to the base of transistor T4 through R13 its collector voltage rises. As a result T5 is forward biased to energies the relay RL5 the pole and normally closed contact of really contact of RL5 are connected to +5v.

When the IR signal is interrupted, the microcontroller starts working as per the program burnt into the EPROM and control the siren, telephone and cassette player via the respective relays.

2. PROBLEM STATEMENT

Providing maximum possible security to a house with specifically designed modules. Making an easily accessible user interface which can be operated at various modes by the user physically or in a remote manner.

3. OBJECTIVE AND SCOPE

Project Purpose	The main purpose of the “Home Security System (HSS)” is giving information about the state of home while the user is away and taking corresponding cautions in the emergency occasions.
Desired Features	The views transmitted from the cameras to web. The system has two modes : Away (all sensors on) and Home (only water and gas sensors on). User can change the mode of the system by mobile device and web. Users have to login to the system with username and password. Data coming from the sensors is gathered by a microcontroller module. States of the sensors (water, gas, PIR and temperature) can be viewed from the web and mobile devices. User records his/her own GSM number to the database. In emergency occasions, HSS will inform the user by SMS. Additional GSM numbers can be recorded to the database by the user. In fire or water flood, HSS calls the Fire Department. When a thief determined, HSS calls the Police Department . When a thief determined, camera views are recorded into database, to identify the thief.
Critical Success Factors	Work hard!
Constraints	The project must be completed by 28 April 2010. The limited maximum cost of the project is $400.
Risks	The project team has no UML experience.

	The project team has no team-working experience. The project team has no electronics background. The project team has never worked in a formal process. .
Actors	Superuser, user, gas sensor, water sensor, PIR, temprature sensor, police dept, fire dept.
Event List	Users login to the system User changes the system mode Superuser creates new users Superusers assigns permissions User decides the camera view seen from web Water sensor calls the fire department Water sensor updates water sensor status Water sensor sends SMS to the users PIR sensor calls the police PIR sensor updates PIR sensor status PIR sensor records the view to the database PIR sensors sends SMS to the users Gas sensor calls the fire department Gas sensor updates gas sensor status Gas sensor sends SMS to the users System transmits the camera view to web Temperature sensor updates temperature sensor status
Use Cases	Create User, Remote Management, Calling, Maintain Sensor Status, Record Camera View, Capture Camera View
Preliminary execution architecture	

3.1 Actors:

Superuser	Changing the system mode Creating new users Assigning permission to users Deciding camera to be watched
User	Changing the system mode Deciding camera to be watched
Gas sensor	Invoking the system in fire occasion
Water sensor	Invoking the system in water flood occasion
PIR	Invoking the system in thief occasion
Temperature sensor	Sending the temperature to the system

3.2 Specification of the System and Algorithms Involved

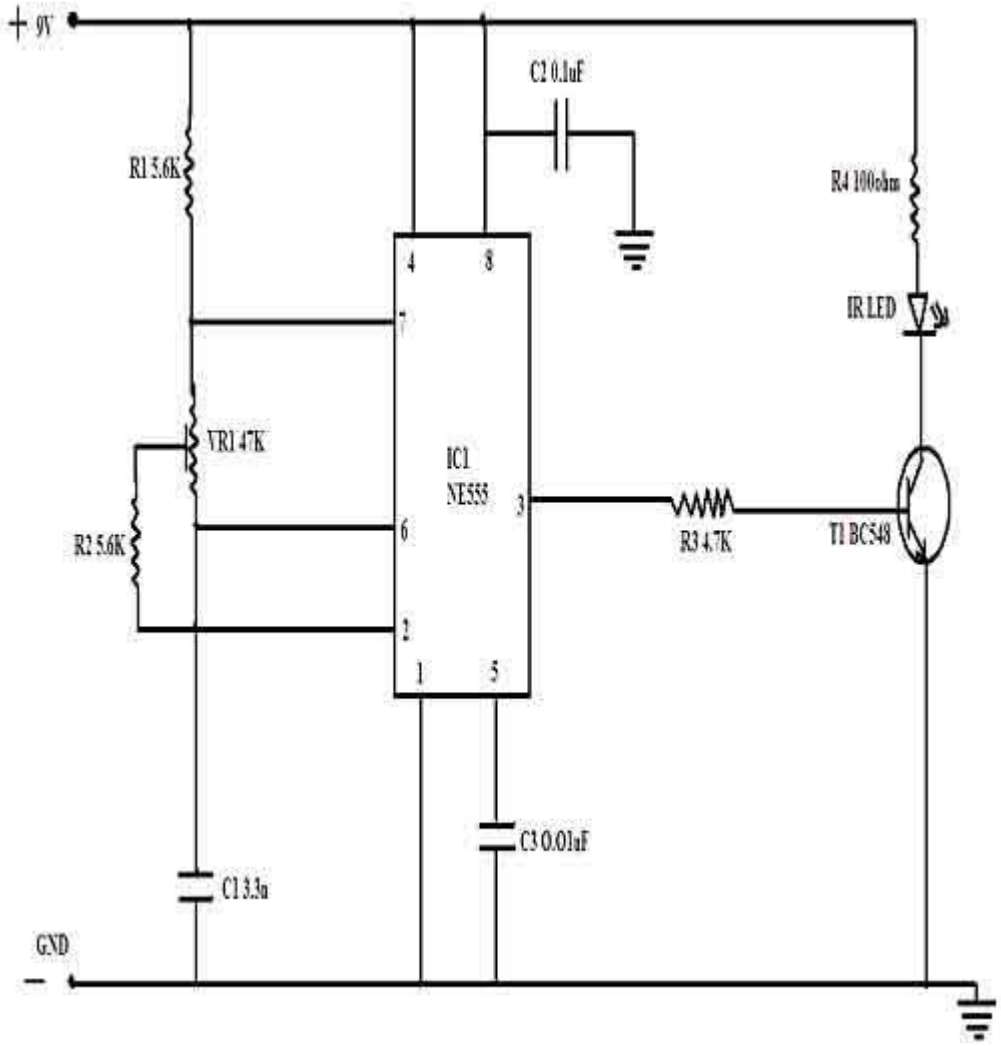
Before system specification, requirement analysis of the HSS is given below:

Table of the possible events in HSS is this:

Subject	Verb	Object	Use-Case	Arrival Pattern	Response
Superuser	Creates	New users	Create User	Episodic	New users are created and recorded to db.
Superuser	Grants Permission	New users	Create User	Episodic	New users are granted permission.
User	Changes	System mode	Remote Management	Episodic	System mode is changed: home/away.
User	Changes	Camera View	Remote Management	Episodic	Camera view is changed
Water Sensor	Calls	Fire Dept.	Calling	Episodic	The fire department is called by the HSS.
Water Sensor	Updates	Water Sensor Status	Maintain Sensor Status	Episodic	Water sensors are updated.
Water Sensor	Sends	SMS	Calling	Episodic	HSS sends SMS to the users to inform them about their home status.
Gas Sensor	Calls	Fire dept.	Calling	Episodic	The fire dept is called.
Gas Sensor	Updates	Gas Sensor Status	Maintain Sensor Status	Episodic	Gas sensor status is updated on web.
Gas Sensor	Sends	SMS	Calling	Episodic	HSS sends SMS to the users to inform them about their home status.

PIR Sensor	Calls	Police dept.	Calling	Episodic	The Police dept is called.
PIR Sensor	Updates	PIR Sensor Status	Maintain Sensor Status	Episodic	PIR Sensors Status is updated.
PIR Sensor	Records	Camera View	Record Camera View	Episodic	Camera view is recorded to the db.
PIR Sensor	Sends	SMS	Calling	Episodic	HSS sends SMS to the users to inform them about their home status.
Temperature Sensor	Updates	Temperature Sensors Status	Maintain Sensor Status	Episodic	Temperature Sensors Status is updated.
System	Transmits	Camera view	Capture Camera View	Episodic	Selected camera view is transmitted to web continuously.
User	Login	System	Remote Management	Episodic	Users login to the HSS by their username and password
User	Watches	Camera View	Remote Management	Episodic	User watches the view from the web

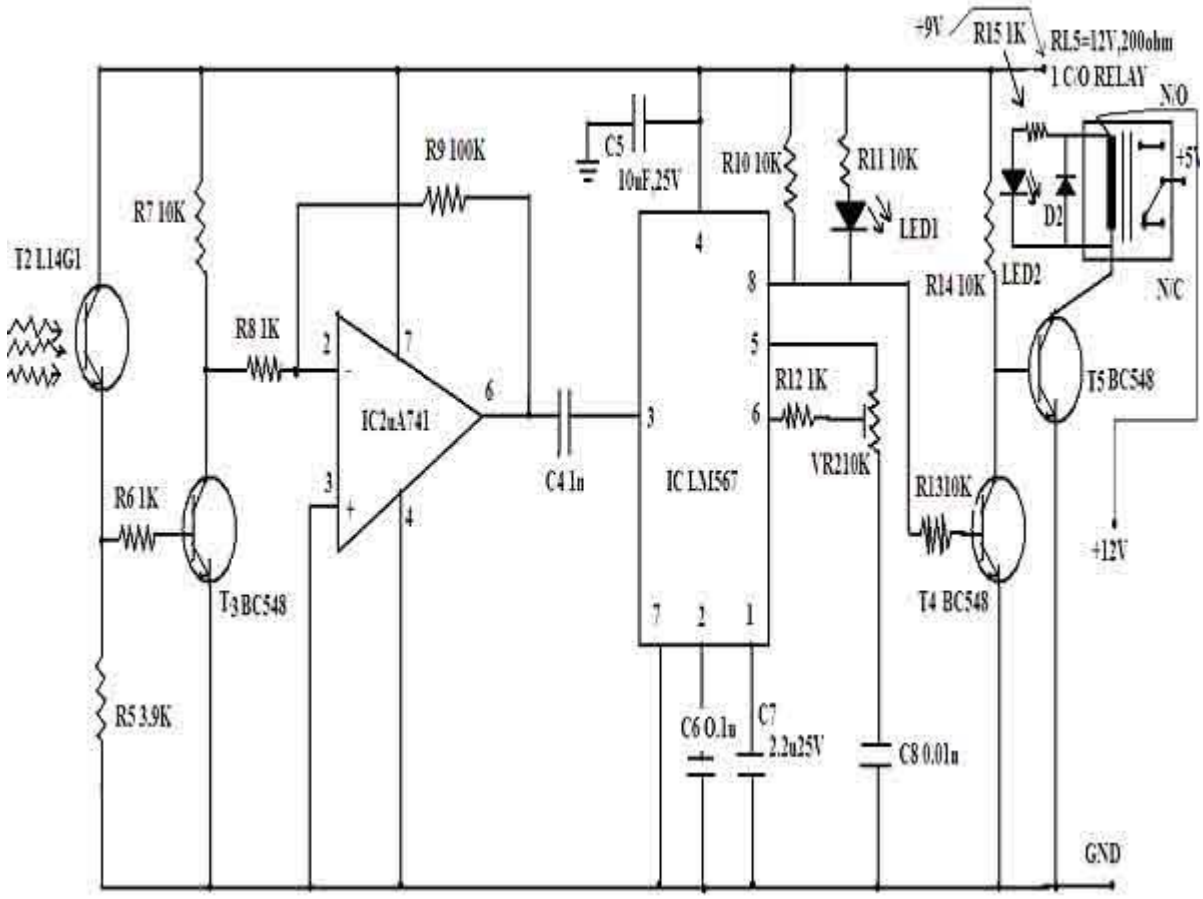
Transmitter Section:



In the transmitter section, NE555(ICI) is wired as an actable multivibrator whose oscillating freq is decided by resistors R1 and R2, preset VR1 and capacitor c1, C3 bypasses the noise to ground, preventing any change in calculated pulse-width.

The out put of ICI is fed to the base of the transistor t1, which drives an IR LED to transmit the modulated IR signal. R4 limits the current flowing through the IR LED. Preset VR1 is used to vary the modulating frequency.

Receiver Section:



The transmitter and receiver are arranged such that the transmitted IR rays fall directly onto the phototransistor LI4GI of the receiver. The signal received by t2 is amplified by transistor t3 and operational amplifier µA741 (IC2). Series input resistor R8 and feedback resistor R9 determine the gain of op amplifier IC2. The amplified single so applied to pin 3 of PLLLM567 (IC3) through capacitor c4.

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resistor R12 abed capacitor C8. Preset VR2 is used for tuning IC3 to the desired center frequency in the 6-10 kHz range, which should match the modulating frequency of the transmitter? Capacitor C6 and C7 are used as low pass filter. Ned out filter respectively when the received signal is locked to frequency of transmitter signal pin 8 of IC3 goes low and LED 1 glows. Since pin 8 is connected to the base of transistor T4 through R13 its collector voltage rises. As a result T5 is forward biased to energies the relay RL5 the pole and normally closed contact of really contact of RL5 are connected to +5v.The low order multiplex address and data lines AD0 though AD7 of IC4 are connected to the EPROM (IC5) through the latch(IC6), while its high order address line A8 through A10 are directly connected to the EPROM. Address lines A0 through A7. Are separated from data lines D0 through D7 by latch enable single.

Address latch – enable pin 30 of the microcontroller is connected to latch enable pin 11 Ic6. When ale high the latch us transparent. The output changes according the input data when ALE goes low, the low order address is latched at the input of IC6.

Data lines D0 throughD7 of microcontroller are connected to dated lines of IC5 and IC7 each. Chip sleets signal for IC5 is generated by RD and IO/M lines with the help of NAND gate. The inverted IO/M signal provides CS signal through IC7.

IC AT89C51 is general purpose programmable device compatible with most microcontrollers. It has three programmable ports, any of which can be ports and the remaining eight bits as port c.

The eight bits of ports c can be used as individual bits or grouped in two 4-bits ports namely, c (upper) and c (lower). Ports A and C are configured as input ports and port B is configured as output port A. is used for inter detection, port B for activating the siren, cassette player, telephone cradle switch and redial button and port C for polarity reversal detection.

The circuit for detecting the polarity reversal detection the telephone line is built around opt coupler IC8 and IC9. Normally, TIP is positive with respect to RING lead of telephone line.

With the handset in off position a nominal loop current of 10 mA is assumed to flow through the telephone line. Resistor R23 is selected as 120 ohms to develop the voltage of1.2v. when the dc lines voltage polarity reversal occurs, opt coupler IC8's internal LED conducts and LED3 glows to indicate polarity reversal occurs. Simultaneously, opt coupler IC9's internal LED goes off and its pin 5 (collector) goes high to provide line –reversal sense signal to AT89C51.

Fig.3 shows the power supply circuit. The AC mains are stepped down by transformer X1 to deliver a secondary output of 12V AC at 300 ma. The transformer output is rectified by a full-wave bridge rectifier.

Comprising diodes D7 through D10. Capacitor C12 acts as a filter to eliminate ripples. IC10 and IC11 provide regulated 5v and 9V power supplies, respectively. Capacitors C13 and C14 bypass any ripple present in the regulated out-us. Switch S2 acts as an 'on'/'off' switch.

The cradle switch in the telephone instrument is a double pole, two-way switch. Replace this cradle switch with the contacts of DPDT relay RL3.

Used to implement the action of lifting the telephone handset.

There are four pads on the PCB of the telephone instrument where cradle switch is connected. The two pads which are shorted when the telephone handset is placed on the cradle are connected to the normally closed (N/O) contacts of relay RL3, while the other two pads which are shorted when the handset is off-hook are connected to to the normally o0pen (N/O) contacts of relay RL3.

Relay RL2 is connected in parallel to the redial button of the telephone instrument. When relay RL3 emerges to emulate lifting of the handset, relay RL2 is energized to switch on the redial button and the already loaded telephone number of the police station or any other help provider is automatically dialed.

Relay RL4 activates the siren whenever the IR signal being received is interrupted iron sounds continuously until the user presses the reset button.

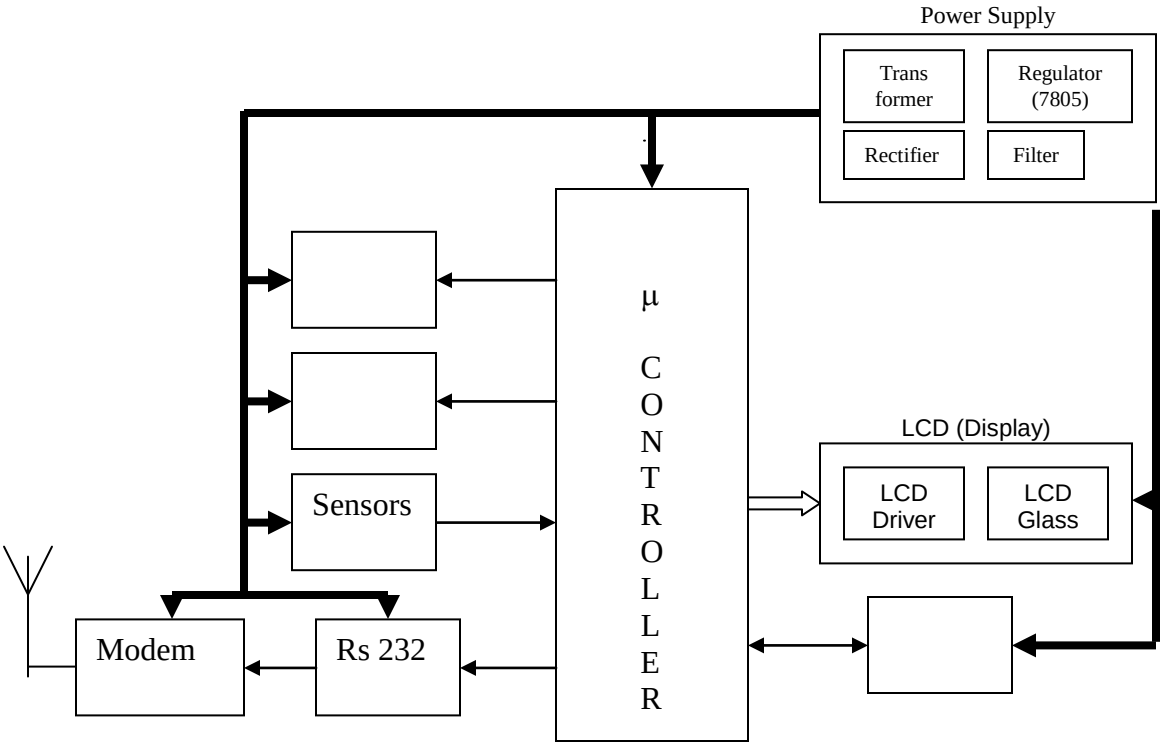
Relay RL1 is used to switch on the audio cassette player, in which the user's residential address and alert message to be conveyed to the police station are prerecorded. The speaker output of the cassette player is connected to the telephone's microphone to convey the alert message to the police station. The player gets switched off when the message is over.

The device consists of GSM modem, microcontroller, sensors, relays, memory and display. If the user wants to control some devices in his house he/she have to send the SMS indicating the operation of the device and then the system password, while the MODEM embedded with the system microcontroller receives SMS. The microcontroller will read SMS and check for the password the user had sent with the SMS, the passwords are stored in memory, so the microcontroller will read the password from memory and compares with the message password. If the password is correct then it will check whether the message is for switch ON or OFF the devices. According to the received message the controller will switch on / off the relays.

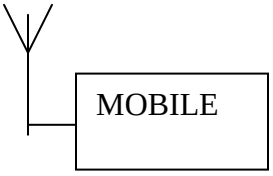
The device is password controlled, therefore only the people who know the device password is capable to control the device.

In the security systems the device is connected to sensors like PIR sensors, smoke sensors etc. when some body had entered home forcibly for ex the PIR sensor connected to the door will detect the presence of person, and it will give an interrupt to the microcontroller. then according to the program load in flash the controller will find out from which sensor the interrupt had came, then it will sent SMS to the owners mobile or police by retrieving the phone numbers from memory.(the owners mobile number and police number is stored in memory)

BLOCK DIAGRAM RECEIVER:



TRANSMITTER:



COMPONENT DETAILS

Power supply:

The microcontroller and other devices get power supply from AC to Dc adapter through 7805, 5 volts regulator. The adapter output voltage will be 12V DC non-regulated. The 7805/7812 voltage regulators are used to convert 12 V to 5V/12V DC.

Vital role of power supply in 'GSM BASED HOME SECURITY SYSTEM .
The adapter output voltage will be 12V DC non-regulated. The 7805/7812 voltage regulators are used to convert 12 V to 5V/12V DC.

Micro controller-AT89S52

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry- standard 80C51 instruction set and pin out.

Features:
8K Bytes of In-System Programmable (ISP) Flash Memory
Endurance: 1000 Write/Erase Cycles
4.0V to 5.5V Operating Range
256 x 8-bit Internal RAM
32 Programmable I/O Lines
Full Duplex UART Serial Channel
Fully Static Operation: 0 Hz to 33 MHz

Vital role of micro controller in ‘GSM BASED HOME SECURITY SYSTEM’.

In the security system the micro controller is programmed in such a way that if somebody had entered in home with out permission the sensors will detect and gives an interrupt to the microcontroller, if the controller is interrupted it will give commands and user number to the modem to sent the alert SMS to the owner mobile.

LCD is connected to microcontroller as 4 bit data mode, before displaying anything in LCD Initialization have to do ,so microcontroller will control the LCD initialization and select the data register and command register according to the purpose.

Memory is connected to microcontroller using two pins, it is communicating with the microcontroller through I2C communication.

Relay and buzzer is controlled by the microcontroller using single pins, Ie giving high means device will switch on and vice versa. Sometimes it may be interchange according to the transistor used to drive the device.

LCD (LIQUID CRYSTAL DISPLAY)

LCD’s can add a lot to your application in terms of providing a useful interface for the user, debugging an application or just giving it a "professional" look. The most common type of LCD controller is the Hitachi 44780 that provides a relatively simple interface between a processor and an LCD. Inexperienced designers do often not attempt using this interface and programmers because it is difficult to find good documentation on the interface, initializing the interface can be a problem and the displays themselves are expensive.
LCD has single line display, Two-line display, four line display. Every line has 16 characters.

LCD is connected to microcontroller as 4 pins for data and a single pin for register select and enable,

Using microcontroller does LCD initialization, before initialization the LCD have to wait for 30 ms delay.

The main application of LCD in this project is to display the status of MODEM, status of sensor etc.for example if the microcontroller is initializing the MODEM, if any case MODEM failed to initialize the user don't know what is happening in the system, so we are using the LCD to display the status.

RS 232 CONVERTER (MAX 232N)

RS-232 was created for one purpose, to interface between Data Terminal Equipment (DTE) and Data Communications Equipment (DCE) employing serial binary data interchange. So as stated the DTE is the terminal or computer and the DCE is the modem or other communications device. RS-232 pin-outs for IBM compatible computers are shown below. There are two configurations that are typically used: one for a 9-pin connector and the other for a 25-pin connector.

9-pin RS-232 Pin-out

PIN	DESIGNATION
1	Data Carrier Detect
2	Receive Data
3	Transmit Data
4	Data Terminal Ready
5	Signal Ground
6	Data Set Ready
7	Request to Send
8	Clear to Send
9	Ring Indicator

Voltage range

The standard voltage range on RS-232 pins is _15V to +15V. This voltage range applies to all RS-232 signal pins. The total voltage swing during signal transmission can be as large as 30V. In many cases, RS-232 ports will operate with voltages as low as _5V to +5V. This wide range of voltages allows for better compatibility between different types of equipment and allows greater noise margin to avoid interference. Because the voltage swing on RS-232 lines is so large, the RS-232 signal lines generate a

significant amount of electrical noise. It is important that this signal does not run close to high impedance microphone lines or audio lines in a system. In cases where you must run these types of signals nearby one another, it is important to make sure that all audio wires are properly shielded.

The main role of the RS232 chip is to convert the data coming for the 12-volt logic to 5 volt logic and from 5 volt logic to 12 volt logic.

MODEM is communication with the microcontroller through serial port, the microcontroller will send the commands to the modem through RS 232.and the data is read through serial port therefore to make compatible computer serial port with microcontroller serial port we are using the RS 232 converter.

GSM modem (900/1800 MHz)

Semen's GSM/GPRS Smart Modem is a multi-functional, ready to use, rugged unit that can be embedded or plugged into any application. The Smart Modem can be controlled and customized to various levels by using the standard AT commands. The modem is fully type-approved, it can speed up the operational time with full range of Voice, Data, Fax and Short Messages (Point to Point and Cell Broadcast), the modem also supports GPRS (Class 2*) for spontaneous data transfer.

Description of the interfaces

The modem comprises several interfaces:

- LED Function including operating Status
- External antenna (via SMA)
- Serial and control link
- Power Supply (Via 2 pin Phoenix ^{tm} contact)
- SIM card holder

LED Status Indicator

The LED will indicate different status of the modem:

- OFF Modem Switched off
- ON Modem is connecting to the network
- Flashing Slowly Modem is in idle mode
- Flashing rapidly Modem is in transmission/communication (GSM only)

GSM is one of the latest mobile technologies using smart MODEM, which can easily interfaced to embedded microcontrollers. Now everything is going to be automated using this technology, using this technology we can access the devices remotely. Using GSM and GPS now we can identify the people, vehicles etc in any where of the world.

MODEM is communicating with the microcontroller using AT commands, for example if we want to send an SMS to number 98xxxxxxxxx,the commands we have to send is AT+CMGS="<98xxxxxxxxxx>", <enter>, <message>, <ctrl-Z>.

In this project it is used to send SMS to the owners mobile when somebody entered the home without permission.

PROTOTYPING

In electronics, prototyping means building an actual circuit to a design to verity that it works, and to provide a physical plat forms for debugging it, it does not work. Prototyping sometimes converts intangible specifications into a tangible but limited working model of the desired information system**.**

CLASSIFICATION OF SYSTEM PROTOTYPES

System prototypes could be classified into:

1. Evolutionary prototype: This design is adapted for permanent use after the ideas are clarified and must be built using the program tools that will be used for the final system.

2. The throwaway prototype: This design is to be discarded after utilization, basically it is to test ideas and is especially useful for comparing alternative designs for part of a system.[**3]**

STEP INVOLVED IN PROTOTYPING

1. Identify the user's known information requirements and features needed in the system.
2. Develop a working prototype.
3. Use the prototype, noting need enhancements and changes; this expands the list of known system requirements.
4. Revise the prototype based on information gained through user experience.
5. Repeat these steps as needed to achieve a satisfactory system.

ADVANTAGES OF PROTOPING

1. Requires user involvement.
2. It helps to refine the potential risks associated with the delivery of the system being developed.
3. Prototyping facilitates system implementation since users know what to expect and exposed developers to potential future system enhancements.

4. User can point to features they like or dislike and so indicate shortcomings in an existing and working system more easily, and then they can describe them in a theoretical or proposed system.

SWITCHING CIRCUIT

This circuit is made up of BC 337 transistor switching circuit; each circuit is connected to a relay, a transistor and diode. The relay when activated, ON or OFF any appliance connected to it. The three lives from the microprocessor are each connected respectively to the BASE pin of the three corresponding transistor.[6]The circuit is the heart of this module. It comprises of 9-pin Dip-male connector, Max-232, 8051 microprocessor, crystal oscillator.

The circuit connects directly to the computer serial port through a pin cable. The MAX- 232 amplifies signal (VS) that goes into the microprocessor from the computer system through the serial cables. Serial data is transmitted from the PC as a series of positive and negative voltage on a single wire, which serial data occurred at a pre-determined time established by the base wire.

The 11-0597MHZ crystal oscillator determines the speed of the 8051 microprocessor used. The microprocessor is connected to the three BC B37A transistor that derives the three relays. Pin 2 an d3 of the serial port are connected to line 14 and 13 of the MAX- 232**.**

4. METHODOLOGY

4.1 Event List :

Users login to the system

User changes the system mode

Superuser creates new users

Superusers assigns permissions

User decides the camera view seen from web

Water sensor calls the fire department

Water sensor updates water sensor status

Water sensor sends SMS to the users

PIR sensor calls the police

PIR sensor updates PIR sensor status

PIR sensor records the view to the database

PIR sensors sends SMS to the users

Gas sensor calls the fire department

Gas sensor updates gas sensor status

Gas sensor sends SMS to the users

System transmits the camera view to web

Temperature sensor updates temperature sensor status

4.2 The Create User Use-Case

Name: Create user

Description:

This use-case starts when the superuser decides to create a new user and logs in the system grants access rights to them.It ends when the new user is created.

Author:

Betul GULBAGCI

Precondition:

Superuser decides to create a new user

Postcondition:

A subuser is created and access righs are given to him by superuser

Trigger Events:

Superuser creates new users

Superuser assigns permissions

Actor:

Superuser

Standard Path:

The superuser decides to create a new user and then gives a username, password and grants permission to the new user

Alternate Pathways:

None

Exception Pathway:

The superuser try to create a new user with an already existing username.

4.3 The Remote Management Use-Case

Name: The Remote Management

Description:

This use-case starts when the user connects the system.The camera view and the system

mode is changed.It ends when the user logs out the system.

Author:

Betul GULBAGCI

Precondition:

The user connects the system.

Postcondition:

A different camera view is captured

With the changing the system mode, some of the sensors start/stop working

Trigger Events:

Users logs in the system,

User changes the system mode,

User decides the camera view seen from web

Actor:

User

Standard Path:

User changes the camera view

Alternate Pathways:

User changes the system mode

Exception Pathways:

User tries to login with a wrong username or password

4.4 The Calling Use-Case

Name: The Calling

Description:

This use-case starts when one of the sensors works. The system calls the Fire Dept., User, Police Dept. This ends when calling process ends.

Author:

Adem Delibaş

Precondition:

The sensor starts to work.

Postcondition:

An SMS is sent to the user.

The fire dept. or police dept.is called by the system.

Trigger Events:

Water sensor calls the fire department

Water sensor sends SMS to the users

PIR sensor calls the police

PIR sensors sends SMS to the users

Gas sensor calls the fire department

Gas sensor sends SMS to the users

Actors:

Water sensor

PIR

Gas sensor

Standard Path:

One of the PIR, water and gas sensor sends SMS to user

Alternate Pathways:

Water sensor works and system calls the fire department

PIR sensor works and the system calls the police

Gas sensor works and the system calls the fire department

Exception Pathways:

User's celular phone can be off

Police dept. can not be reached

Fire dept. Can not be reached

4.5 The Maintain Sensor Status Use-Case

Name: Maintain Sensor Status

Description:

This use-case starts when one of the sensors works. The system updates the working status and use case ends.

Author:

Precondition:

The sensor starts to work.

Postcondition:

Status of the sensor is updated on web for informing the users

Trigger Events:

Water sensor updates water sensor status

PIR sensor updates PIR sensor status

Gas sensor updates gas sensor status

Temperature sensor updates the value of temperature on web

Actors:

Water sensor

PIR

Gas sensor

Temperature sensor

Standard Path:

The value of tempreture is updated on web.

Alternate Pathways:

PIR sensor status is updated

Water sensor status is updated

Gas sensor status is updated

Exception Pathways:

None

4.6 The Record Camera View Use-Case

Name: The Record Camera View

Description:

This use-case starts when PIR sensor works. This ends when view recorded to the database.

Author:

Precondition:

The PIR sensor starts to work.

Postcondition:

Current view of the camera is recorded to the database.

Trigger Events:

PIR sensor records the view to the database

Actors:

PIR

Standard Path:

The view is recorded to the database.

Alternate Pathways:

Exception Pathways:

System can not connect to the database

4.7 The Capture Camera View Use-Case

Name: Capture Camera View

Description:

This use-case starts and never ends.

Author: baba

Precondition:

Postcondition:

View of the camera is captured and transmitted to the web.

Trigger Events:

System transmits the camera view to web

Actors:

Alternate Pathways:

Exception Pathways:

System can not connect to the database

4.8 The Create User Standard Path

The superuser decides to create a new user and then gives a username, password and grants permission to the subuser

1- The superuser login.
2- The superuser clicks on the “create new user ” link.
3- The superuser assigns a usernamed to the new user.
4- The superuser assigns a password to the new user.
5- The superuser can grant mode changing right to the new user.
6- The superuser can grant camera view changing right to the new user.
7- The superuser can grant being informed by SMS right to the new user.
   7.1- The superuser records the GSM number of new user to the system.

4.9 The Remote Management Standard Path

User changes the camera view

1- The user login
2- The user selects a different view from list.
3- The new camera view begin to be transmitted to the web.

4.10 The Calling Standard Path

One of the PIR, water and gas sensor sends SMS to user

1-The PIR, water or gas sensor works.
2-System determines which sensor works.
3-System sends SMS to the users and informs the user in the emergency occasion.

4.11 The Maintain Sensor Status Standard Path

The value of tempreture is updated on web.

1- Temperature of the room changes.
2- Temperature sensor informs the system about the new temperature.
3- The value of temperature on web is updated.

4.12 The Record Camera View Standard Path

The view is recorded to the database.

1-PIR sensor works.
2-The camera view is recorded to the database.

4.13 The Capture Camera Standard Path

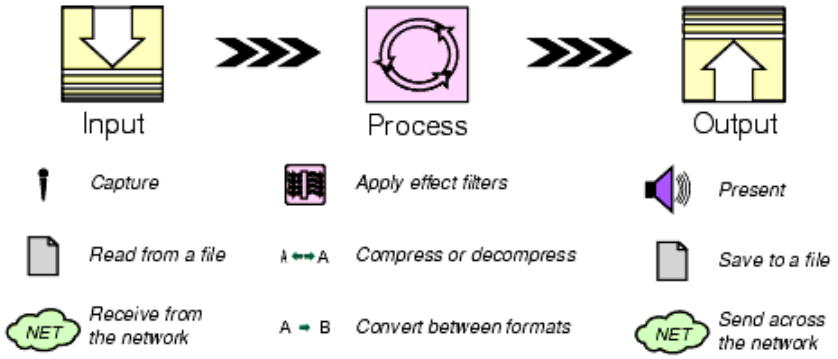
The view is recorded to the database.

Capture Camera View

Time-based media is captured from a digital camera for processing. This capturing can be thought of as the input phase of the standard media processing model. The camera sends streaming media to connected computer. In this application, connected computer is server part of the main system.

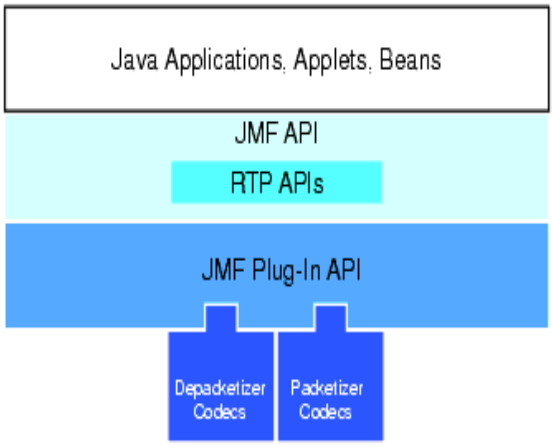
To capture media data from the camera, we get the device's Media Locator from its Capture Device Info object.

Then, using the javax.swing.media package, we create a Processor object which converts the coming image to RGB format .This process is shown below:



After the captured media is encoded, it is sent to network or Internet using transmitting feature of the program part. But to make the transmitting faster, the media is converted into JPEG or H263 format. If we send it by its original format, the ratio of size of sent package to sent video will be low. The server broadcasts media over the internet.

The client is an applet which is connected to server by Session Manager object. It is used to coordinate the RTP session. The applet class implements from a Receive Stream-Listener, so when an incoming stream occurs it displays the video on the center panel. The codecs decompresses the media to format which Player object can understand. So the user can watch each part of the house only switching the open sessions which are coming from the server.



HSS User Interface

The HSS comes with easy to use user interfaces to enable the users to access and direct the system. We developed two types of interfaces: a web interface to access the system with TCP/IP connection using a browser, a wap interface to access the system with a mobile phone using Wireless Application Protocol-WAP.

Web Interface

The HSS provides users to access and direct the system from web. Users can connect internet and watch the condition of their home whenever they want. We used Java Server Pages, JSP and Servlets to develop this interface. Figure 3.1.5.1.1 shows this web interface after superuser logged in system.
In HSS, there are two user types: user and superuser. For each home, there is only one superuser. A superuser has all the rights; that are:

-changing system mode
-changing the room that is watched
-being sent SMS

Figure 3.1.5.1.1 HSS Web Interface After superuser logged in

Moreover superuser is able to create new users and reconfigure home mode (Figure 3.1.5.1.2). To create a new user, he gives a new username and password to system for each user and assigns rights that he wants them to have.

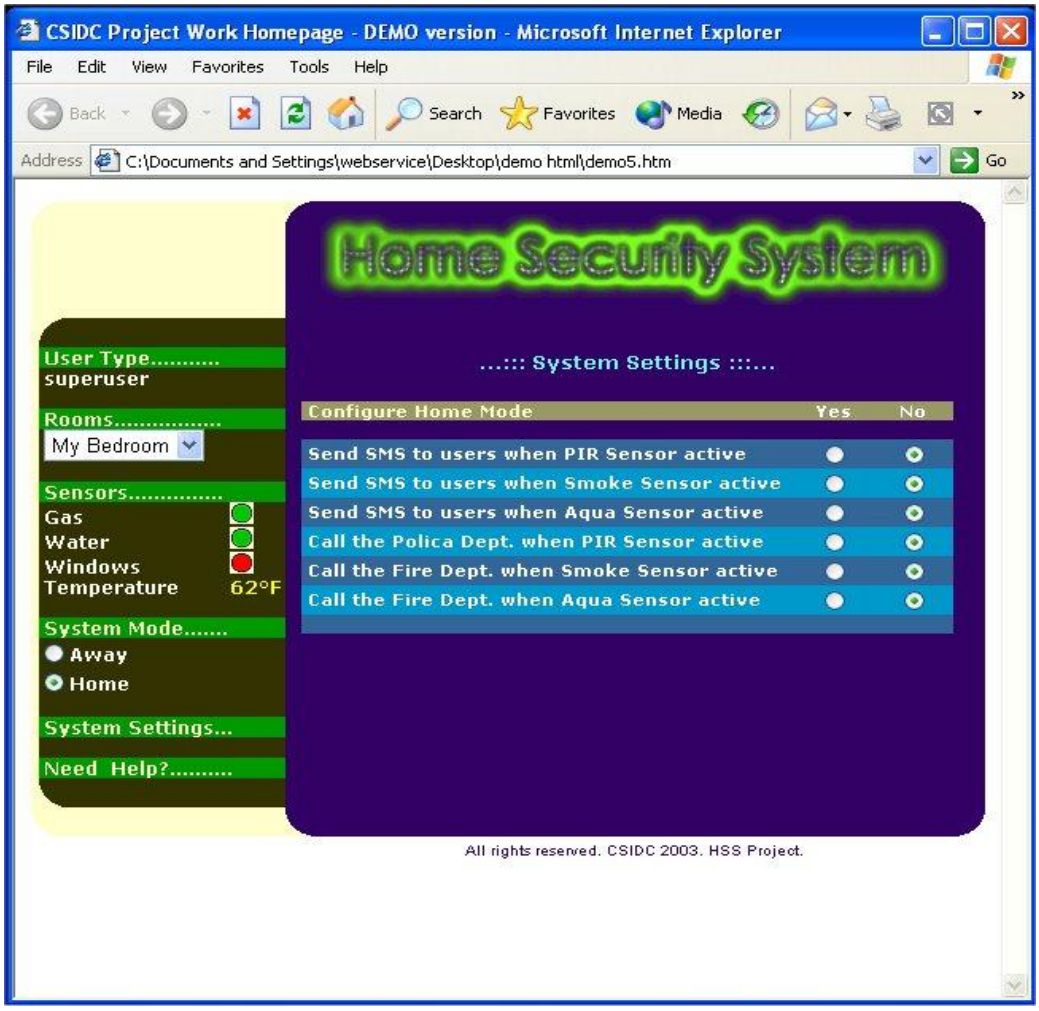


Figure 3.1.5.1.3 Reconfigure *Home Mode*

Web interface lets users

-Watch the camera views

-Switch to different views

-See the status of sensors (whether they are detecting at current time)

-See the temperature of the room

-Change the system mode

-Create new users only if logged in user is “superuser”.

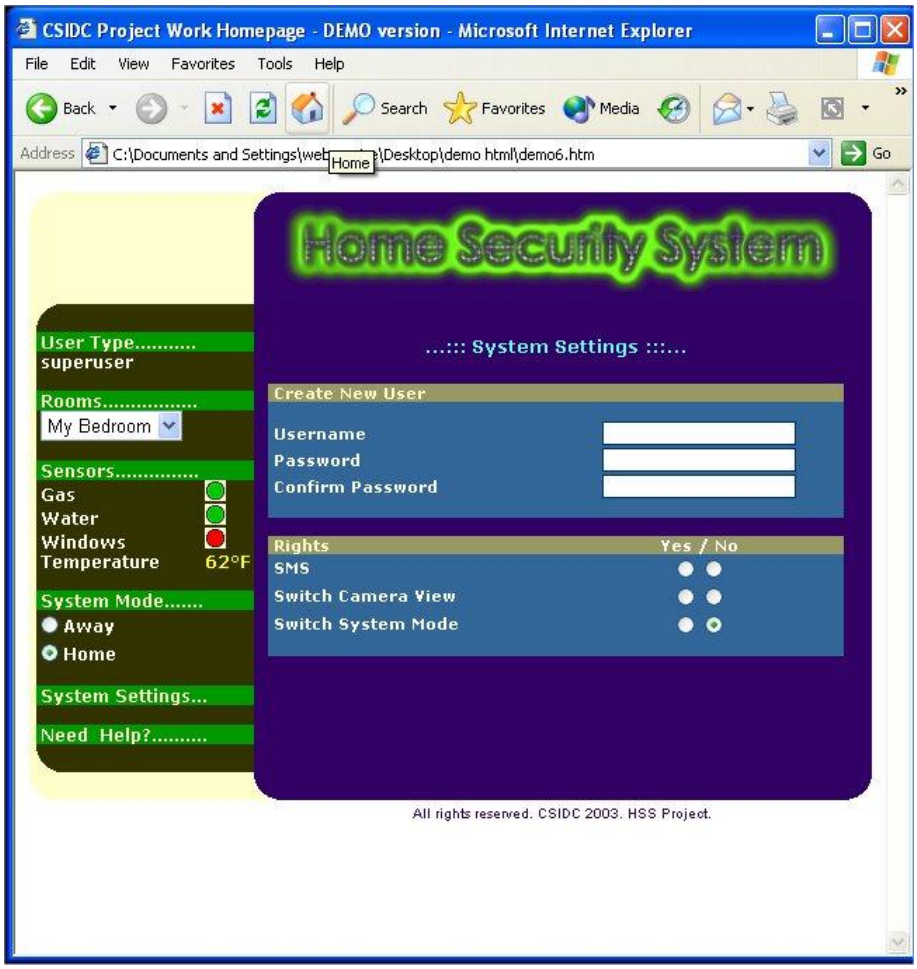


Figure 3.1.5.1.3 Create *New User*

WAP Interface

The HSS provides users to access and direct the system from wap-enabled mobile phone. This part, explains about the wap interface between user and the system. To develop this interface we used *Openwave SDK 6.2.*
With this WAP interface the user is able to change the system mode and get information about sensor current status. To achieve those activities:

-The user connects to wap server of the HSS (Figure 3.1.6.1)
-The user logs in to system with his username and password (3.1.6.2)

To get information about current status of the sensors in the system, the user selects *Sensor Info* from main menu (Figure 3.1.6.3), then current status of sensor shown on phone screen by the system
(Figure 3.1.6.5).In this figure, we see gas and aqua sensors are not detecting, so there is no such problem in home. However, windows are not OK, means somebody opened it and PIR sensor on this window start detecting.

Figure 3.1.6.1 Connect HSS WAP Server

Figure 3.1.6.2 Login to HSS WAP Server

To change the system mode, user chooses this option from menu (Figure 3.1.6.3) and selects the new mode of the system (Figure 3.1.6.4)

Figure 3.1.6.3 Main Menu

Figure 3.1.6.3 Main Menu

Figure 3.1.6.5 Sensor Status

5. RESOURCE AND LIMITATIONS

5.1 Sensors Module

In HSS, different kinds of sensors are mounted to home. Sensors we used in our system are:

- temperature sensor
- Passive Infra-Red Sensor(PIR)-SP 1200
- smoke/gas sensor

Sensors are connected to Sensor Module. We chose this module because we need an intermediate unit which provides a number of sensors to connect PC's serial port. Also, status of those sensors used in the system can easily be read by means of this module Sensor Module provides high speed serial port connection. It consists of one or more RS232-based networkable modules that are connected together to a single serial port on PC. The 8-port sensing station features 8 general purpose sensors which are continually monitored, and whose status can be read remotely by the PC.
Features of the module:

- Sensors: Eight TTL-compatible sensor ports
- Status: Event detections latched until read
- Sensitivity: Each port individually adjustable

For communication with PC, status bytes are sent to PC's serial port. The format of the status byte during READ operation is:

S8	S7	S6	S5	S4	S3	S2	S1

Where S_N = Status of sensor #N (1 = sensor active (detecting), 0 = sensor inactive)

Since we have four sensors in this implementation, S8, S7, S6 and S5 are always 0. S1 is used for smoke sensor, S2 for aqua sensor, S3 for PIR sensor and S4 for temperature. Figure shows the algorithm used to understand which sensors detecting.

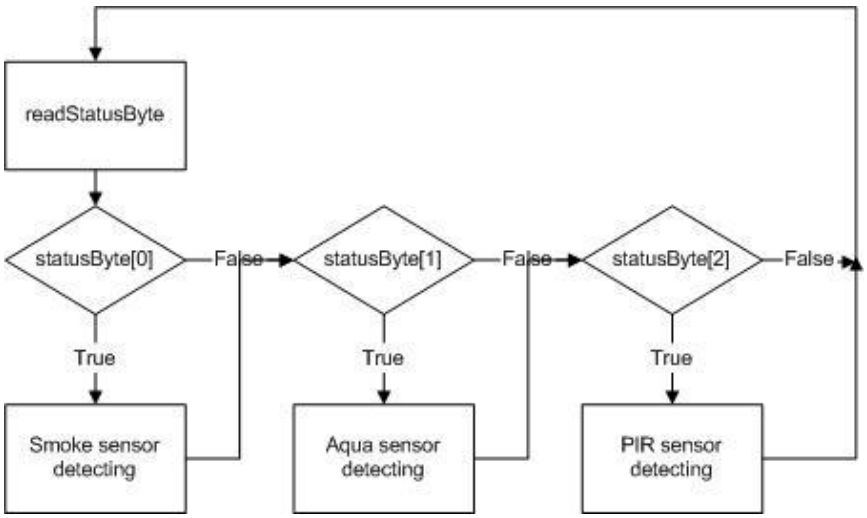


Figure Algorithm to understand which sensors work

5.2 System Modes

The HSS provides various functionalities for users to make their home secure such as:

-Detect fire in home,

-Detect thief in room,

-Detect water flood in home,

-Inform the users by SMS about the fire or smoke in their home,

-Inform the users by SMS about the open doors and windows in their home (which possibly means there is someone not desired in home),

-Dial the Police Department when it detects someone suspected in home,

-Dial the Fire Department when it detects fire in home

Although all this services are desired when the household is away, some of them may not be wanted when the house owners are home. For example, when they are home, they will, not surprisingly, open doors and windows. Receiving an SMS whenever household opens any door or window possibly will be disturbing. By considering this situation, we defined two different modes in which the HSS works: *home* and *away*

.

5.2.1 Away Mode

In away mode, all functionalities listed above are provided to users because the time in which homes or offices need most security precaution is when all household is away. Also, in a situation where children are left at home but parents are away, mode of the HSS can be arranged to “away”.

5.2.2 Home Mode

In home mode, some of provided functionalities of the HSS can be deactivated by the user. As default, we eliminate following functionalities in “home mode”:

- Inform the users by SMS about the open doors or windows in their home
- Dial the Police Department when it detects open doors or windows which may mean there is someone suspected in home when household is away.

However, the HSS allows the user to reconfigure home mode as he desires. The HSS makes it possible for the users to change mode of the system by using web interface (see section 3.1.5.1) or WAP interface

Calling Unite (GPRS Modem)

The HSS informs the user by SMS when sensors in the system detect smoke, water flood or theft. There we developed a calling unit which consists of a software called Calling and a GPRS modem (as a GPRS modem we used SIEMENS M20).
This modem is connected to PC's serial port via a data cable.
To send SMS and dial via this modem, we needed to write corresponding AT commands to serial port of the PC. AT commands to dial and to send SMS shown below:

AT command to dial phoneNumber → ATD"phoneNumber"

AT commands to send "messageString" to "phoneNumber" as SMS →

AT+CMGF=1

AT+CMGS="phoneNumber"\r\n"messageString"CTRL-Z

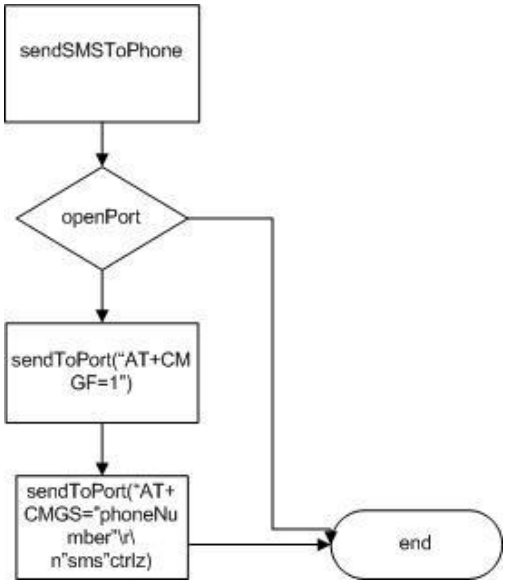


Figure State Diagram for Sending SMS

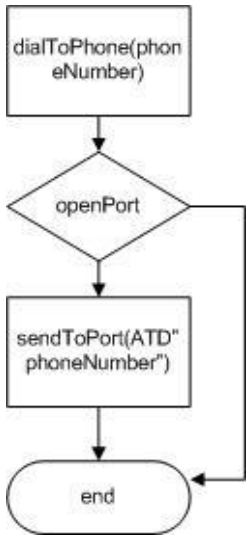
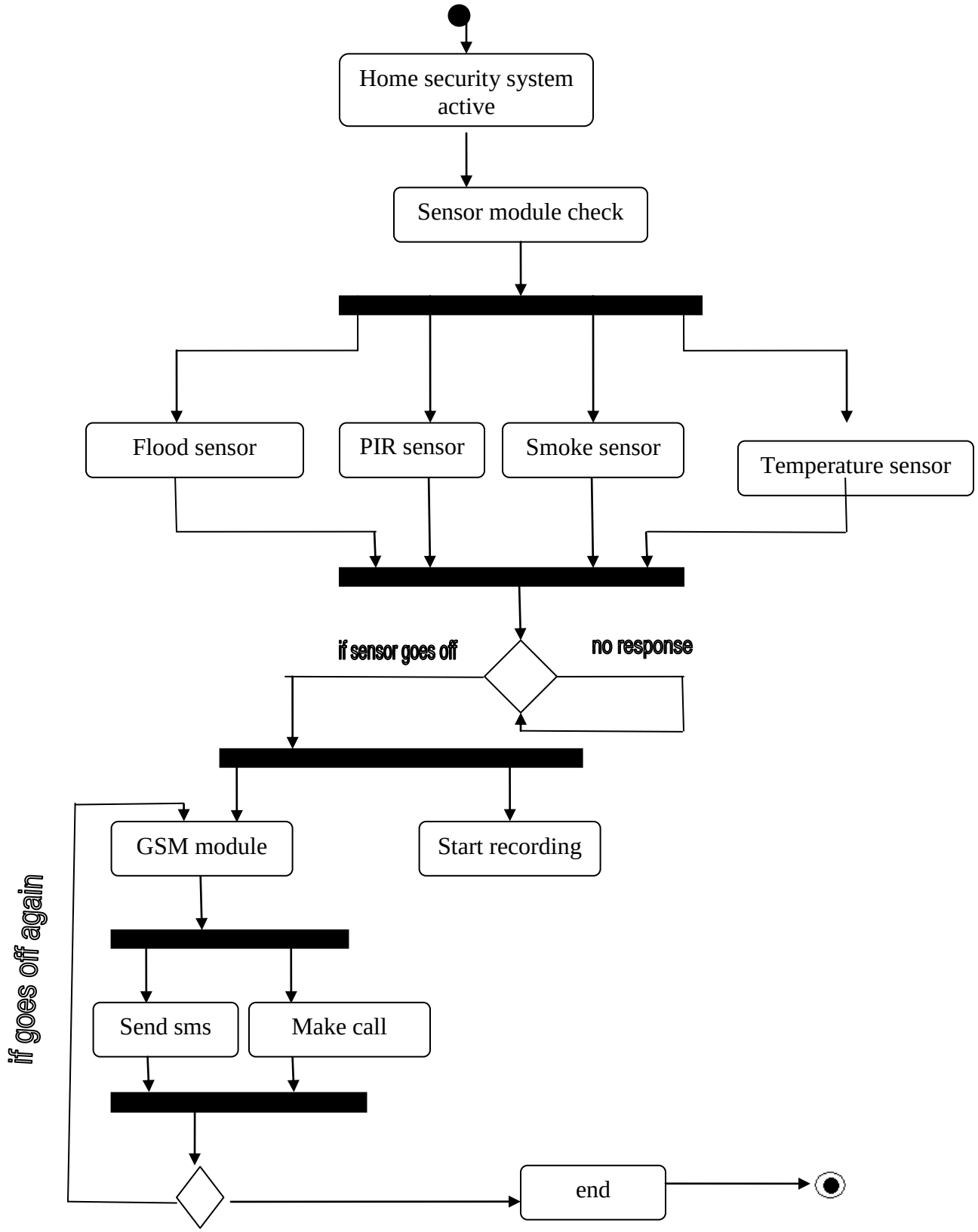


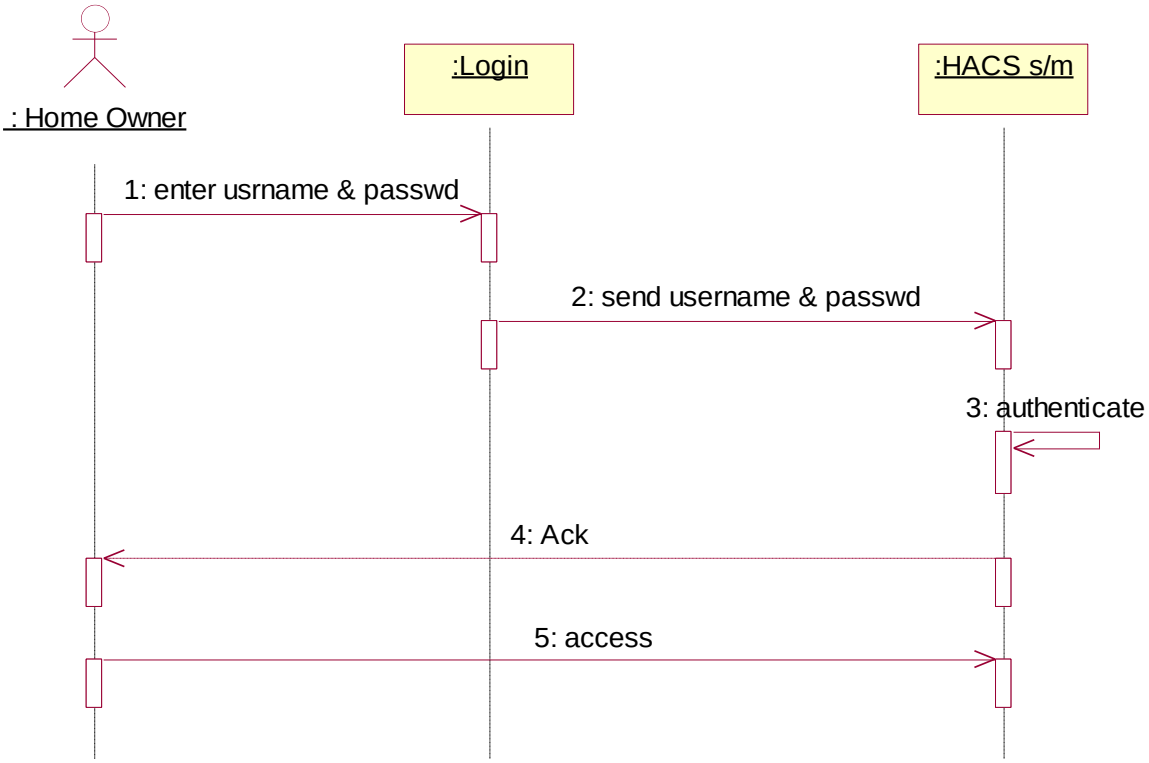
Figure State Diagram for Dialing

6. PROCESS DESCRIPTION

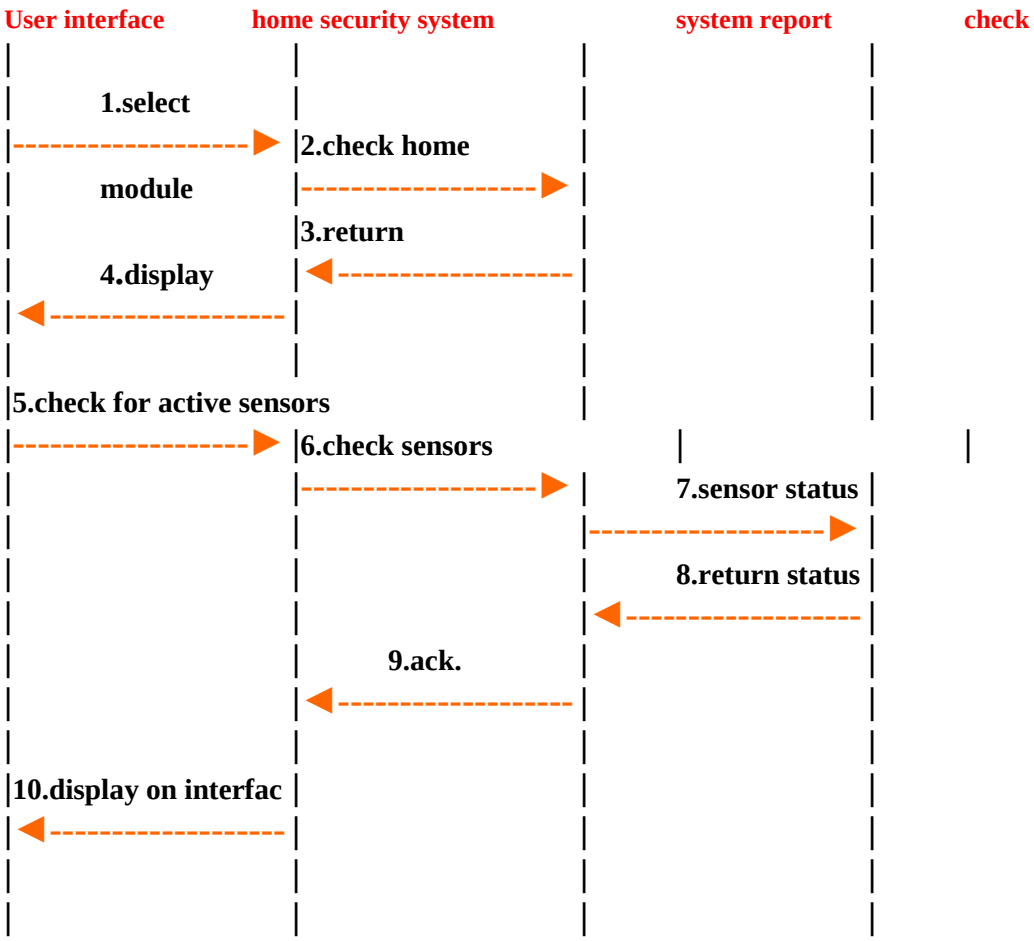


6.1 SEQUENCE DIAGRAMS

6.1.1 Sequence Diagram for User login authentication:

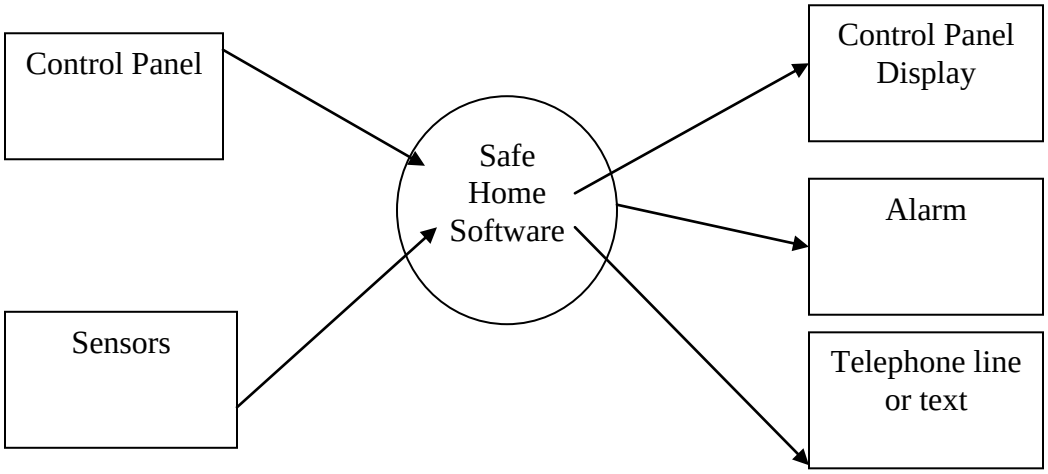


6.1.2 SEQUENCE DIAGRAM FOR SENSORS CHECK:

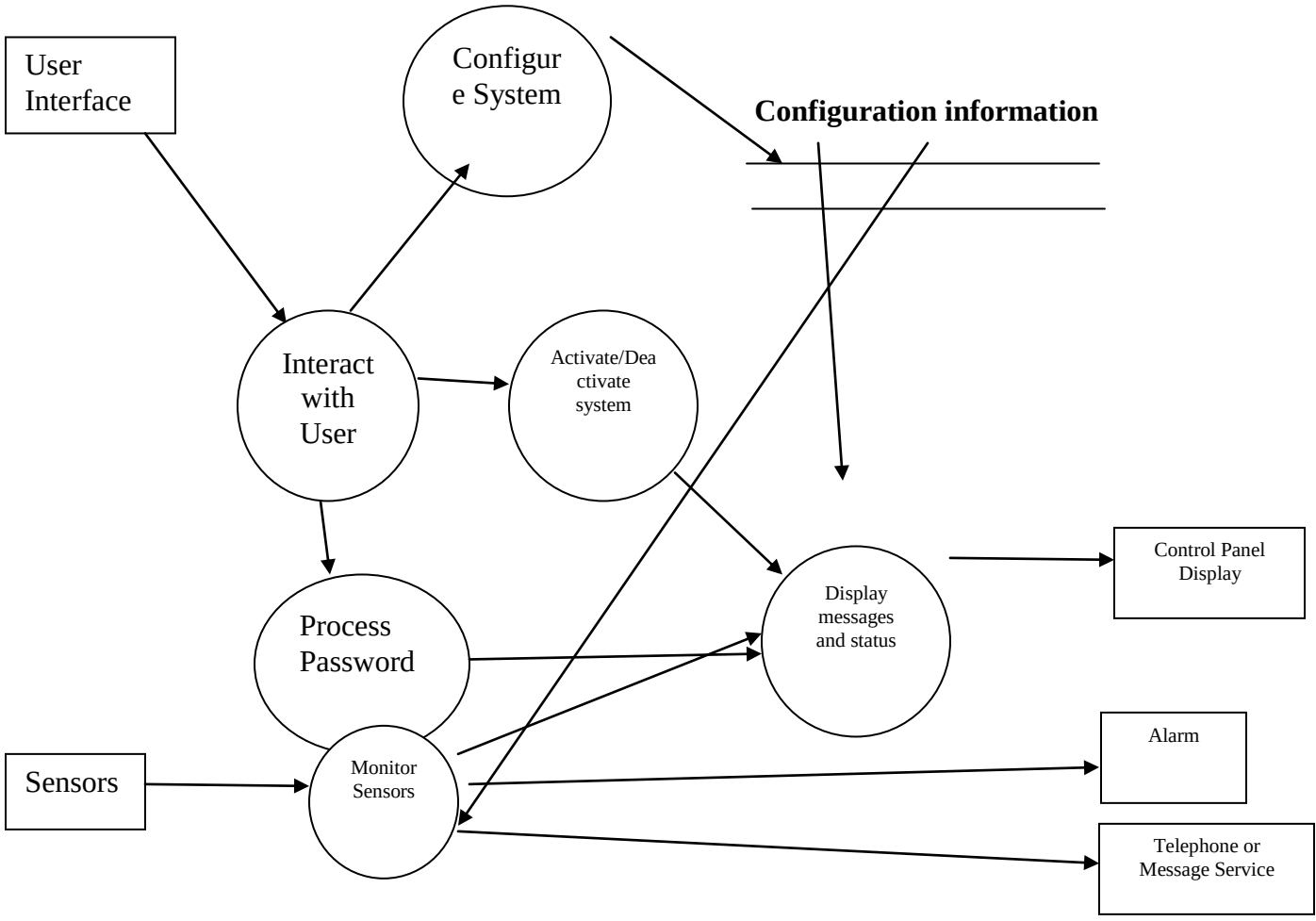


6.2 DATA FLOW DIAGRAMS

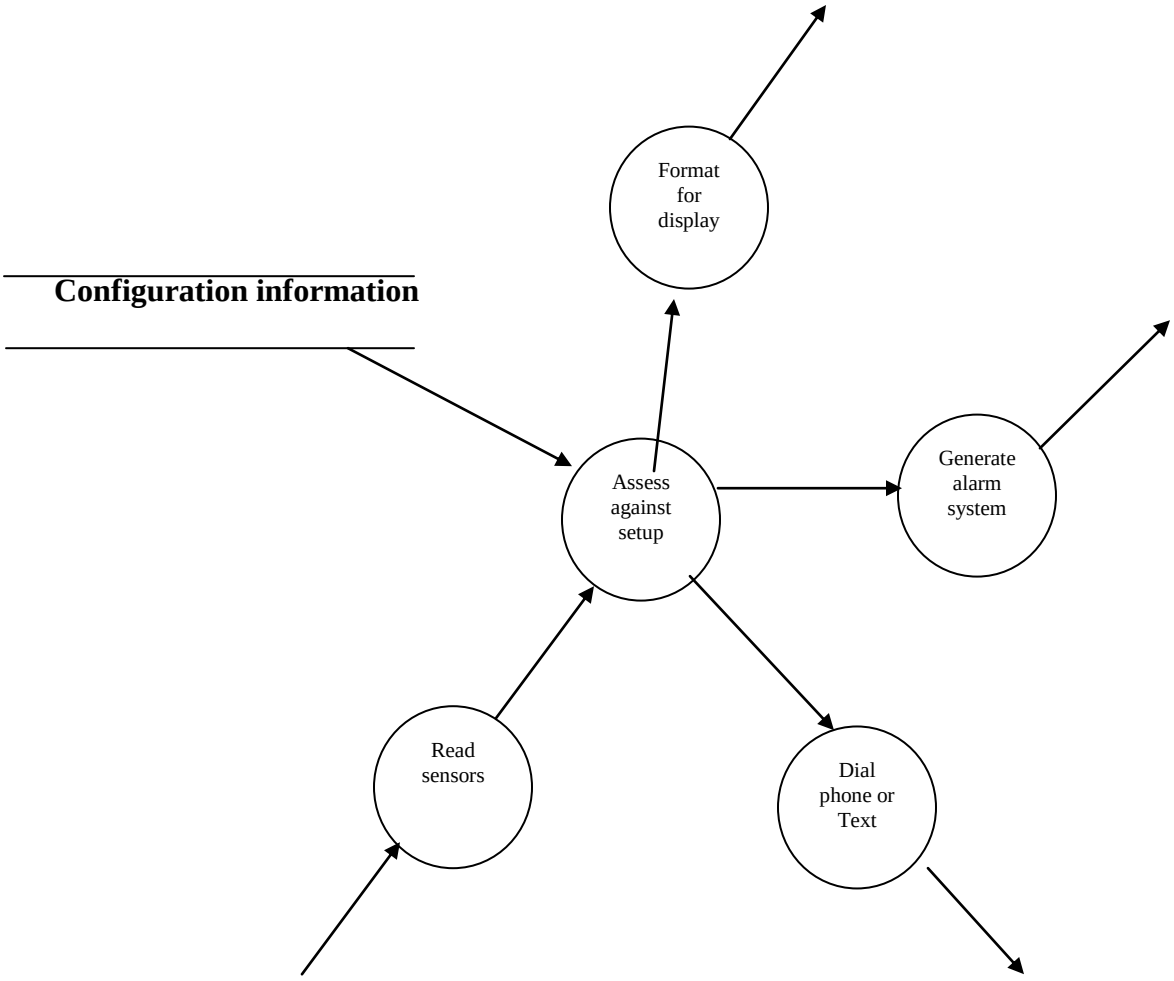
6.2.1 Context Level DFD for home security system:



6.2.2 Level 1 DFD for Home Security System:



6.2.3 Level2 DFD for monitoring sensors transform:



7. EXPLANATION OF EACH MODULE

Types of sensors:-

7.1 PIR sensor

A Passive InfraRed sensor (PIR sensor) is an electronic device that measures infrared (IR) light radiating from objects in its field of view. PIR sensors are often used in the construction of PIR-based motion detectors. Apparent motion is detected when an infrared source with one temperature, such as a human, passes in front of an infrared source with another temperature, such as a wall.

All objects emit what is known as black body radiation. It is usually infrared radiation that is invisible to the human eye but can be detected by electronic devices designed for such a purpose. The term passive in this instance means that the PIR device does not emit an infrared beam but merely passively accepts incoming infrared radiation. "Infra" meaning below our ability to detect it visually, and "Red" because this color represents the lowest energy level that our eyes can sense before it becomes invisible. Thus, infrared means below the energy level of the color red, and applies to many sources of invisible energy Design.

Infrared radiation enters through the front of the sensor, known as the sensor face. At the core of a PIR sensor is a solid state sensor or set of sensors, made from an approximately 1/4 inch square of natural or artificial pyroelectric materials, usually in the form of a thin film, out of gallium nitride (GaN), caesium nitrate ($CsNO_3$), polyvinyl fluorides, derivatives of phenylpyrazine, and cobalt phthalocyanine. (See pyroelectric crystals.) Lithium tantalate ($LiTaO_3$) is a crystal exhibiting both piezoelectric and pyroelectric properties.

In a PIR-based motion detector (usually called a PID, for Passive Infrared Detector), the PIR sensor is typically mounted on a printed circuit board containing the necessary electronics required to interpret the signals from the pyroelectric sensor chip.

7.2 Smoke sensor:

A smoke detector is a device that detects smoke, typically as an indicator of fire. Commercial, industrial, and mass residential devices issue a signal to a fire alarm system, while household detectors, known as smoke alarms, generally issue a local audible and/or visual alarm from the detector itself.

Smoke detectors are typically housed in a disk-shaped plastic enclosure about 150 millimetres (6 in) in diameter and 25 millimetres (1 in) thick, but the shape can vary by manufacturer or product line. Most smoke detectors work either by optical detection (photoelectric) or by physical process (ionization), while others use both detection methods to increase sensitivity to smoke. Sensitive alarms can be used to detect, and thus deter, smoking in areas where it is banned such as toilets and schools. Smoke detectors in large commercial, industrial, and residential buildings are usually powered by a central fire alarm system, which is powered by the building power with a battery backup. However, in many single family detached and smaller multiple family housings, a smoke alarm is often powered only by a single disposable battery.

7.2 Temperature sensor:

A temperature sensor is a device that gathers data concerning the temperature from a source and converts it to a form that can be understood either by an observer or another device. Temperature sensors come in many different forms and are used for a wide variety of purposes, from simple home use to extremely accurate and precise scientific use. They play a very important role almost everywhere that they are applied.

The best known example of a temperature sensor is the mercury-in- glass thermometer. Mercury expands and contracts based on changes in temperature; when these volume changes are quantified, temperature can be measured with a fair degree of accuracy.

7.3 WAP Interface

The HSS provides users to access and direct the system from wap-enabled mobile phone. This part, explains about the wap interface between user and the system.

With this WAP interface the user is able to change the system mode and get information about sensor current status. To achieve those activities:

-The user connects to wap server of the HSS

-The user logs in to system with his username and password

To get information about current status of the sensors in the system, the user selects *Sensor Info* from main menu then current status of sensor shown on phone screen by the system , we see sensor is not detecting, so there is no such problem in home. However, windows are not OK, means somebody opened it and PIR sensor on this window start detecting.

7.4 Web Interface

The HSS provides users to access and direct the system from web. Users can connect internet and watch the condition of their home whenever they want. We used Java Server Pages, JSP and Servlets to develop this interface.
In HSS, there are two user types: user and superuser. For each home, there is only one super user. A superuser has all the rights; that are:

-changing system mode
-changing the room that is watched
-being sent SMS

Moreover superuser is able to create new users and reconfigure home mode To create a new user, he gives a new username and password to system for each user and assigns rights.

Web interface lets users

-Watch the camera views
-Switch to different views
-See the status of sensors (whether they are detecting at current time)
-See the temperature of the room
-Change the system mode
-Create new users only if logged in user is “superuser”.

8. SOFTWARE REQUIREMENTS SPECIFICATION

Ultimately the requirement phase translates the ideas whatever is in the mind of client (the input) into a formal document (the output of the requirement phase.). In a more general way the SRS is a document that completely describes "What" the proposed system should do without describing "How" the software will do it.

FEASIBILITY STUDY

The feasibility study concerns with the consideration made to verify whether the system fit to be developed in all terms. Once an idea to develop software is put forward the question that arises first will pertain to the feasibility aspects.

There are different aspects in the feasibility study:

- Operational Feasibility.
- Technical Feasibility.
- Economical Feasibility.

OPERATIONAL FEASIBILITY:

There in no difficulty in implementing the system, if the user has the knowledge in internal working of the system. Therefore, it is assumed that he will not face any problem in running the system. The main problem faced during development of a new system is getting acceptance from the users. As users are responsible for initiating the development of a new system this is rooted out.

TECHNICAL FEASIBILITY:

Technical feasibility deals with the study of function, performance, and constraints like resources availability, technology, development risk that may affect the ability to achieve an acceptable system.

ECONOMICAL FEASIBILITY:

One of the factors, which affect the development of a new system, is the cost it would incur. The existing resources available in the company are sufficient for implementing the proposed and hence no extra cost has to be incurred to run the system developed. Thus, the system is financially feasible.

9. SYSTEM REQUIREMENTS

HARDWARE REQUIREMENTS (MININUM)

CPU : 1.6 GHz
RAM : 384 MB
DISPLAY : 1024*768 Monitor
Hard Disk : 8 GB

SOFTWARE REQUIREMENTS

OS : Windows XP/Vista/7
Software : Microsoft Visual Studio 2008

SDLC MODEL USED

To develop software a particular development strategy is used which encompasses the process, methods and tools. The strategy is often referred to as process model of Software Engineering Paradigm. A process model for software is chosen based in the nature of the project and application, the methods and tools to be used and the controls and deliverables that are required. The model which is being used in this project development is WATERFALL MODEL.

WATERFALL MODEL

The waterfall model derives its name due to the cascading effect from one phase to the other as is illustrated in Figure1.1. In this model each phase well defined starting and ending point, with identifiable deliveries to the next phase.

Note that this model is sometimes referred to as the linear sequential model or the software life cycle. The model consists of six distinct stages, namely:

1. REQUIREMENTS ANALYSIS

In the requirements analysis phase:
(a) The problem is specified along with the desired service objectives (goals).
(b) The constraints are identified.

2. SPECIFICATION PHASE

In the specification phase the system specification is produced from the detailed definitions of (a) and (b) above. This document should clearly define the product function.
Note that in some text, the requirements analysis and specifications phases are combined and represented as a single phase.

3. SYSTEM AND SOFTWARE DESIGN PHASE

In the system and software design phase, the system specifications are translated into a software representation. The software engineer at this stage is concerned with:

a. Data structure
b. Software architecture
c. Algorithmic detail and
d. Interface representations

The hardware requirements are also determined at this stage along with a picture of the overall system architecture. By the end of this stage the software engineer should be able to identify the relationship between the hardware, software and the associated interfaces. Any faults in the specification should ideally not be passed 'down stream'.

4. IMPLEMENTATION AND TESTING PHASE

In the implementation and testing phase stage the designs are translated into the software domain:

- Detailed documentation from the design phase can significantly reduce the coding effort.

- Testing at this stage focuses on making sure that any errors are identified and that the software meets its required specification.

5. INTEGRATION AND SYSTEM TESTING PHASE

In the integration and system testing phase all the program units are integrated and tested to ensure that the complete system meets the software requirements. After this stage the software is delivered to the customer [Deliverable – The software product is delivered to the client for acceptance testing.]

MAINTENANCE PHASE

The maintenance phase the usually the longest stage of the software. In this phase the software is updated to:

- Meet the changing customer needs
- Adapted to accommodate changes in the external environment
- Correct errors and oversights previously undetected in the testing phases
- Enhancing the efficiency of the software

Observe that feed back loops allow for corrections to be incorporated into the model. For example a problem/update in the design phase requires a 'revisit' to the specifications phase. When changes are made at any phase, the relevant documentation should be updated to reflect that change.

10. SUMMARY

The HSS is a security system for homes and offices, and it is developed to make offices and,especially, homes much more secure. Although there are existing security systems for homes, the HSS differs from them in many ways.

First, it combines different security techniques, such as sensors and cameras. Then, it makes it very easy to access and direct the system with web and WAP interfaces. Accessibility from mobile devices makes the HSS is really different from existing security systems.

The HSS has lots of beneficial effects on society. Its social impact will be very important, because people far away from their home need not to be worried about it. People will be able to watch their home and give commands to the HSS by mobile devices. In the time of emergency they will be warned by the system by SMS and at that time the necessary process (calling police, fire brigade etc.) will be done by HSS. It is also very important for the police stations because the system will help them to determine the identity of the thief by using the database that the views are recorded.

The HSS is a low-cost security system, and it is really easy to make a home secure with the HSS. What you need to make your home secure with HSS is only four different types of sensors(smoke, aqua, PIR and temperature), a camera and a PC.

The system we have developed is an experimental platform; we have successfully implemented and tested all the main functions that our system was intended to meet. In its commercial release, the system may lead to great achievements in home and office security and prevention of different dangerous situations such as fire and theft.

In further release of the HSS, the system can be extended to transmit camera view of home to the users via their mobile phones and other mobile devices like PDA.

11. CONTRIBUTION

This project contributes to a safe home OR workplace.

İt gives the user an ease to keep the premises in their control and supervision so that any unprecedented affair is avoided and humanity lives in a clean breath of safety.

FUTURE WORK

Future enhancements recommended are :

1. Work on Video Recording.
2. Storage & implementation of code on the microcontroller chip, make the sensors functional in the produced hardware
3. The limit of message length to be increased.
4. User Interface to be improved.

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[1] www.wapforum.com

[2] wireless.java.com

[3] www.gumuskaya.com

[4] msdn.microsoft.com

[5] java.sun.com

APPENDIX – A

CODING

```
#include<intrins.h>
#include<lcdrout.h>
#include<serial.h>
#include <atcommand.h>
#define lcd_string lcd_puts
#define data P1
#define RS P35
#define RW P36
#define E P37
#define ADC P0
sbit adc_smoke = P3^4;
sbit adc_temp = P2^1;
sbit Pir=P2^2;
sbit Std= P2^3;


void check_temp()
{
                                adc_temp=1;
                                adc_smoke =0;
                                Std=0;
                                ms_delay(50);
                                Std=1;
                                return(ADC);
}

void check_smoke()
{
                                adc_temp=0;
                                adc_smoke =1;
                                Std=0;
                                ms_delay(50);
                                Std=1;
                                return(ADC);
```

```
}

#define number2 "9418290989"

void main()
{                       P0=0;
                        lcd_init();
                        lcd_cmd1(0x84);
                        lcd_puts("HOME  ");
                        lcd_cmd1(0xC0);
                        lcd_puts("Security System");
                        init_serial(9600);
                        at_init();
                        clrscr();
                        while(1)
                          {
                              lcd_cmd1(0x80);
                              lcd_puts("Monitoring....");
                         if(check_temp>=40)
                          {
                               buzz=0;
                               lcd_cmd1(0x01);
                               lcd_cmd1(0x80);
                               lcd_string("Temp exceeds..");

                               send_message_at("Temp exceeds",number2);
                               buzz=1;
                          }
                          if(check_smoke>=80)
                          {

                                        buzz=0;
                                        lcd_cmd1(0x01);
                                        lcd_cmd1(0x80);
                                        lcd_string("Fire Occured.");

                                        send_message_at("Fire
OCCUR",number2);
                                        secdelay(2);
                                        buzz=1;
```

```
                                        }
                                            if(PIR==0)
                                            {
                                                        lcd_cmd1(0x01);
                                                        lcd_cmd1(0x80);
                                                        buzz=0;
                                                        lcd_puts("ENTERED ");

                                                        send_message_at("SOME ONE
    HAS ENTERED",number2);
                                                        secdelay(3);
                                                        buzz=1;

                                            }
}
```