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GIS Based Precision Agriculture & Smart Farming

Amin Siam, Morsalin

Independent University, Bangladesh

An Undergraduate Internship/Project on

GIS Based Precision Agriculture & Smart Farming

By

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1710450

Summer 2022

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Lecturer

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School of Engineering, Technology & Sciences

Independent University, Bangladesh (IUB)

September 14, 2022

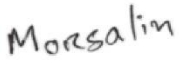
Dissertation submitted in partial fulfilment for the degree of Bachelor of Science in Computer Science

Department of Computer Science & Engineering

Independent University, Bangladesh

Attestation

I thus certify that I, Morsalin Amin Siam - 1710450, a student affiliated with Independent University Bangladesh, have finished the report, and submitted it in partial fulfillment of the requirement for the Degree of Computer Science and Engineering from Independent University, Bangladesh (IUB). I followed the advice of my honoured faculty, Mohammad Noor Nabi, and gave due credit where credit is due for the sources of material used in this project and report.



Signature

Morsalin Amin Siam

Name

14/09/2022

Date

Acknowledgement

I thank Allah, the Almighty first and foremost for giving me this chance and for giving me the capacity to complete my internship report on time. I would like to thank my internal supervisor, Mohammad Noor Nabi, Lecturer in the Department of Computer Science and Engineering at Independent University, Bangladesh (IUB), for all his invaluable advice, constant direction, support, and inspiration throughout my internship and the writing of this report.

Working as an intern for "HASHTECH360" has been a fantastic journey. The people at "HASHTECH360" have shown me so much support and encouragement. I would want to express my gratitude to my supervisor for devoting his time and expertise, both of which were crucial to the completion of this report. My appreciation goes out to my classmates. They have always been supportive and occasionally offered insightful information.

Finally, I want to express my gratitude to my family. They have offered unwavering support without conditions. Even on challenging days, their belief in me and dreams for me kept me going.

Letter of Transmittal

Mohammad Noor Nabi

Lecturer,

Department of Computer Science and Engineering,

School of Engineering and Computer Science

Independent University, Bangladesh

Subject: **Submission of Internship Report.**

Dear Sir,

This is to let you know that I, Morsalin Amin Siam (ID: 1710450), from the summer 2022 semester's CSE 499 Internship Course, would like to submit my Internship Report. This report is based on my internship program and the project I worked on at company HASHTECH360. I attempted to make this report as useful as possible with the experience I have obtained throughout my internship term. I completed my internship program under the direction of Emtiaz Hussain.

I've tried my best to deliver a reliable report. However, it might not be faultless. I would greatly appreciate it if you could study this report and provide your wise judgment. I believe the report that follows will be adequate and win your approval.

Sincerely,

Morsalin Amin Siam

ID: 1710450

Department of Computer Science & Engineering

Independent University, Bangladesh (IUB)

Evaluation Committee

.....

Name: Mohammad Noor Nabi

Supervisor

.....

Name: Raihan Bin Rafique

Internal Examiner-1 / Panel Member-1

.....

Name: Md. Asif Bin Khaled

Internal Examiner-2 / Panel Member-1

.....

Abstract

This Document contains GIS based Smart farming project management, architectural design, user interface design, and future work of 'GIS based Smart farming system'. This system allows the user which are the Government to use web portal.

In this system the user will monitor the farm fields and they can also predict if farming there will be beneficial or not. They can also monitor crop health, weather report, and the amount of product. They can check the survey results. They can also store the draft copy of the farmers farmlands, and which name they are registered to. We can also monitor crop pattern changes, crop health.

Contents

List Of Figures:

Chapter 1

1 Introduction

1.1 Overview/ Background of the project

With the development of our country Bangladesh, there is also a need for technological development increase in different sectors. Bangladesh has become more advanced to technologies in recent years. But with the technological advancement in different sectors, there was no digital advancement in Agriculture sector. The name of the company where this system will be used is EOfactory (Earth Observation factory). Our plan is to create a system were using GIS (Geographic Information System) we can monitor farm fields though satellite. We can map farm fields; we can monitor growing crops by using different kinds of AI.

1.2 Objectives

Our project is completely based on smart farming with the help of GIS. As GIS is mainly used by satellite, all the works are done by satellite images. As it is a new system in farming, we are trying our best to complete with the conditions that our benefactors have provided. we have good security to ensure we don't have any data breaches

1.3 Scopes

Scope of the project is a necessity to ensure the accomplishment of a project. As we are making a system which is new system. New means there is no existing system like our proposed system. We think our proposed system is needed in the farming sector.

The primary purpose of the system was to completely automate the formerly laborious process of maintaining Farm information. By creating this system, the farmers burden will be lessened. After the completion of this project, we can predict crop assessment, weather reports. We can also set landing lands under owner’s name. We can also verify the land. We can store drafts copy of the lands in this system.

Chapter 2

2 Literature Review

2.1 Relationship with Undergraduate Studies

My undergraduate degrees have equipped me with the knowledge and skills I need to advance my endeavour. My undergrade studies gave me the information and abilities that helped me with my tasks. A few of the courses include:

CSC 203 (Data Structure):

CSC 203 obscures which are a specific organization for coordinating, processing, retrieving, and storing information. Data structures are developed to coordinate Data for a particular use and might be simple or complicated. Because of data structures, clients find it simple to access the data they require and use it appropriately. Poor data structure selection may result in unfavourable run times or sluggish programming.

CSC 305- Object-Oriented Programming:

Computer programs for item-based writing are built on objects. In object-oriented programming, information designs or things with unique attributes or properties are characterized. The amount of work required to assemble and plan applications can be reduced by using OOP. It frequently gets used, for instance, while creating flowcharts and diagrams. It helped with the ongoing framework configuration needed to complete this activity.

CSC401 (Database Management):

It was the most important course in my undergraduate life because here I learned many different things. Some of them are - Six Element Analysis, Rich Picture, Requirement Analysis, Entity

Relationship Diagram, Business Process Model, and some more. This course also helped me to learn front-end and back-end programming. Which to a programmer is a must.

CSC405 (System Analysis Design):

The systematic process of developing a framework is made up of several cycles, including planning, examination, planning, sending, and support. In meetings, we normally pay close attention to system analysis and system design. The methods and tools used in the design and analysis of data frameworks are discussed in this course. Here we also learned, the framework model, application engineering, organized examination, framework plan, and client plan are all included in the execution of the framework. Information base plan, board programming, front-end and back-end plans, and equipment selection are all included.

CSC455 (Web Applications & Internet):

This course helped me to learn front-end programming. From this course I also learned HTML, CSS, JavaScript, and PHP which will be helpful in my further development.

Chapter 3

3 Project Management & Financing

3.1 Work Breakdown Structure

Using a WBS, you can see how a project is divided up into smaller parts. The use of WBS provides a visual representation of all the scopes, risks, points of communication, duties, expenses, and assurances that important deliverables will not be missed. It is the perfect tool for the team to use for brainstorming and collaboration. I applied a top-down strategy to my WBS. For my project I have divided the system main parts into smaller parts and what order they will be finished though visual representation of WBS.

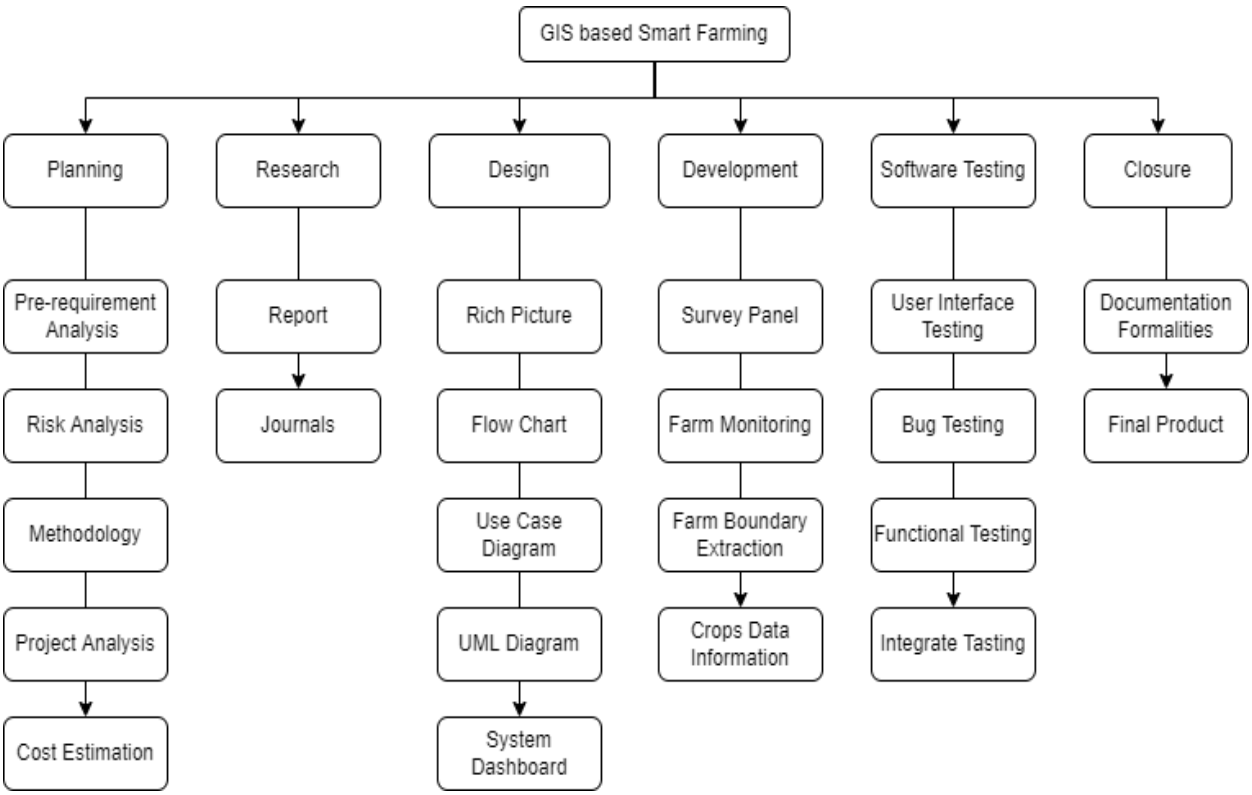


Fig3.1: WBS of GIS based Smart Farming

3.2 Activity Wise Time Distribution

For any project completion there is a time limit. We must finish the within that timeline. So, before starting a project we analyse how many it may take. This table below shows the time allocation of the work for this project.

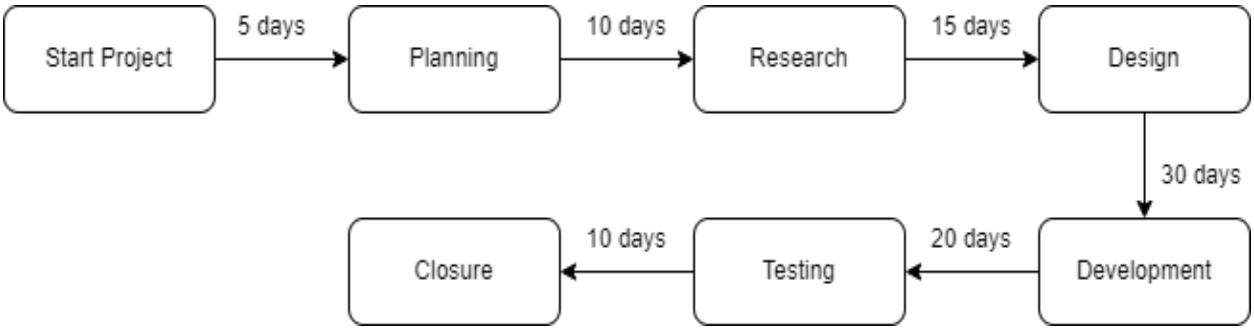


Fig3.2: Process of Activity Diagram

For this project it took almost 3 months for its completion. After starting the project, it took 5 days to plan the project. After planning the research for this project began and it took 10 days. Then the designing for this project began. Designing is very important for a project because how the interfaces for users will look like, decided here. For development this it 1 month of time. And after development, we tested this project for 20 days. And, then it took almost 10 days to complete close the project.

3.3 Gantt Chart

I have used the Gantt Chart to plan and schedule all the activities that were needed to be done to complete the project successfully.

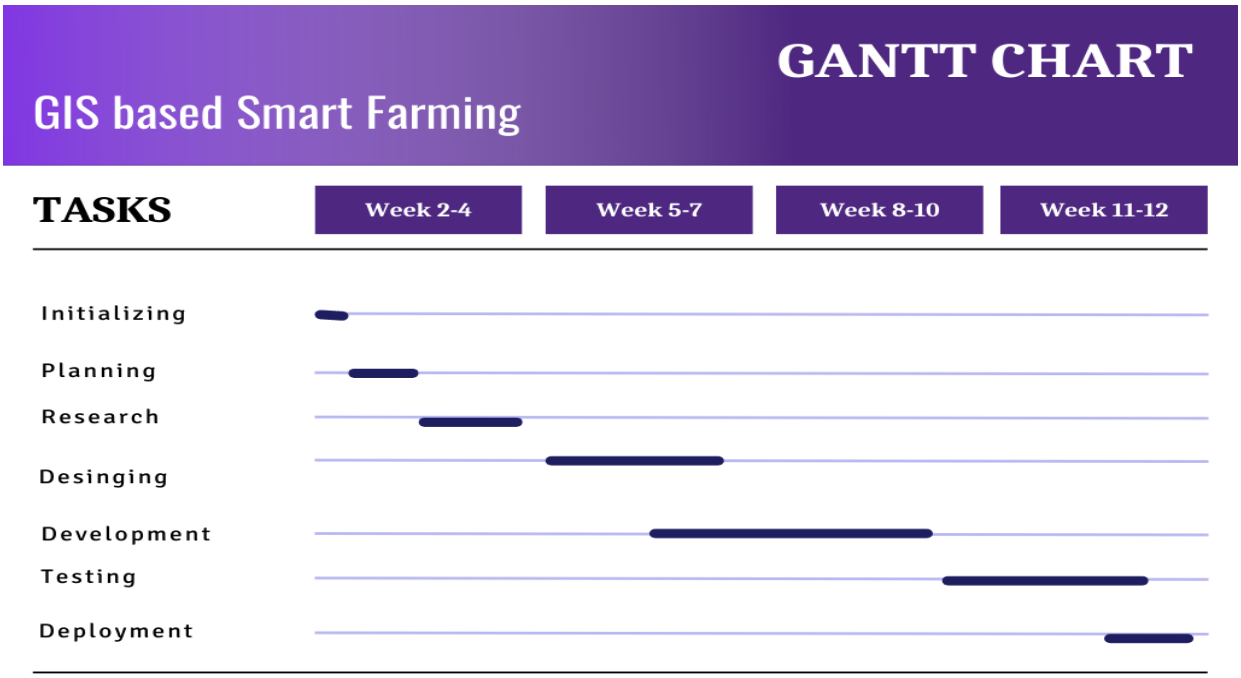


Fig 3.3: Gantt Chart

Chapter 4

4 Methodology

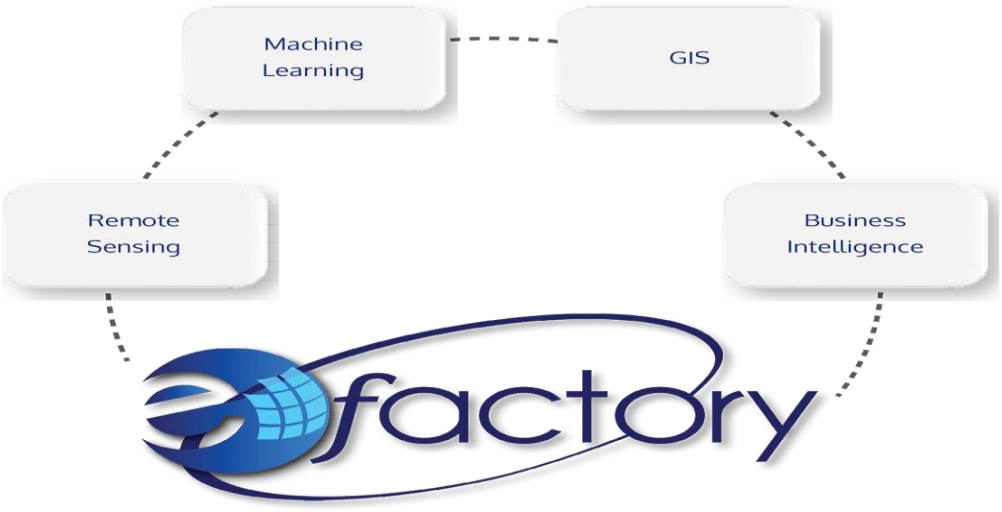


Fig4.1: Agile Methodology of EOfactory

The convergence of **Remote Sensing**, **Machine Learning**, **Geospatial Intelligence** and **Business Intelligence** formulates the core of EOfactory.

One of the best methods for developing software is the agile software development methodology, which is utilized to create a structured software management process that permits frequent project modification. One conceptual foundation for carrying out numerous software engineering tasks is provided by this kind of software development methodology.

Therefore, this model becomes the ideal option for the team leader and its members whenever there are unanticipated changes, either from the client's side or internally. In the end, this reduces the risks when a new feature is added to the system.

Advantages of Agile Development Methodology:

- Customer satisfaction by rapid, continuous delivery of useful software.
- Human interaction is emphasized rather than process and development tools. Customers, developers, and testers constantly interact with each other.
- Agile methodology has an adaptive approach that can respond to the changing requirements of the clients.

Disadvantages of Agile Development Methodology:

- In the case of some software deliverables, especially the large ones, it is difficult to assess the effort required at the beginning of the software development life cycle.
- Agile focuses on working software rather than documentation, hence it may result in a lack of documentation.

Chapter 5

5 Body of the Project

5.1 Work Description

GIS agricultural system is based on smart farming technology. Using smart farming technology and machine learning platform we can collect metrics of farm information about the state of the crops for multiple vegetation indices enabling regular monitoring of fields to derive quick and crucial information timely before the conditions before the crops deteriorate, giving stakeholders the ability to make quick decisions.

There are many things in this system which are used, some of the are:

1.Login Page

2.Farm Monitoring

3.Drafts data

4.Collection of data

5.2 Requirement Analysis

Rich Picture

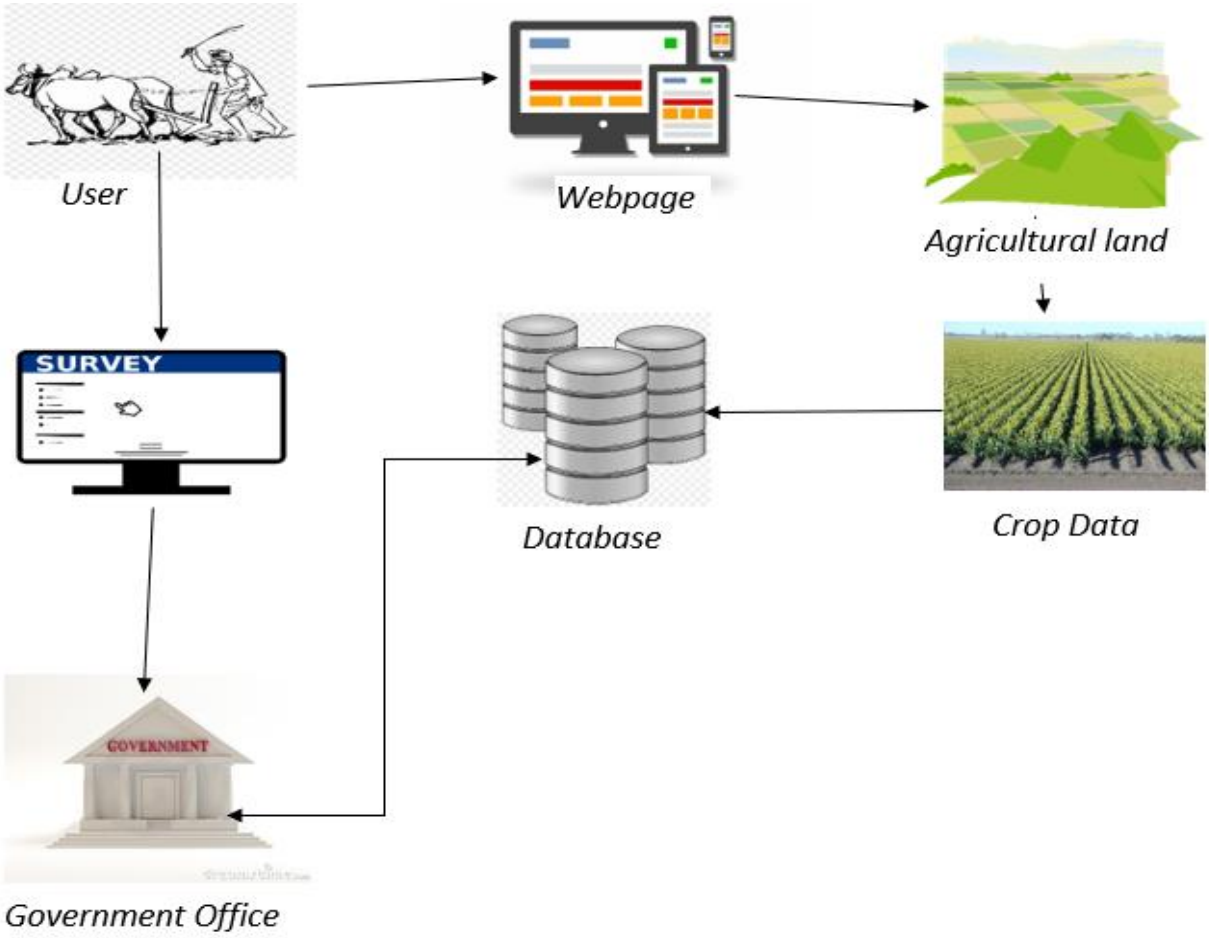


Fig5.1: Rich Picture

Functional & Non-Functional Requirements

Functional Requirements:

- Browse App
- Responsive for various screen size
- Navigation Bar
- Select Plan
- Login
- Logout
- Survey Info
- Farm Boundary Extraction
- Crop Information
- Monitoring overview

- Farming Plot Verification

Non-Functional Requirements:

- The system should run all PCs with windows 7 or higher version of OS.
- The system will be intuitive so that users can easily navigate through the system
- Security for the system will be tough to break in for any data breach

5.3 System Analysis

5.3.1 Six Element Analysis

System Roles						
Process	Human	Non-Computing Hardware	Computing Hardware	Software	Database	Network
Home Page	User: User can browse through home page and select which page to go Admin: Admin will maintain the home page if there is any error	N/A	Computer Smartphone	ArgGIS pro, ArgGIS desktop pro, Java, Swift, vsCode Python	MySQL	Wi-Fi, LAN
View Farm	User: Here user can view how much land is registered	Pen & Paper for keeping track of farm size	Computer, Smartphone	ArgGIS pro, ArgGIS desktop pro, Java, Swift, vsCode. Python	MySQL	Wi-Fi, LAN

Collect Data	Admin: Admin will collect survey data from the database	Pen & Paper to write the results manually	Computer, Smartphone	ArgGIS pro, ArgGIS desktop pro, Java, Swift, vsCode, Python	MySQL	Wi-Fi, LAN
Collecting Drafts	Admin: 1. Admin will collect farm fields details from here. 2. Admin will manage and map the fields from drafts	Hardcopy of the drafts copy	Computer, Smartphone	ArgGIS pro, ArgGIS desktop pro, Java, Swift, vsCode, Python	MySQL	Wi-Fi, LAN
Farm boundary extraction	Admin: 1. The mapping for the farm's boundary will be done.	Hardcopy of original farm registration files (GOVT approved)	Computer, Smartphone	ArgGIS pro, ArgGIS desktop pro, Java, Swift, vsCode, Python	MySQL	Wi-Fi, LAN
Crop information	Admin: 1. Admin will monitor crop	N/A	Computer, Smartphone	ArgGIS pro, ArgGIS desktop	MySQL	Wi-Fi, LAN

	health, density, canopy, chlorophyll using multiple indices on optical imageries and can generate analytics on soil moisture and flood intensity using SAR Imagery. 2. Admin will make quick decision if there is any changes in crop health's.			pro, Java, Swift, vsCode, Python		

5.3.2 Feasibility Analysis:

By doing feasibility analysis we can assess a project's chances of success and the outcome from the project. It will allow us to create a comprehensive report on the strengths, weaknesses, opportunities for this project.

For this project, four feasibility studies are used:

- Technical Feasibility: This assessment pertains to the technological resources available inside our organization. It does not require any fancy hardware or anything.
- Operational Feasibility: This system will be able to help people connect with sellers and vice versa.
- Economic Feasibility: The cost and advantages of this website have been evaluated in this section. On the website, there are no hidden expenses for users
- Legal Feasibility: This system complies with all the laws of cyber-security.

5.3.3 Problem Solution Analysis:
While developing the system there were many problems and we took some basic steps in solving a problem:

1. Defining the problem
2. Generating Alternatives
3. Implementing solution

We had encountered some problems that were halting our progress. By using these solutions, we refreshed our minds, continue to work, and then finish the project.

5.4 System Design

5.4.1 UML Diagrams:
Use case diagram:

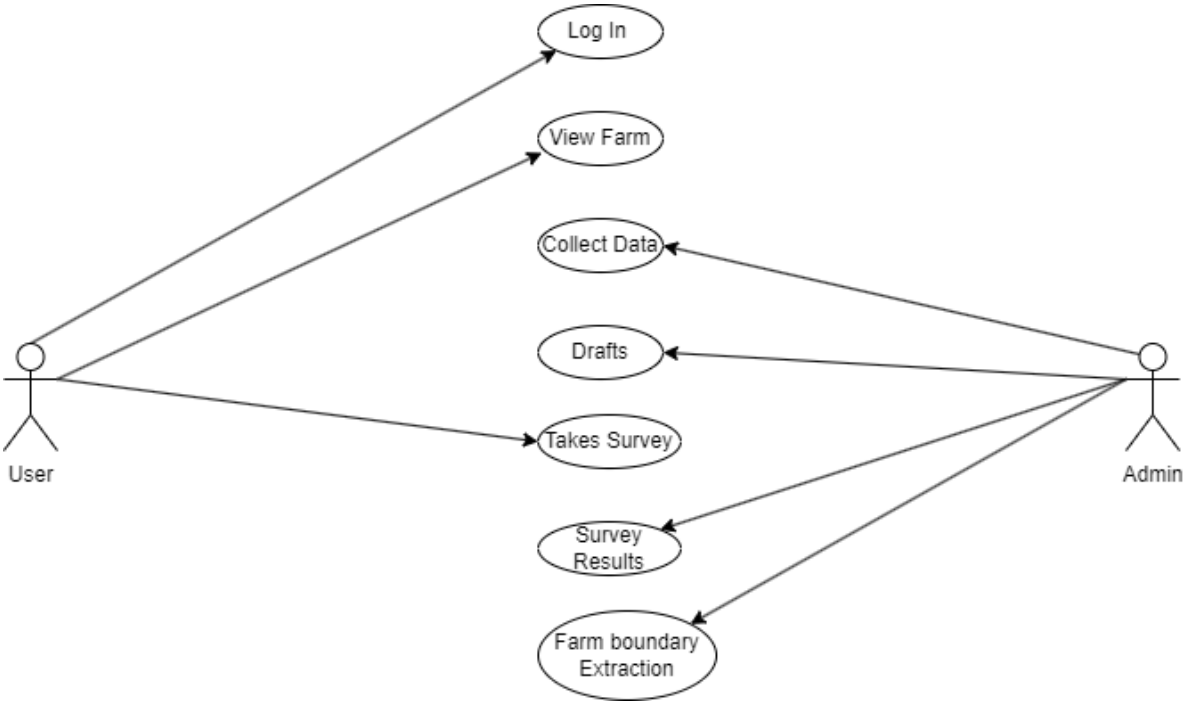


Fig5.2: Use Case Diagram

5.4.2 Activity Diagram:
Admin Activity Diagram:

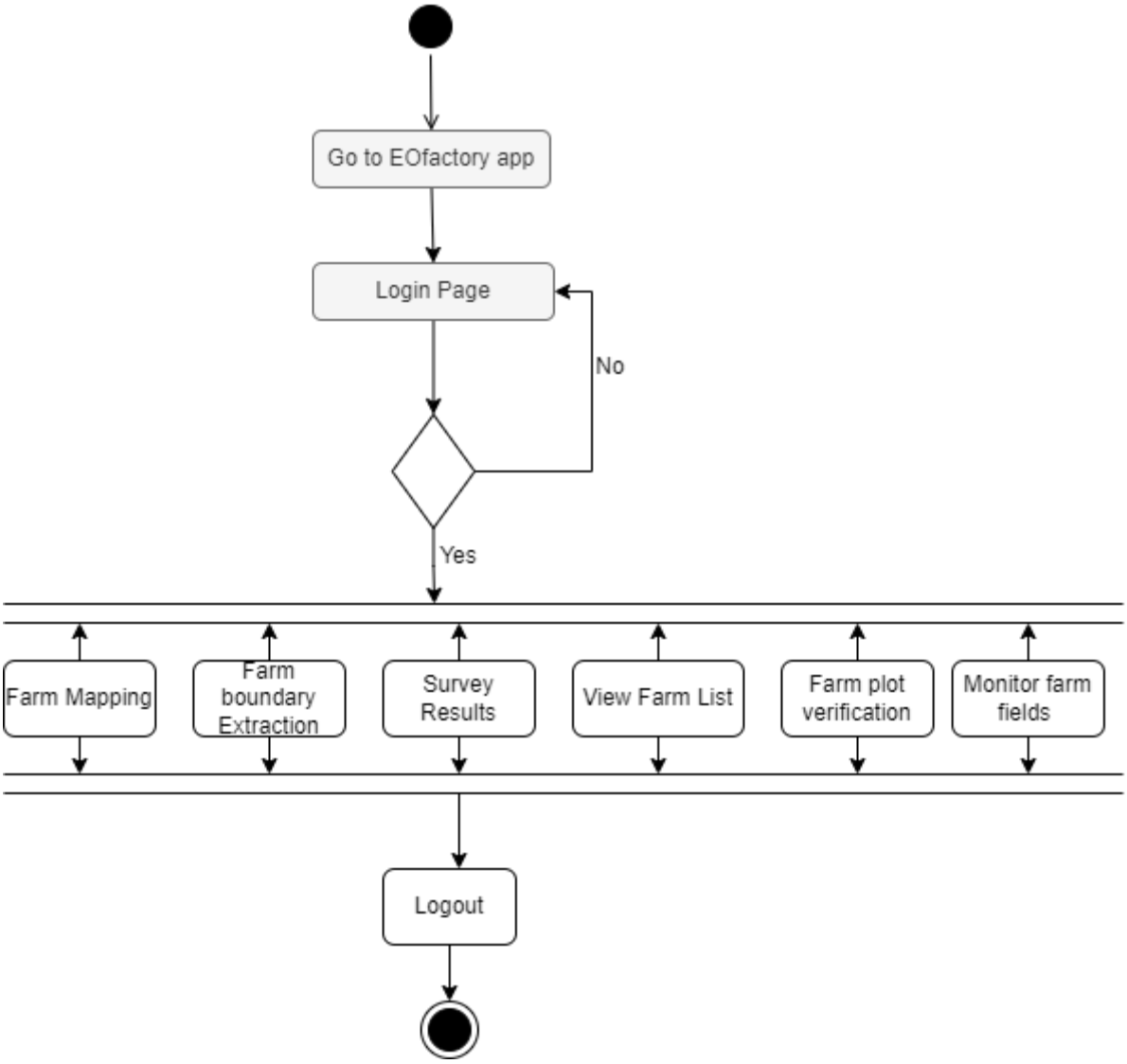


Fig5.3: Admin Activity Diagram

User Activity Diagram:

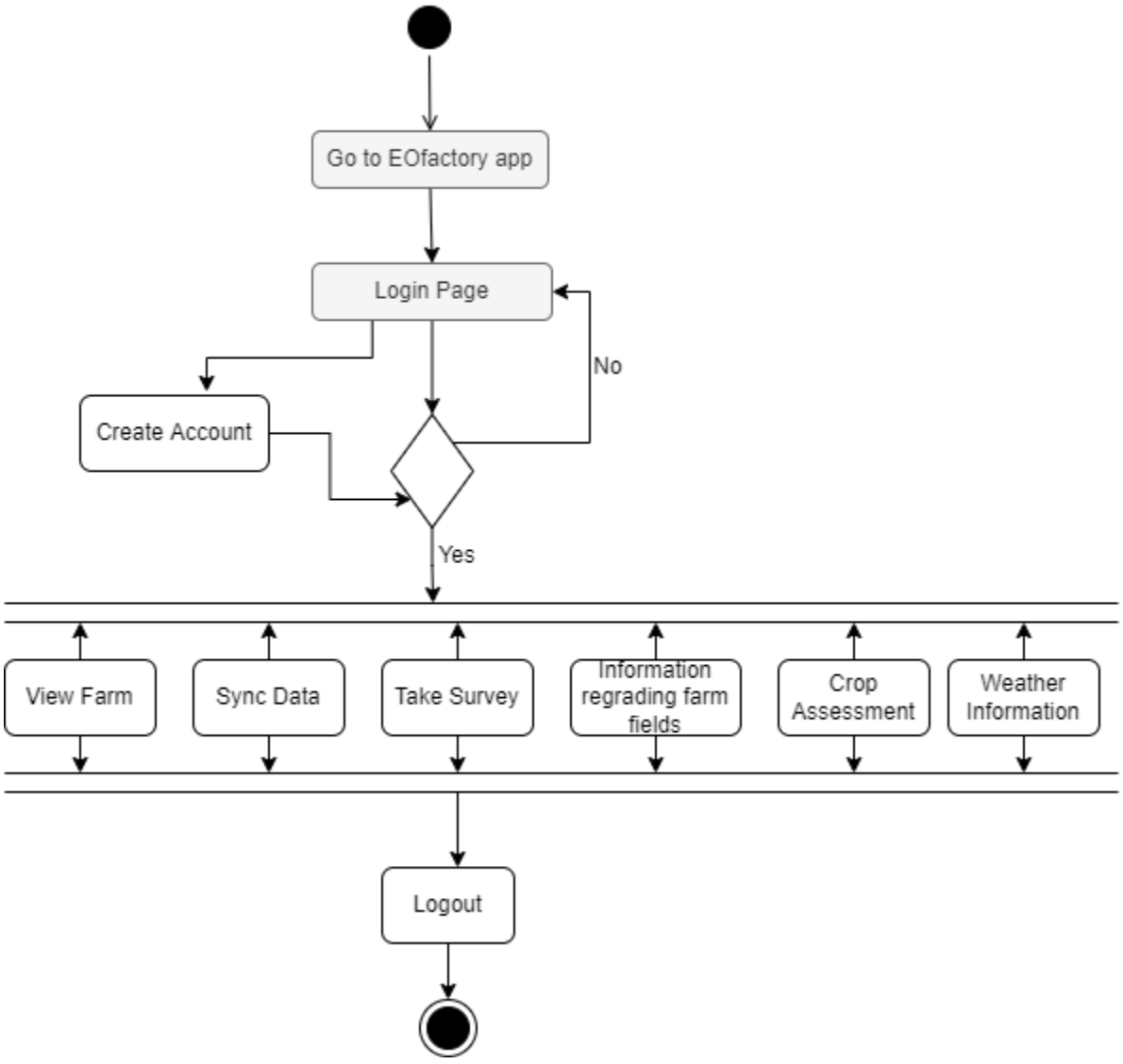


Fig5.4: User Activity Diagram

5.5 Implementation:

Implementing a website entail moving from the design phase to the site's completion and launch.

This include gathering all the information required to fill the site's pages, adding it to the pages, uploading the pages to a server, testing the pages, and launching the site by letting people know that it is there.

1. Write all the required codes on VS Code and save with a filename and a filename extension of .html or .py at this juncture the code editor.

Input

Eofactory Survey:

Here the surveys are taken and based on the survey the remarks are given.

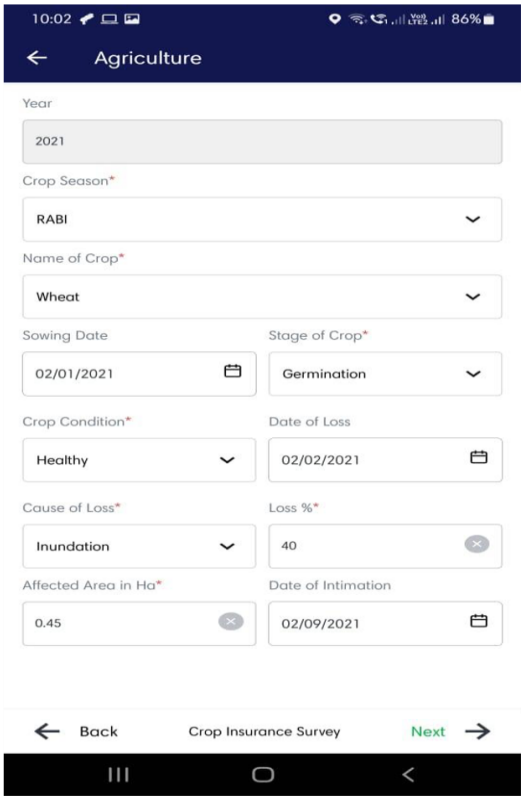


Fig5.5.1: Registration

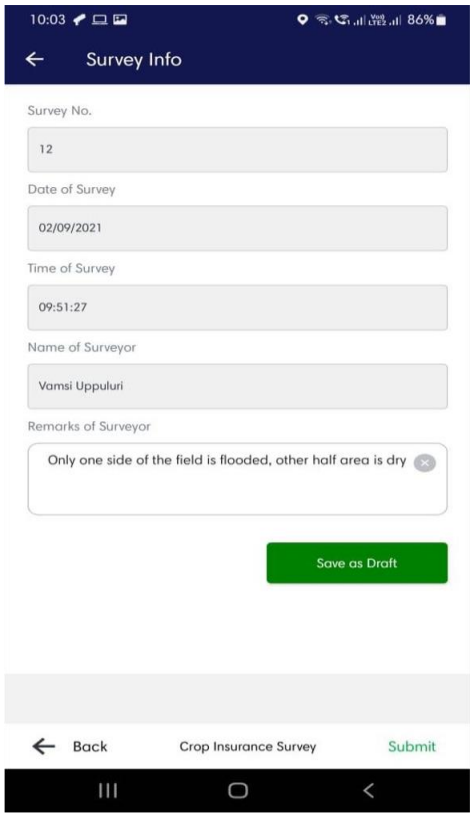


Fig 5.5.2: Survey

Home Page:

It is the home page on mobile devices of our main project GIS based Smart Farming.

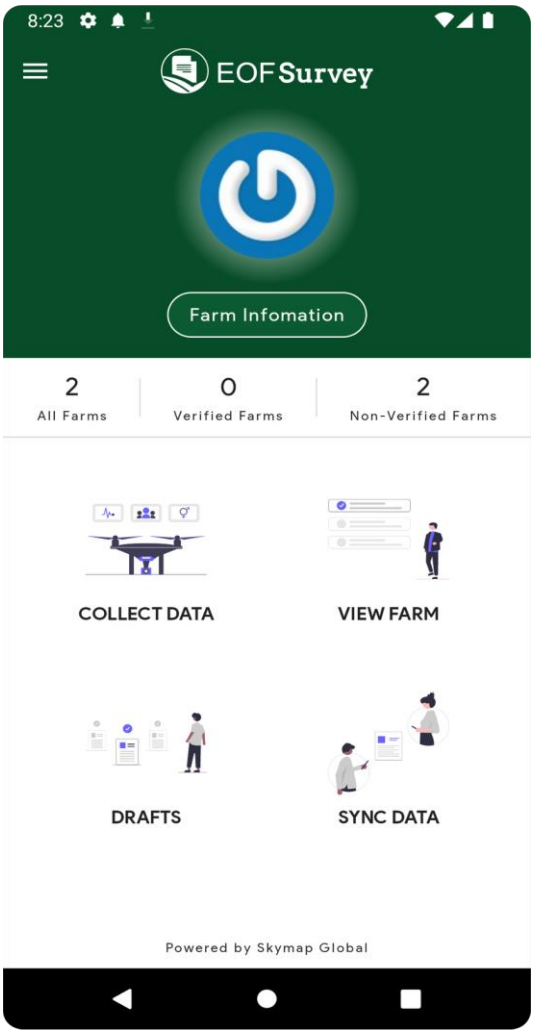


Fig 5.5.3: EOfactory Home Page 1

Farm Mapping:

Here the mappings of the fields for farms are done.

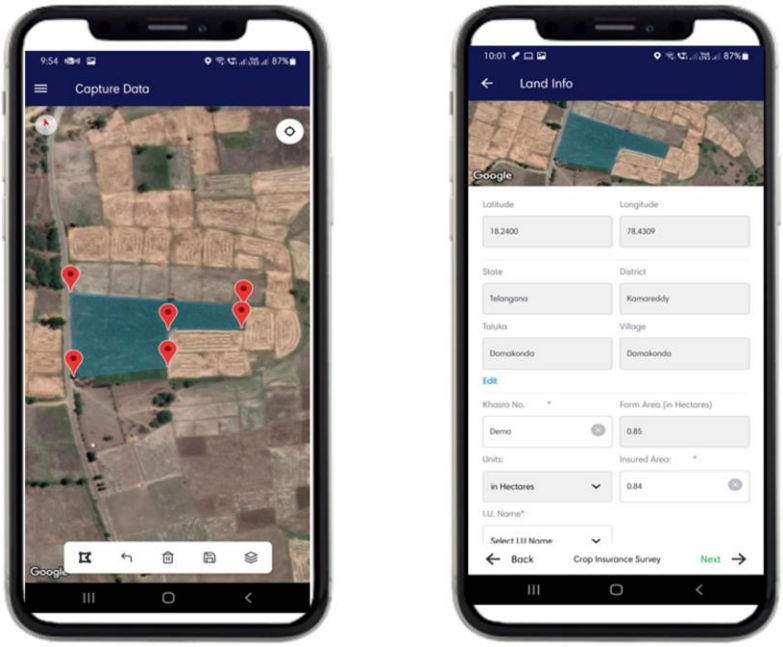


Fig 5.5.4: Farm Mapping

Farm Extract Boundary:

The boundary for the farm fields is shown.

Fig 5.5.5: Farm Boundary Extraction 1

Farm List:

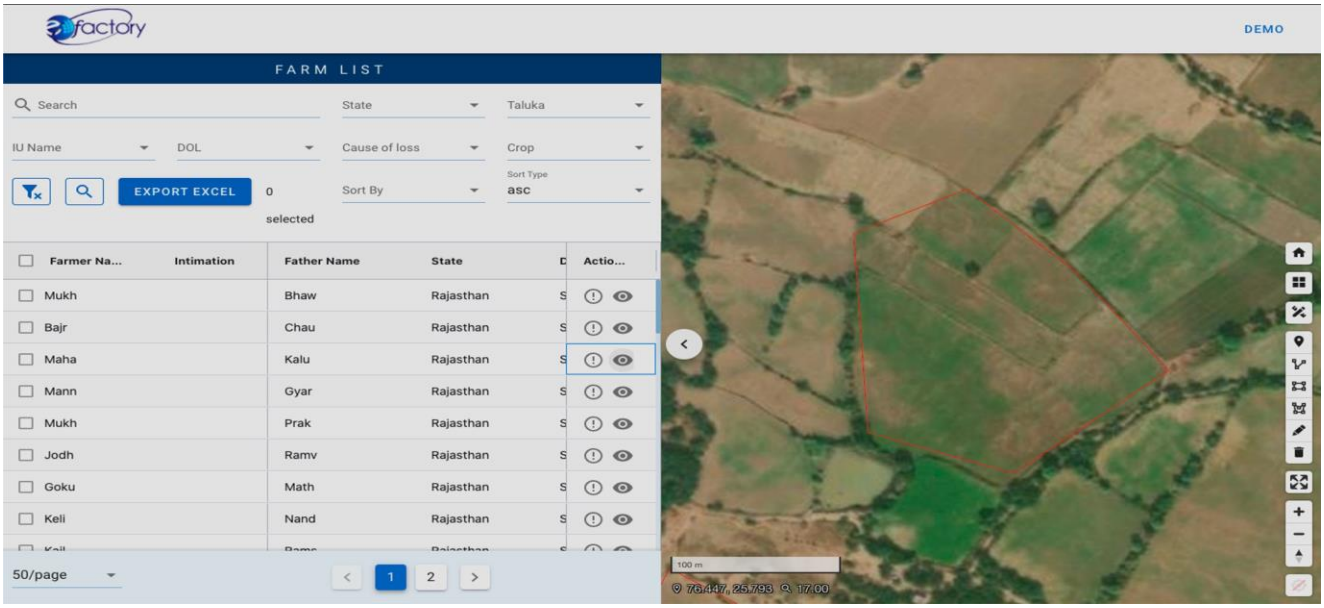


Fig 5.5.6: Farm List 1

Crop Details:

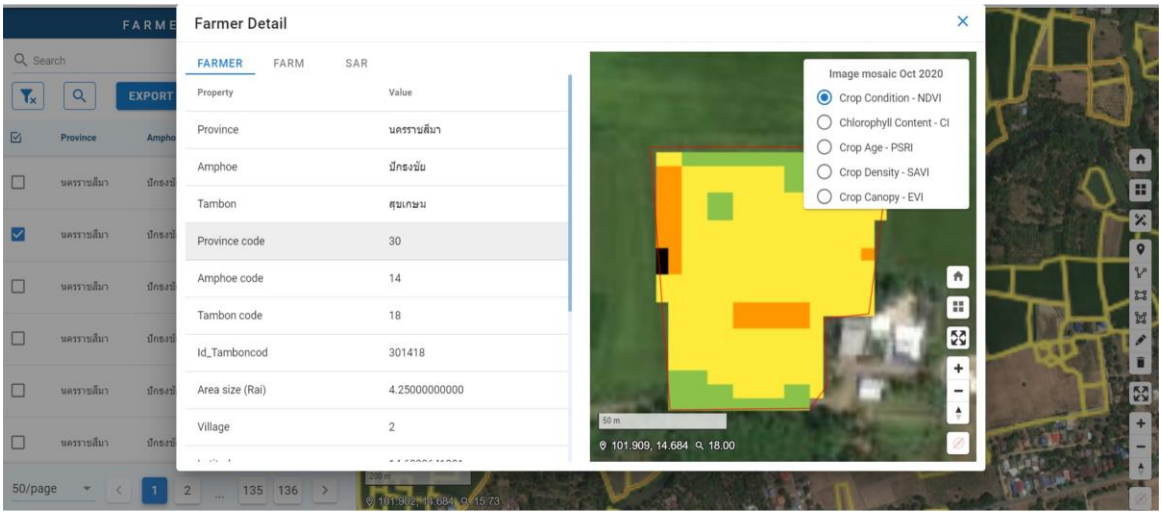


Fig 5.5.7: Crop Details

Weather Information:

Fig 5.5.8: Weather Information

Code:

```
[ ]  test_path='/content/data4/test'
     train_path='/content/data4/train'
```

```
import pandas as pd
import nibabel as nib
import numpy as np
import os
from keras import layers
from keras import models
from keras import optimizers
from keras import backend as K
from sklearn.metrics import roc_curve,roc_auc_score
import matplotlib.pyplot as plt
from sklearn.metrics import confusion_matrix
import seaborn as sns
from sklearn.metrics import classification_report
from keras.preprocessing.image import ImageDataGenerator
```

```
#train_data= np.zeros((540,91,109,91),dtype=float)
train_reserved= np.array([], dtype='float64').reshape(0,91,109,91)
train_levels_reserved=np.array([], dtype='int32').reshape(0,1)
#test_data= np.zeros((148,91,109,91),dtype=float)
test_data= np.array([], dtype='float64').reshape(0,91,109,91)
test_labels=np.array([], dtype='int32').reshape(0,1)
```

```
###train data loading
#k=0;
for j in ['/content/data4/train/non satelliteimagedata/','/content/data4/train/satelliteimagedata/']:

  if j=='/content/data4/train/rawpreviousdata/':
    train_levels_reserved=np.vstack([train_levels_reserved,np.ones((len(os.listdir(path=j)),1))])
  else:
    train_levels_reserved=np.vstack([train_levels_reserved,np.zeros((len(os.listdir(path=j)),1))])
  for i in os.listdir(path=j):
    data=nib.load(j+i)
    data= np.array(data.dataobj).reshape(1,91,109,91)
    #test_data=np.concatenate((test_data,data),axis=0)
    train_reserved=np.vstack([train_reserved, data])
    #train_data[k,:,:,:]=np.array(data.dataobj)
    #k=k+1
```

```
###test data loading
#k=0;
for j in ['/content/data4/test/satelliteimagedata/','/content/data4/test/satelliteimagedata/']:
  if j=='/content/data4/test/rawpreviousdata/':
    test_labels=np.vstack([test_labels,np.ones((len(os.listdir(path=j)),1))])
  else:
    test_labels=np.vstack([test_labels,np.zeros((len(os.listdir(path=j)),1))])


  for i in os.listdir(path=j):
    data=nib.load(j+i)
    data= np.array(data.dataobj).astype(float).reshape(1,91,109,91)
    #test_data=np.concatenate((test_data,data),axis=0)
    test_data=np.vstack([test_data, data])
    #test_data[k,:,:,:]=np.array(data.dataobj)
    #k=k+1
```

```
model = models.Sequential()
model.add(layers.Conv2D(32, (3, 3), activation='relu',input_shape=(91, 109, 91)))
model.add(layers.MaxPooling2D((2, 2)))
model.add(layers.Conv2D(64, (3, 3), activation='relu'))
model.add(layers.MaxPooling2D((2, 2)))
model.add(layers.Conv2D(128, (3, 3), activation='relu'))
model.add(layers.MaxPooling2D((2, 2)))
model.add(layers.Conv2D(128, (3, 3), activation='relu'))
model.add(layers.MaxPooling2D((2, 2)))
model.add(layers.Flatten())
model.add(layers.Dense(512, activation='relu'))
model.add(layers.Dense(1, activation='sigmoid'))

model.compile(loss='binary_crossentropy',optimizer=optimizers.RMSprop(lr=1e-4),metrics=['acc'])
```

```
WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorflow_backend.py:66: The name tf.get_default_graph is deprecated. Please use tf.

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorflow_backend.py:541: The name tf.placeholder is deprecated. Please use tf.compa

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorflow_backend.py:4432: The name tf.random_uniform is deprecated. Please use tf.r

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorflow_backend.py:4267: The name tf.nn.max_pool is deprecated. Please use tf.nn.m

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/optimizers.py:793: The name tf.train.Optimizer is deprecated. Please use tf.compat.v1.train.O

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorflow_backend.py:3657: The name tf.log is deprecated. Please use tf.math.log ins
```

```
history=model.fit(train_data,train_labels,epochs=50,batch_size=10,validation_split=0.1,verbose=1,shuffle=True)
```

```
WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorflow_backend.py:1033: The name tf.assign_add is deprecated. Please use tf.co

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorflow_backend.py:1020: The name tf.assign is deprecated. Please use tf.compat.

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorflow_backend.py:3005: The name tf.Session is deprecated. Please use tf.compat

Train on 72 samples, validate on 8 samples
Epoch 1/50
WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorflow_backend.py:190: The name tf.get_default_session is deprecated. Please us

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorflow_backend.py:197: The name tf.ConfigProto is deprecated. Please use tf.co

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorflow_backend.py:207: The name tf.global_variables is deprecated. Please use t

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorflow_backend.py:216: The name tf.is_variable_initialized is deprecated. Pleas

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorflow_backend.py:223: The name tf.variables_initializer is deprecated. Please

72/72 [==============================] - 6s 81ms/step - loss: 0.6834 - acc: 0.6528 - val_loss: 0.6177 - val_acc: 0.6250
Epoch 2/50
72/72 [==============================] - 5s 68ms/step - loss: 0.5372 - acc: 0.7500 - val_loss: 0.2123 - val_acc: 1.0000
Epoch 3/50
72/72 [==============================] - 5s 69ms/step - loss: 0.5098 - acc: 0.7917 - val_loss: 0.2146 - val_acc: 1.0000
Epoch 4/50
72/72 [==============================] - 5s 68ms/step - loss: 0.4688 - acc: 0.7639 - val_loss: 0.6572 - val_acc: 0.6250
Epoch 5/50
```

Chapter 6

6 Results & Analysis

The results portion of the research paper should endeavour to tell the findings without attempting to analyse or evaluate them and serve as a guide for the discussion section. The analysis is revealed when the results are reported. The writer explains what was done with the data found in the analysis section. Knowing what the analysis included is crucial for writing the analysis part, but this does not imply that data is required. The analysis must be finished before writing the results section.

From this smart farming project, we can see how the is planned and how it will help farmers in the long future. This project includes farming details such as- farm mapping, boundary extraction, crop loss assessment, crop gain assessment and if the field where farming will happen is ready or not. If it is not a farming field, then no matter how much we try we can't grow crops there.

We can also predict the crops output from this project. If the crops are not healthy then we can take necessary actions immediately. We can also predict plant health & plant density. If the fields have sufficient water or not, we also predict from the system. So, it will help us to keep the farm from damaging.

Although the actions on this project are good but there is still some lacking which needs to be fixed, such as- Lack of automation technology, Data management issues, Reporting to the Management on the changes monthly on their locations.

Chapter 7

7 Project as Engineering Problem Analysis

7.1 Sustainability of the Project/Work

Sustainability of the Project/Work Engineering problems usually have more than one solution. It is the aim of the engineer to obtain the best solution possible with the resources available. Engineers are professionally responsible for the safety and performance of their designs. The objective is to solve a given problem with the simplest, safest, most efficient design possible, at the lowest cost A product can be sustainable in two main categories:

Community Sustainability: After the development and official release of GIS based Smart Farming System ' it is predicted that it will create a strong farming base and from that will emerge a community of users with mutual likeness.

Financial Sustainability: The system is mainly developed for government. So, the main user of this system will be the government people. So, the financial cost for this project will not be a problem.

7.2 Social and Environmental Effects and Analysis

Technology is increasing at a very fast pace. To keep with technology, people need computers. Be it schools, work, home, or any other aspect in life.

Social Effect: Investing in solutions that may help with monitoring arrival and customer owns can allow businesses and organizations to perform their services while maintaining a high safety standard. In the current environment, safety is the priority for all service providers. In conclusion, scheduling appointments is crucial since it ensures that time is used efficiently and shows people that you respect their time.

Environmental Effects: The environmental variables under investigation include service time variability and the cost-to-user time ratio. To separate the residual or genuine effects of these factors on total cost performance, the effects of these elements are assessed using a near-optimal algorithm that already modifies the appointment dates to reduce the negative effects of these parameters.

7.3 Addressing Ethics and Ethical Issues

The study of morality as a branch of philosophy dates to ancient Greece. It alludes to a set of values that have the power to drastically alter prior decisions and behaviours. According to a popular belief, the philosophy subfield of ethics is concerned with the dynamics of moral judgment. Like all human endeavours, scientific inquiry is regulated by social, communal, and individual values. Research ethics include rules for daily tasks, the safeguarding of individuals' dignity, and the dissemination of research findings. Because we value our users' privacy, we, as the developers of "HASHTECH360," have complied with all standards of behaviour and privacy.

- No Sharing or Selling of User Data: The system will not compromise any user data to any one nor will it allow purchasing of any data.
- Data Security. Only the owner, admin, and lead developer of HASHTECH360 System will have access to the database of the system to limit the chances of data compromise.
- No discrimination Policy: Apart from certain age restrictions, no one shall be discriminated in GIS based Smart Farming system.

Chapter 8

8 Lesson Learned

My Time as an intern in 'HASHTECH360' has been a great eye opener. I faced multiple challenges which I overcame by brainstorming for a workaround or a solution to those problems.

8.1 Problems faced during this period

Apart from all these, I have faced lots of challenges while working on this Project. Some of these are listed below.

- **Work Environment:** I faced some difficulties at work too. I had to be punctual and attend daily meetings. There were rules and regulations that were to be strictly maintained and I had to make sure that I followed them properly. I had to get myself familiar with their work culture in a very short period. I had to learn a completely new library of JavaScript and for back-end Python.
- **Adapting to New Technologies:** Since this was the first time, I have ever worked on a web application in an office environment I had to learn and adapt to new technologies of the company. Although acquiring the skill set was possible it became hard to apply them in real life situations.
- **Identifying & Fixing Bugs:** Often there were bugs in the system, and it was difficult to find them so, I had to ask the senior members of the company for help, and it was very unpleasant.

8.2 Solution of those problem

The last 5 years as an undergraduate student has taught me valuable lessons. Which helped me to find most of the solutions of this problem. Solutions for those problems are given below:

- Work Environment: From the university lessons, I learned the crucial ability of time management. Because of this, I was able to adjust appropriate time for myself so that I can meet the strict deadlines.
- Adapting to New Technologies: In the beginning, I found it challenging to adapt to new technologies. But with the help of my boss and the assistance of the web developer team, I became accustomed to the entire procedure after a few days.
- Identifying and Fixing Bugs: Most of the time I take help from online platforms and a senior developer helped me to fix some issues.

Chapter 9

9 Future Work & Conclusion

9.1 Future Work

The GIS based Smart Farming system is fully developed. But there some Features still need to be polished from time to time. ‘GIS based Smart Farming’ is the first version of this type of system. It has many sides for improvement

Some of them are:

- Lack of automation technology
- Inaccurate green cover monitoring
- Data management issues
- Improve the existing system.

9.2 Conclusion

This was a very successful internship for me. I've learned new things, gained new skills, and met a lot of new people. I was able to work and get experience in my sector professionally. An excellent way to acquire this experience is through an internship. It helped to describe my skills and limitations during the internship. This assisted me in identifying the information and abilities I need to develop the following time. During my internship, I picked up JavaScript and Python.

I now know how a website could be created with many functionalities. I've collaborated with a developer team in HASHTECH360. I now understand how to collaborate with the team in a software company and how to speak with other project staff members.

In conclusion, I would like to thank both my supervisors whose guidance and encouragement Persuaded me to strive for the success in this project and for the endless project to come in my way in future.

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An Undergraduate Internship/Project on

GIS based Smart Farming

By

Morsalin Amin Siam

Student ID: **1710450**

Summer, 2022

Consent Form

The student modified the internship final report as per the recommendations made by his/her academic supervisor and/or panel members during final viva, and the department can use this version for archiving.

(Signature of the Supervisor)

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