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Chapter 1

Introduction

1.1 Introduction

In our Information System Design lab, we must create a project based on our learning outcomes of the labs. A group of three people must contribute and create the project. In our group we are three members, as supervised on the first lab me and my group members have to give unique idea of a project. We gathered several project ideas from each of the group members like Habit tracking app, e-commerce-based ideas, intruder alert system for home or residences. After gathering the ideas, we did feasibility study about the project ideas each member give, where we discussed about the scope, the advantages and the complexities of our project ideas. Then we did the market analysis of all the ideas and finally, after ranking the projects based on the above process, we found that the Intruder Alert System for Residents is the best choice for us. Intruder alert system for home use is a design that detects the presence of an intruder in restricted areas and informs the user by triggering an alarm. The system is based on hardware controller and other electronic design. The idea is quite trendy and necessary for the upcoming revolution of enhancing security based on information technology.

1.2 Objective

Our objective or goal is exactly like our project idea name. Intruder alert system presents a smart trespasser detection and alert system for home which aims to increase the amount of security as well as the likelihood of positively identifying or stopping trespassers and intruders as compared to other commonly deployed home security system. Using multiple sensors, this system can gauge the extent of danger exhibited by a person in or around the home parameters and can forward certain critical information regarding the same to homeowners as well as other specified persons such as relevant security authorities. The aim and objective of this project is to provide a cost effective and efficient security services for home use, to offer its users a paramount security.

Chapter 2

Design/Development/Implementation of the Project

2.1 Design:

2.1.1 System Design Approach: When we were finished with the planning part, we started the analysis part of our project. To do a well-organized analysis there are some procedures. The first procedure would be creating an interview questionnaire about the project. The interview guide and the answers are briefly discussed below:

2.1.2 Interview Questionnaire:

1. What different types of intruder alarms system Flamingo Security install?

Answer: Flamingo Security install's wireless and hardwired intruder alarm systems, recommended depending on the requirements of the premises. Once we have conducted a free site survey, identified strengths and weaknesses in the existing security setup (if any) and discussed clients requirements, we can then choose the best systems for clients, alongside clients.

Generally, we install three different types of burglar alarm system.

- Monitored Alarm Systems
- Self-monitored Alarm Systems
- Bell-Only Alarm Systems

2. Will the Police Come when the Alarm Goes Off?

Answer: If client have a monitored alarm system with the option of Police Response, then the ARC (Alarm Receiving Centre) will contact the police if a 'confirmed' signal is transmitted from the alarm system.

One thing should be noted that the police will only visit a property when they have verification from the Alarm Receiving Centre (ARC) confirming that they believe the alarm has sounded in a genuine situation, and not a misfire. They will accept one of three options:

- Video Verification – Involves the ARC viewing alarmed areas remotely using CCTV cameras used by the system.
- Audio verification – For this method of verification, the police will request that the ARC listens to what is happening in the premises using microphones which are part of the system.

- Sequential Verification – This involves two different detectors triggering in one instance of the alarm going off. At the first trigger, the ARC will listen in on the premises, and determine whether they can hear sounds which indicate a break-in. At this stage, the police are not informed but the ARC will call the owner or the service provider. Most monitored intruder alarm systems use Sequential Verification.

3. Does the system works at night?

Answer: Yes, the alarm systems we provide allow client to fully set or part-set the system depending on clients situational needs. So, at night client can leave the ground floor set and the first floor unset, so the client can walk around without worry.

4. Is it possible to have alarms which are not monitored?

Answer: Yes, client can have an alarm system fitted which has no monitoring and you are solely in control of it, this is referred to as a ‘bell/audible only system’ – and it should be noted that with these, the police will not be notified. Furthermore, only client are notified.

5. Are intruder alarms easy to use?

Answer: The intruder alarms we install are very user friendly, in most cases a programmed key fob will set and unset the system. A simplified user guide is provided for client, and we are always here to help, so client can call us if they have any issues. We understand the security concerns of our customers, and we understand that customer support doesn’t cease when a sale is made.

6. Are your alarms sensitive to pets?

Answer: If client have pets at home, we can install pet-immune PIR detectors that will reduce the risk of false alarm activations.

7. Will my alarm work in a power cut?

Answer: All our alarm control panels incorporate a standby battery which will power the system in the event of a mains electricity failure. The industry standard is for the battery to power the system for a min of 8 hours. If the system is armed and there is a power failure, the standby battery will hold the alarm in its status until the power comes.

2.1.3 Functional/Non-functional Requirements:

Functional Requirements:

Our targeted area is home and residents:

- Intruder emergency Response
- Detect intrusions specific to a designated area of protection
- Intruder detection and false alarm detection
- Entry Exit detection
- Perimeter Detection
- Automatically record events and incidents then suggest other users
- Perform data reduction, preferably at the source, to lessen data load
- Refine raw data to eliminate redundancy and false alarms

Non-Functional Requirements:

- The response time of the system would be immediate.
- Video camera specification.
- Utilization of the system would be nearly 100 percent
- Capability to create reports for following up on and taking corrective action on suspicious events or discovered vulnerabilities not getting immediate attention
- A site profile database, to be used by an operator to maintain a record of site-specific activity.

Functional Requirements Analysis:

- Intruder alert monitoring System: Multiple sensors will gather the sensing information of the intruder.
- The ultrasonic passive infrared (PIR) sensors are to sense biological, visual, auditory disturbance or any kind of combination of this.
- Image processing will help to detect body language, matching templates.
- The Node MCU (IoT module) will help to automate the control to analyze.
- So, the process is,



- Data analysis would be done by
 - a) Local Binary Pattern
 - b) Template Match
 - c) Deep learning

Non-Functional Requirements Analysis:

- Facial feature evaluation
- Illumination using template
- Face angle evaluation
- Prediction confidence

Complexity:

- Finding the proper intruder (Comparing faces, body heats with the perimeters).
- Complex algorithm.
- Too many false alarms (If the sensors misbehave).

2.2 Diagrams:

2.2.1 USE CASE DIAGRAM:

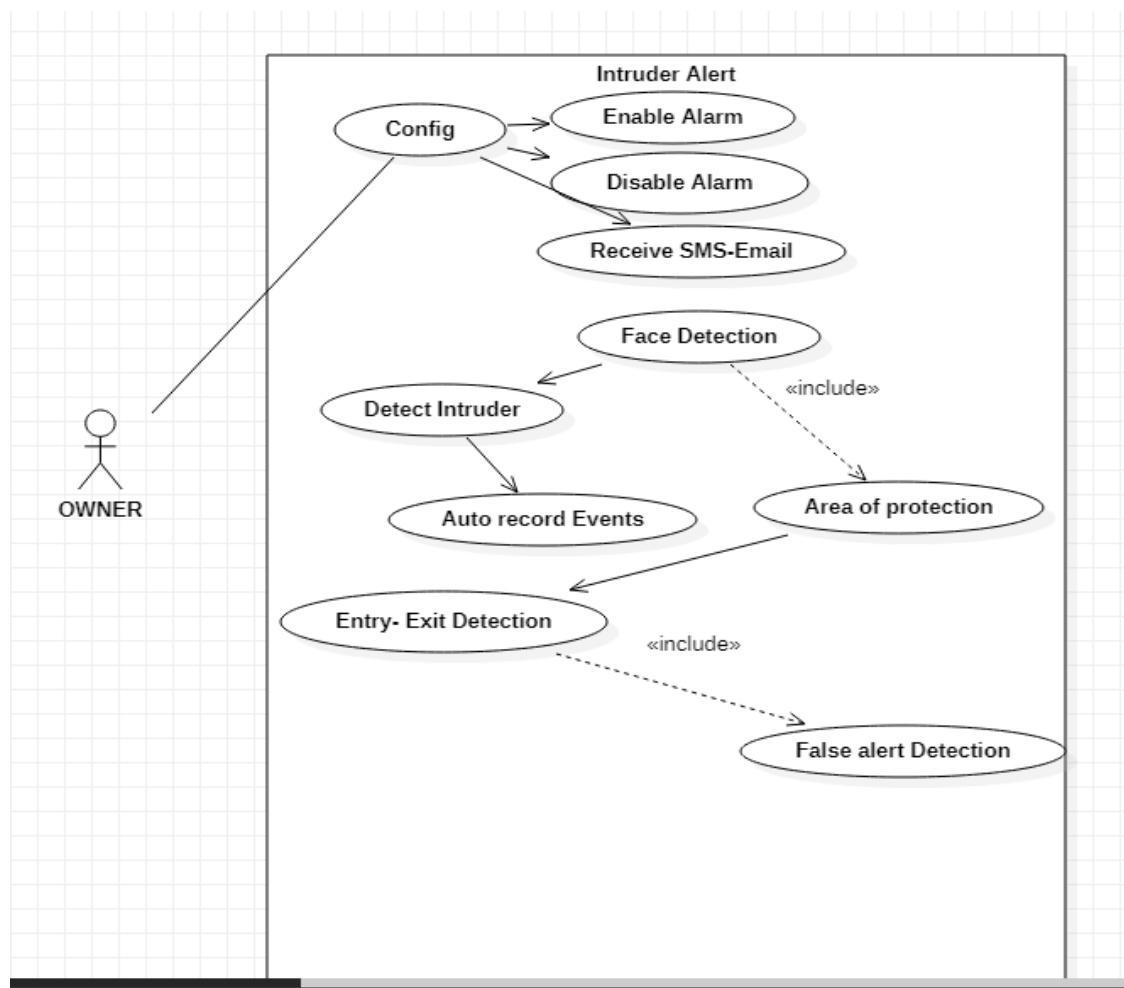


Figure 1: Use Case Diagram

This is the use case diagram which shows what is the owner's action and procedure of the project.

2.2.2: CLASS DIAGRAM:

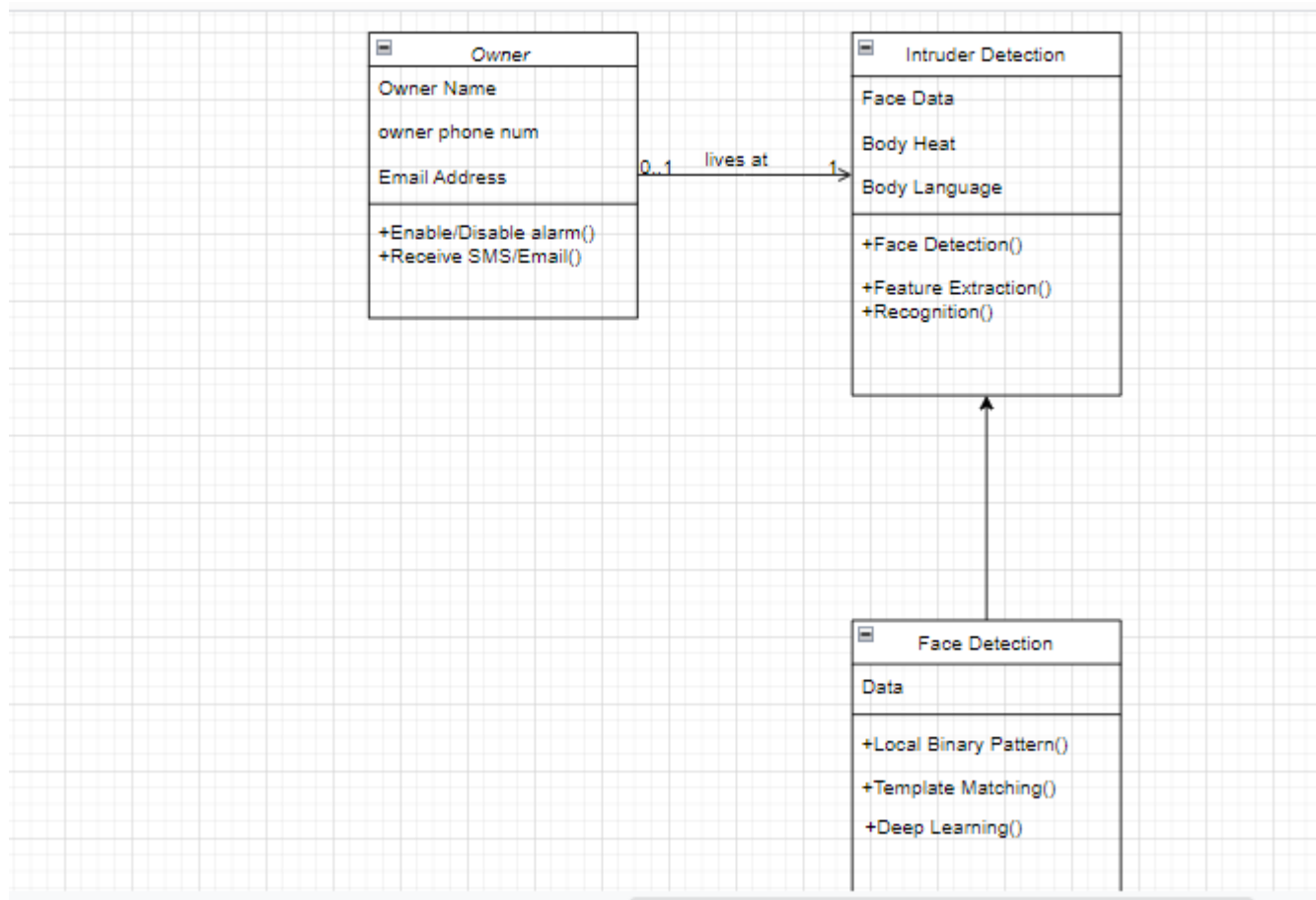


Figure 2: Class Diagram

The class diagram represents various classes with their attribute and methods of working procedures.

2.2.3: SEQUENCE DIAGRAM:

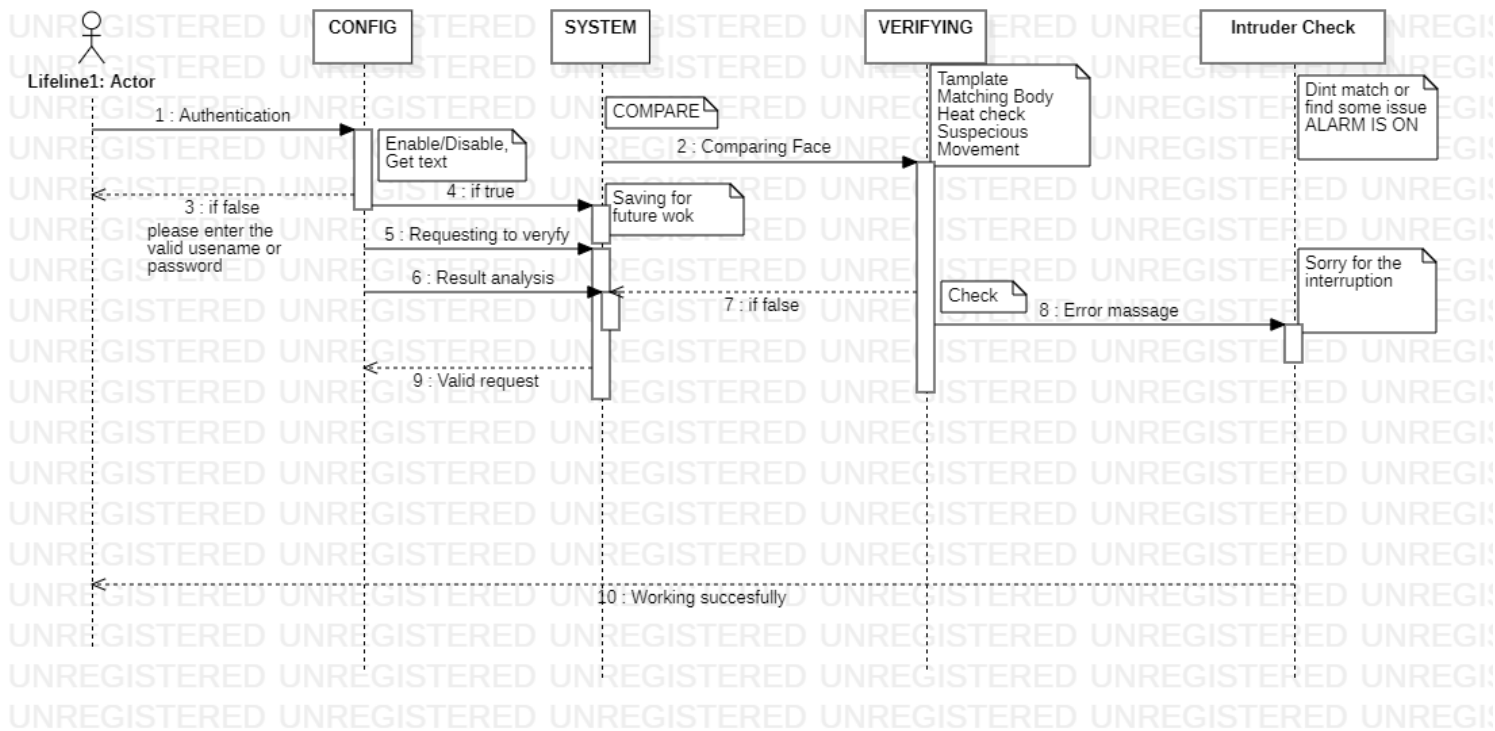


Figure 3: Sequence Diagram

The sequence diagram is the live process where we can see from authenticating actor to work finish process.

2.2.4: ER (Entity relationship table) DIAGRAM:

Entity Table							
File Edit View Insert Format Data Tools Extensions Help Last edit was on April 18							
F20 this pc/prio							
	A	B	C	D	E	F	G
1							
2	Owner Name	Owner ID	Owner Email	Owner Phn.num	Face Data	Body heat	Body Language
3	Jerin	111	fjf@fksf.com	14787859	FD111	null	Facial expression, hand gesture, Interest, haptics
4	Rima	222	fkbfj@gus.com	16464678	FD222	null	Facial expression, hand gesture, Interest, haptics
5	Prio	333	khsf@420.com	17557671	FD333	null	Facial expression, hand gesture, Interest, haptics
6	Rofiq	444	khg@jbjs.com	15464664	FD444	null	Facial expression, hand gesture, Interest, haptics
7	Safiq	555	ldm@jfjf.com	1545496	FD555	null	Facial expression, hand gesture, Interest, haptics



Entity Table

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100%
\$ % .0 .00 123
Default (Ari...
10
B *I* S A

F20			this pc/prio				
	H	I	J	K	L	M	
1		IP.Cam Location					
2	Xp	Yp	Zp	Template	IP camera	Family/Relatives	
3	666.4464	-454.5656	646.3636	this pc/jerin	11.22.223.232	True/false	
4	545.6456	-565.3235	545.3694	this pc/rima	11.22.332.333	True/false	
5	656.6464	-646.6464	255.5455	this pc/prio	22.11.323.333	True/false	
6	545.3695	-565.5645	346.1464	this pc/rofiq	23.23.233.333	True/false	
7	454.3669	-565.5454	444.1545	this pc/shafiq	23.333.3222.33	True/false	

OWNER					
Owner ID (pk)	Owner Name	Owner Email	Owner Phn.num	Family/Relatives	Template
111	Jerin	fjf@fksf.com	14787859	True/false	this pc/jerin
222	Rima	fbjfb@gus.com	16464678	True/false	this pc/rima
333	Prio	khsf@420.com	17557671	True/false	this pc/prio
444	Rofiq	khg@jbjs.com	15464664	True/false	this pc/rofiq
555	Safiq	ldm@jfff.com	1545496	True/false	this pc/shafiq

CAMERA			IP.Cam Location		
Body Language		Xp	Yp	Zp	IP camera(pk)
Facial expression, hand gesture, Interest, haptics		666.4464	-454.5656	646.3636	11.22.223.232
Facial expression, hand gesture, Interest, haptics		545.6456	-565.3235	545.3694	11.22.332.333
Facial expression, hand gesture, Interest, haptics		656.6464	-646.6464	255.5455	22.11.323.333
Facial expression, hand gesture, Interest, haptics		545.3695	-565.5645	346.1464	23.23.233.333
Facial expression, hand gesture, Interest, haptics		454.3669	-565.5454	444.1545	23.333.3222.33

USER			Camera			
Owner ID (pk)	Template	Family/Relatives	IP camera(pk)	Body Language	Face Data	Body heat
111	this pc/jerin	True/false	11.22.223.232	Facial expression, hand gesture, Interest, haptics	FD111	null
222	this pc/rima	True/false	11.22.332.333	Facial expression, hand gesture, Interest, haptics	FD222	null
333	this pc/prio	True/false	22.11.323.333	Facial expression, hand gesture, Interest, haptics	FD333	null
444	this pc/rofiq	True/false	23.23.233.333	Facial expression, hand gesture, Interest, haptics	FD444	null
555	this pc/shafiq	True/false	23.333.3222.33	Facial expression, hand gesture, Interest, haptics	FD555	null

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1															
2	Owner ID	Owner Email	Owner Phn.num	Face Data	Body heat	Body Language	Xp	Yp	Zp	Template	IP camera	Family/Relatives			
3	111	fft@fksf.com	14787859	FD111	null	Facial expression, hand gesture, Interest, haptios	666.4464	-454.5555	646.3636	this pol/jerin	11.22.223.232	True/false			
4	222	ftb@f@pus.com	16484678	FD222	null	Facial expression, hand gesture, Interest, haptios	545.6456	-565.3235	545.3694	this pol/rima	11.22.332.333	True/false			
5	333	khs@420.com	17557671	FD333	null	Facial expression, hand gesture, Interest, haptios	655.6464	-646.6464	255.5455	this pol/prio	22.11.323.333	True/false			
6	444	khg@bjs.com	15484684	FD444	null	Facial expression, hand gesture, Interest, haptios	545.3695	-565.5945	346.1464	this pol/rofiq	23.23.233.333	True/false			
7	555	ldm@fjf.com	1545496	FD555	null	Facial expression, hand gesture, Interest, haptios	454.3666	-565.5454	444.1545	this pol/shafiq	23.333.3222.33	True/false			
8															
9						CAMERA									
10						Body Language	Xp	Yp	Zp	IP camera(pk)					
11						Facial expression, hand gesture, Interest, haptios	666.4464	-454.5555	646.3636	11.22.223.232					
12						Facial expression, hand gesture, Interest, haptios	545.6456	-565.3235	545.3694	11.22.332.333					
13						Facial expression, hand gesture, Interest, haptios	655.6464	-646.6464	255.5455	22.11.323.333					
14						Facial expression, hand gesture, Interest, haptios	545.3695	-565.5945	346.1464	23.23.233.333					
15						Facial expression, hand gesture, Interest, haptios	454.3666	-565.5454	444.1545	23.333.3222.33					
16															
17	Owner Name	Owner Email	Owner Phn.num	Family/Relatives	Template										
18	Jerin	fft@fksf.com	14787859	True/false	this pol/jerin										
19	Rima	ftb@f@pus.com	16484678	True/false	this pol/rima										
20	Prio	khs@420.com	17557671	True/false	this pol/prio										
21	Rofiq	khg@bjs.com	15484684	True/false	this pol/rofiq										
22	Safiq	ldm@fjf.com	1545496	True/false	this pol/shafiq										
23															
24	Owner ID (pk)	Template	Family/Relatives		IP camera(pk)	Body Language	Face Data	Body heat							
25	111	this pol/jerin	True/false		11.22.223.232	Facial expression, hand gesture, Interest, haptios	FD111	null							
26	222	this pol/rima	True/false		11.22.332.333	Facial expression, hand gesture, Interest, haptios	FD222	null							
27	333	this pol/prio	True/false		22.11.323.333	Facial expression, hand gesture, Interest, haptios	FD333	null							
28	444	this pol/rofiq	True/false		23.23.233.333	Facial expression, hand gesture, Interest, haptios	FD444	null							
29	555	this pol/shafiq	True/false		23.333.3222.33	Facial expression, hand gesture, Interest, haptios	FD555	null							

Figure 4: ER(Table) Diagram

This is entity relation(table) diagram, which provides all the information about the data that will exist in the project.

The four diagrams above explains the methodology of implementation and working procedure of our system. The diagrams were created using various tools like Star UML, draw.io, google sheets.

Chapter 3

Performance Evaluation

3.1 Simulation Procedure

This is an information system design project based on data analysis. We created a prototype of our company's website and created a simulation environment using UI design platform *figma.com*. The prototype will elaborate our project technically.

3.1.1 THE HOMEPAGE (page 1):

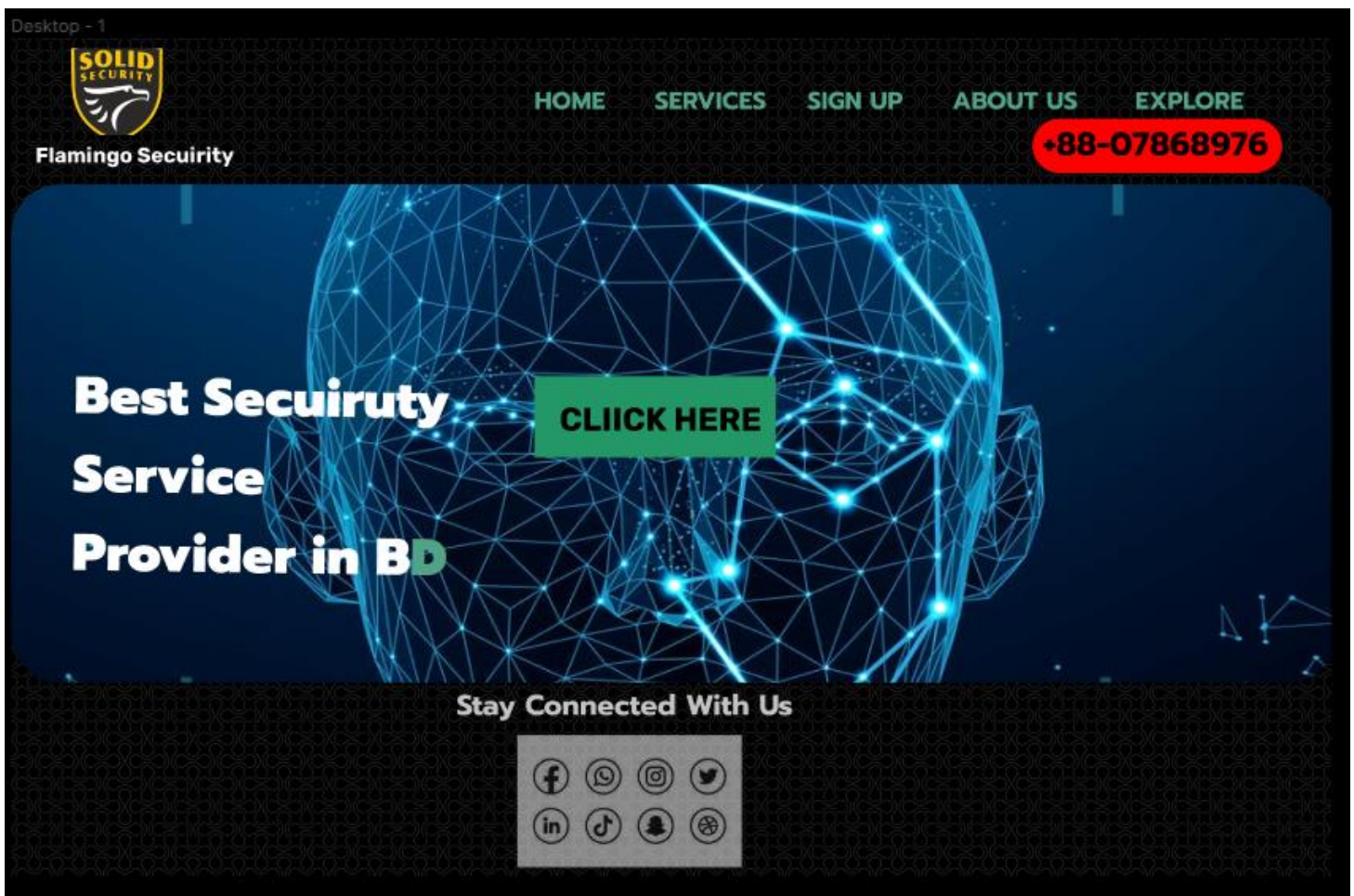


Figure 5: Homepage(prototype)

This is the homepage of our company's (Flamingo Security) website. The website (prototype) is created with figma.com, following the Nielsen's heuristics of creating a website, like the logo will appear on the left side of the page, an organized navigation bar in every page. Easy to use for the clients of every age. The homepage contains the enquiry option (click here) and a simple way to stay connected with us in some social media platform.

3.1.2 THE SERVICES PAGE (page 2):

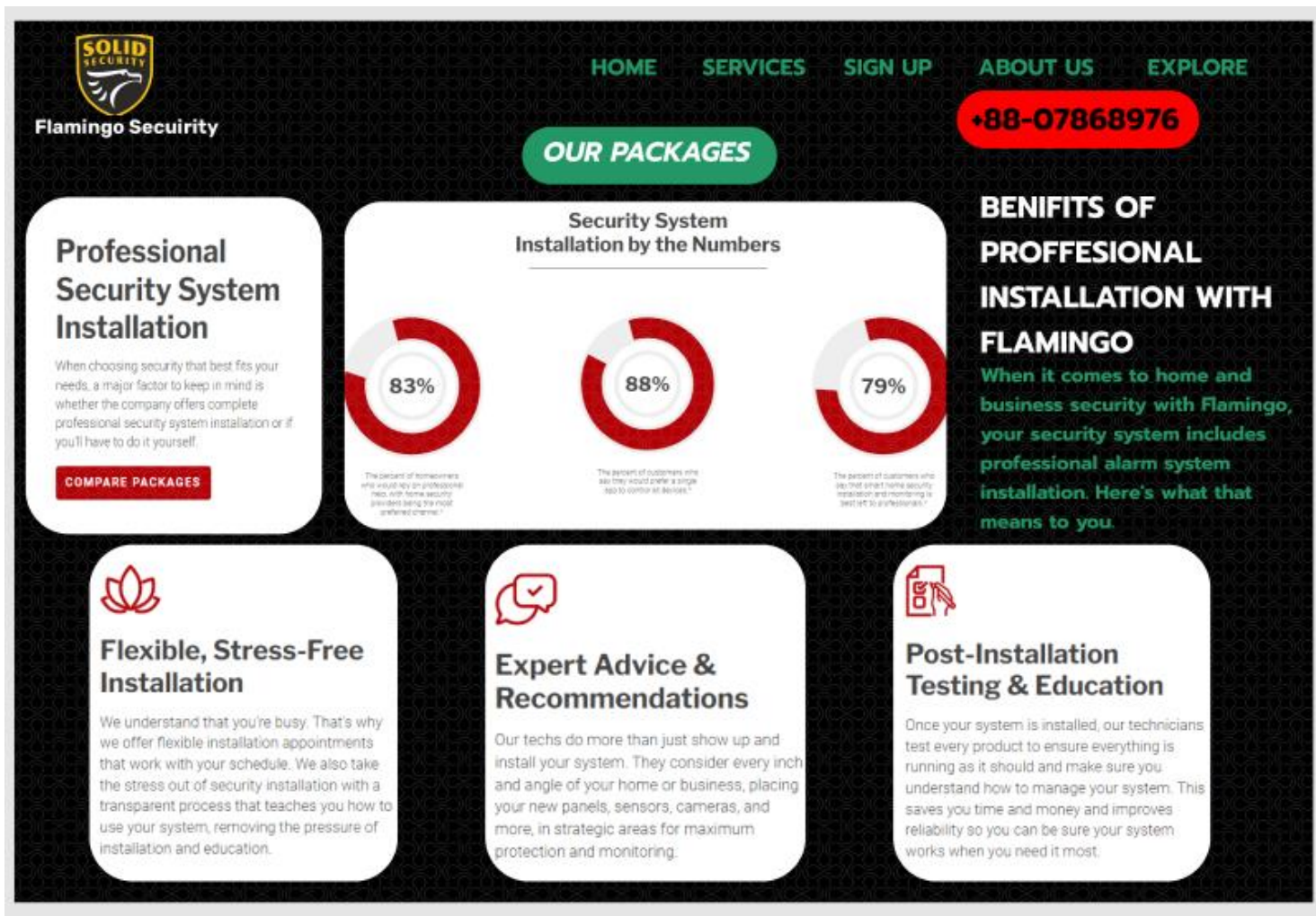


Figure 6: Services page (prototype)

The services page contains the information about our packages that we are currently providing like, installing a professional security system for residents. The ratio of our security system installation. The page describes the benefits of taking services from Flamingo Security. We always provide flexible, stress-free installation, before installing expert advice and recommendations, after installation testing and maintaining service.

3.1.3 THE ENQUIRY PAGE (page 3):

SOLID SECURITY
Flamingo Security

HOME SERVICES SIGN UP ABOUT US EXPLORE

ENQUIRE +88-07868976

First Name

Last Name

Email

Address

Phone No

Select Service

Write a comment (optional)

SUBMIT

Figure 7: Enquiry page (prototype)

The enquiry or the sign-up page is to see our full-fledged services and packages. Client will provide their information like name, email, address, phone number after that they will select a service for the select service option and if they have any optional comment, they can post that on the comment section. The enquiry submission form is very easy for any kind of user.

3.1.4 ABOUT US (page 4):

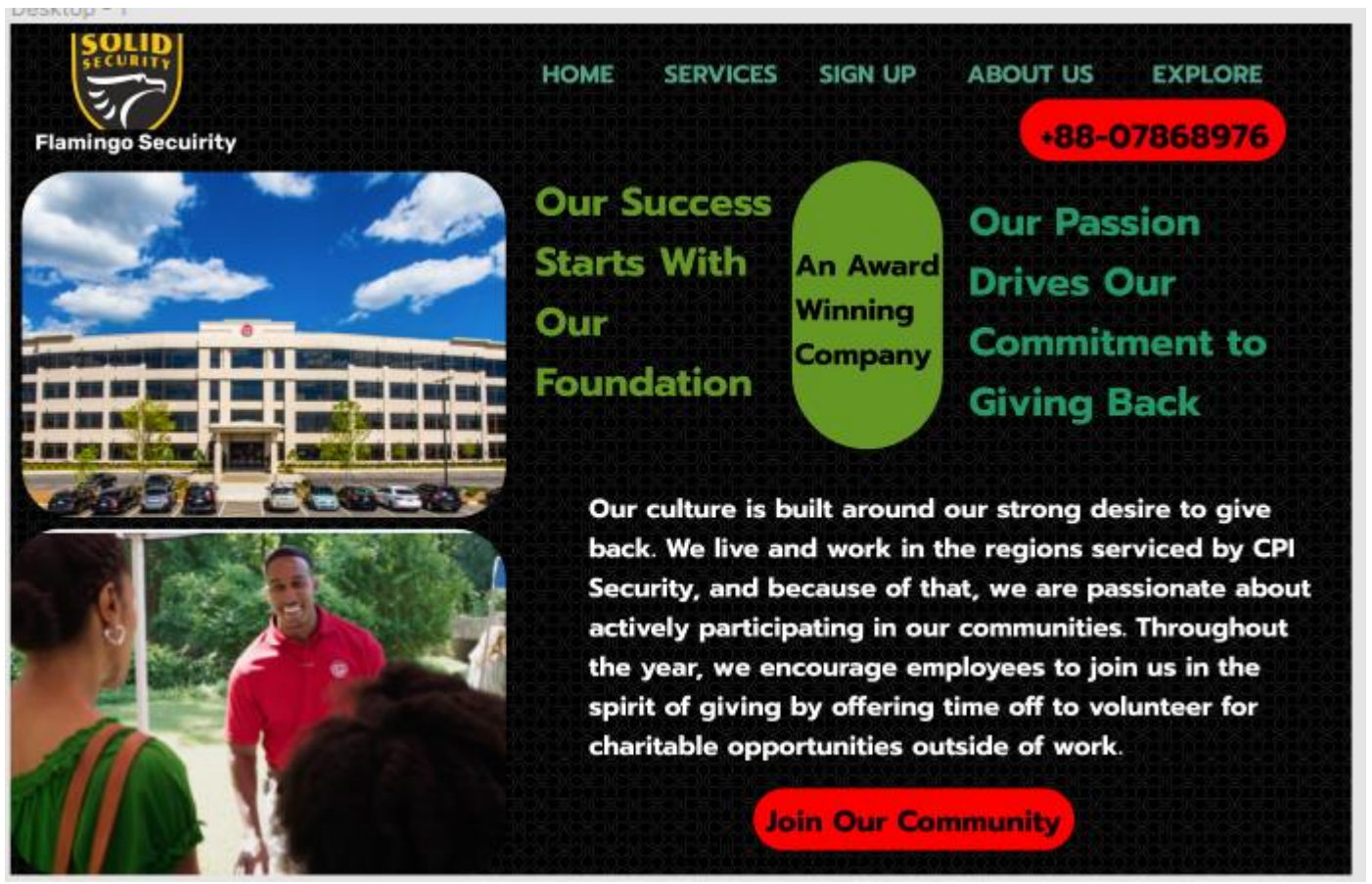


Figure 8: About us page (prototype)

In our about us page, we describe about our success and passion. This page also contains a community forum, and the members are those who take our services. In the community forum people discuss about our services, success as well as criticism or anyone having trouble with our services.

In conclusion about our prototype website, it provides what customer needs, and we accept valid recommendations or suggestions to make our services more than perfect.

Results and Discussions

The project intruder alert system is a simultaneous lab work project. From selecting project idea to creating a prototype we learned how to design a system from gathering information. While collecting the information and gathering data some steps were quite difficult. We learned how to design a project from scratch. Under the supervision, we sorted out the difficulties and we found the work very interesting. After when we started implementing the diagrams, the process of collecting data and made them usable become to make sense.

When we were done with the diagrams and started to make the prototype, we truly realize that analysis-design-implementation is the heart of any system development.

The analysis was successfully done. The design part where we designed the diagrams, we think we gathered the correct data and created the diagrams correctly. The sequence and ER table diagram were bit difficult, but we did finish it as required.

While creating the prototype of the project we didn't face any problems because we were familiar with the environment of creating UI in Figma. The four pages of our website elaborates us and our services.

Conclusion

4.1 Introduction

Intruder Security is a billion-dollar Industry, and a growing worldwide market. The mobile and IP communications have developed and completely changed the way we now use, monitor and control intruder security systems.

The outcome of this project has developed our design and analysis skills. Thus, we have designed a home security project of intruder alert system using various motion sensor, cameras which is handy, portable, cost-effective and highly effective as well. Such alarm systems are hugely in demand for security purposes, and thus the given system can be proved useful and effective in view of the above features.

This project offers an excellent knowledge about planning, design, and implementation stage. As well as, gaining some experience with using engineering software tools for creating the diagrams and prototype. It also provides the opportunity to apply and develop the analytic skills of ours.

4.2 Scope of Future Work

This project has proposed an intruder alert system based on various factors. The proposed system basically works with facial recognition. The novelty of the system is the inclusion of intruder detection capability by analyzing body heat, body language and alarm as method to warn the house owner. The results show that the system can detect an intruder within seconds with accuracy of 90% with processing time around 2 seconds. Future research will explore other feature extraction and classification method to improve the accuracy of intruder detection.

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- <https://thescipub.com/pdf/jcssp.2019.1108.1122.pdf>
- <https://cupdf.com/document/project-report-intruder-alert-system-2-1-abstract-securityisavitalissuethatexpandsacrossmanyareasoflifethatrequireprotectingvitalinformation.html?page=35>
- https://kipdf.com/intruder-alarm-system_5ac644541723ddb4d99168e1.html