Artificially Intelligent Surveillance Tower(AIST)

User Manual

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1.0 GENERAL INFORMATION

Constant surveillance is a very important aspect of the external and internal security of a country. In the context of Bangladesh, our military forces have many secured installations all over which need constant 24/7 surveillance. We have mobile and static surveillance posts for defending those installations along with sensitive borders that we share with our neighboring countries. And these posts are constantly being guarded physically by man. Alongside many important installations situated inside the country need 24/7 surveillance for internal security and safety. But handling all these check/monitoring/surveillance posts that include some difficult terrains like CHT are hard to man all the time.

To mitigate this situation and ensure constant surveillance in the borders and the Key Point Defence Installations we can apply an unmanned AI-based surveillance system.

To serve this purpose, we want to establish the **AI Surveillance Tower** in our national borders(land/sea), KeyPoint Defence Installations and on difficult terrains to strengthen the security of our country. It will also focus our national defense and security into a dynamic view.

1.1 System Overview

The purpose of the AI-based surveillance system is to provide 24/7 surveillance in difficult as well as sensitive terrains without any physical involvement. Alongside it will provide identification of trace pacers and military vehicles. This system will also be able to detect the infiltration of all kinds of intruders and generate an alarm.

1.2 Organization of the Manual

The user's manual consists of the following sections.

1. General Information
2. System summary
3. System deployment

4. User access
5. Using the system

2.0 SYSTEM SUMMARY

System Summary provides a general overview of the system. It outlines the uses of the system's hardware and software requirements, System configuration, user access, and risk factors.

2.1 System Configuration

The AI Surveillance System will be a hardware and software-based system for surveillance that will be fully functional without any physical involvement. With a solar power source, it will be self-propelled and automated. Mainly, it will be a machine learning-based human detection system through a wide-angle camera without any human interaction to generate an alarm/warning message to inform the concerned.

2.2 Types of User

There are two types of users:

1. Admin Users
2. Operators

3.0 SYSTEM DEPLOYMENT

To work with the system the hardware modules need to be set up on the terrain.

3.1 Deploying the System on Ground

- Set the tower in an open place.
- Set the cameras at the top of the tower

- Set the solar panels beside the tower in such a way so that it gets most of the daylight.
- Set the Sealed Stainless box beside the tower. And Connect all the cables with the hardware modules.
- Test the hardware modules.
- Ensure that all the hardware is running properly.
- Get the GPS data for the particular location.

3.2 Setting up the Software Environment

Now it's time to set up the Software Environment. As the system is still in its Beta version, so the system is not available as a single package. So you need to do some extra work.

3.2.1 Setting up the Virtual Environment

For setting up the virtual environment do the following.
- Create a folder in any directory in the deployed system.
- Inside the folder open the command prompt.
- Make sure pip version 3 is installed on the machine. To check the pip version type the following:
  pip --version
- In the terminal type
  pip install virtualenv
- After the successful installation of the virtual environment creates a virtual environment for your system
  Virtualenv env
- When the virtual environment is created make sure by following the directory as **yourSystemDirectory > env**
- Run the virtual environment by typing:
  .\env\Scripts\activate (for windows)

3.2.2 Installing the Library Packages

For deploying the system you need the following python packages. Before that make sure your machine has python installed: **python --version** in the terminal.

1. arrow==1.0.3
2. asgiref==3.3.1
3. branca==0.4.2
4. certifi==2020.12.5
5. chardet==4.0.0
6. Django==3.1.7
7. folium==0.12.1
8. idna==2.10
9. imutils==0.5.4
10. Jinja2==2.11.3
11. MarkupSafe==1.1.1
12. numpy==1.20.2
13. opencv-contrib-python==4.5.1.48
14. pandas==1.2.4
15. Pillow==8.2.0
16. playsound==1.2.2
17. psycopg2==2.8.6
18. pycairo==1.20.0
19. python-dateutil==2.8.1
20. pytz==2021.1
21. requests==2.25.1
22. six==1.15.0
23. sqlparse==0.4.1
24. threaded==4.1.0
25. times==0.7
26. urllib3==1.26.4

- To install the packages you can install by pip inside the virtual environment. Make sure the virtual environment is activated already.
  Pip install packageName
- Or you can install the packages altogether. For that, you need to copy the whole project folder inside the main directory for the software. Then in the terminal do the following:
    1. **cd surveillance**
    2. **pip install -r requirements.txt**
- It will take time to install all the packages. Be patient.
- After the successful installation of all the packages, you can find the installed packages with
  Pip freeze

3.2.3 Setting up the Database Management System

To use Postgre in your machine, you need to install:

1. Postgre Database Server
2. A graphical tool to administer and manage the DB. pgAdmin is the most popular tool GUI Tool for Postgre

You could individually Download PostgreSQL for Windows and install these components but coupling the settings between the DB server, and a GUI tool could be a challenge. It's best to use a bundled installer that takes care of configuration complexities.

Following is a step by step process on How to **Install PostgreSQL**

- Go to https://www.postgresql.org/download and select Windows

DOWNLOADS

POSTGRESQL CORE DISTRIBUTION

The core of the PostgreSQL object-relational database management system is available in several source and binary formats

BINARY PACKAGES

Pre-built binary packages are available for a number of different operating systems:

- BSD
  - FreeBSD
  - OpenBSD
- Linux
  - Red Hat family Linux (including CentOS/Fedora/Scientific/Oracle variants)
  - Debian GNU/Linux and derivatives
  - Ubuntu Linux and derivatives
  - SuSE and OpenSuSE
  - Other Linux
- macOS
- Solaris
- Windows

- You are given two options

  1. Interactive Installer by EnterpriseDB

  2. Graphical Installer by BigSQL

  BigSQL currently installs pgAdmin version 3 which is deprecated. It's best to choose EnterpriseDB which installs the latest version 4

WINDOWS INSTALLERS

INTERACTIVE INSTALLER BY ENTERPRISEDB

Download the installer certified by EnterpriseDB for all supported PostgreSQL versions.

This installer includes the PostgreSQL server, pgAdmin; a graphical tool for managing and developing your databases, and StackBuilder; a package mana used to download and install additional PostgreSQL tools and drivers. Stackbuilder includes management, integration, migration, replication, geospatial, other tools.

This installer can run in graphical or silent install mod

The installer is designed to be a straightforward, fast way to get up and running with PostgreSQL on Windows.

Advanced users can also download a **zip archive** of the binaries, without the installer. This download is intended for users who wish to include PostgreSC another application installer.

PLATFORM SUPPORT

The installers are tested by EnterpriseDB on the following platforms. They can generally be expected to run on other comparable versions:

PostgreSQL Version	64 Bit Windows Platforms	32 Bit Windows Platforms
10	2016, 2012 R2 & R1, 2008 R2, 7, 8, 10	2008 R1, 7, 8, 10

- You will be prompted to the desired PostgreSQL version and operating system. Select the latest PostgreSQL version and OS as per your environment

Click the Download Button
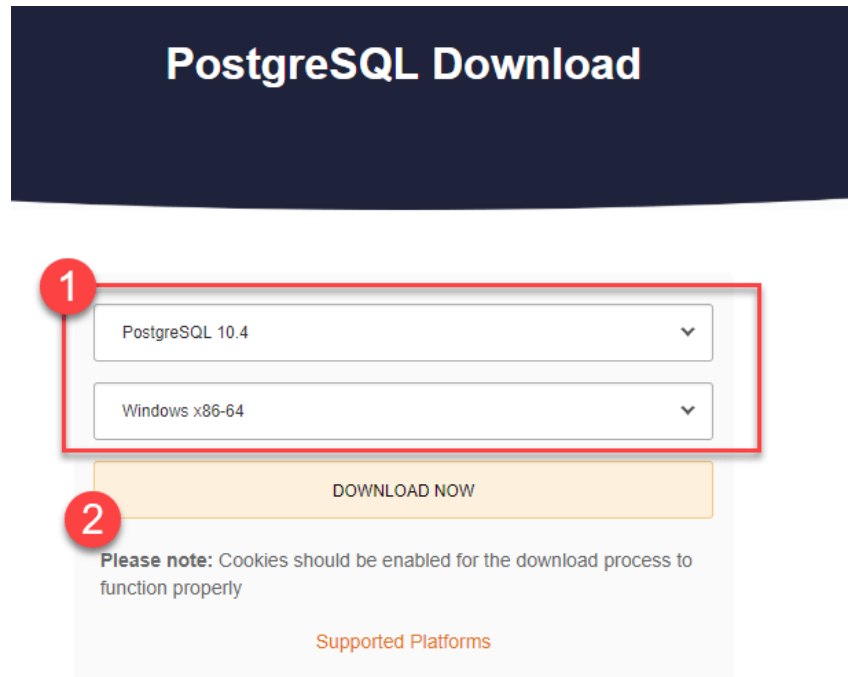
- Once you Download PostgreSQL, open the downloaded exe and Click next on the install welcome screen.
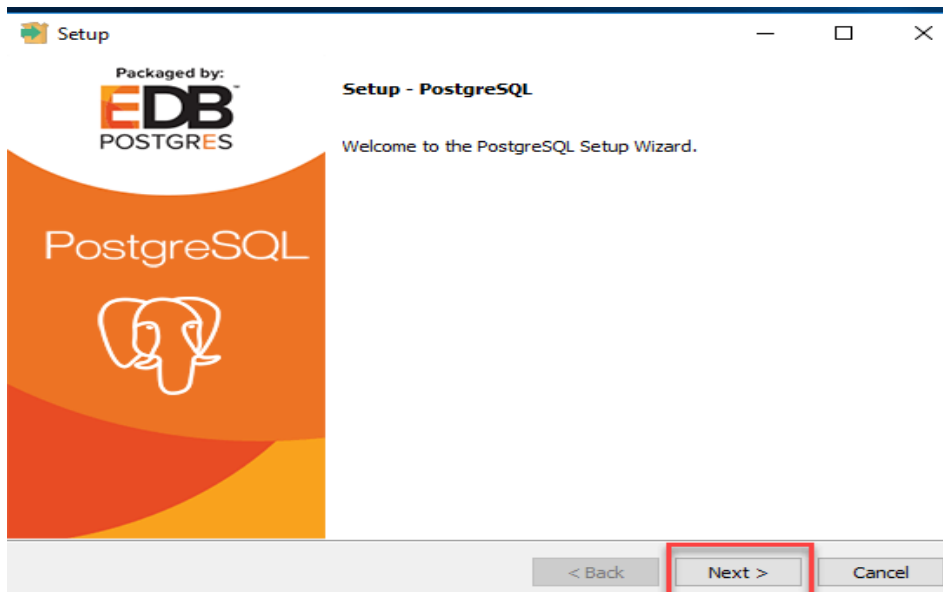
- Change the Installation directory if required, else leave it to default
- Click Next
- You may choose the components you want to install in your system. You may uncheck Stack Builder
- Click Next
- You may change the data location
- Click Next
- Enter superuser password. Make a note of it
- Click Next
- Leave the port number default
- Click Next
- Check the pre-installation summary:
- Click Next
- Click the next button
- Once install is complete you will see the Stack Builder prompt
  1. Uncheck that option. We will use Stack Builder in more advanced tutorials
  2. Click Finish
- To launch PostgreSQL go to Start Menu and search pgAdmin 4
- You will see the pgAdmin homepage
- Click on Servers > PostgreSQL 10 in the left tree
- Enter superuser password set during installation
- Click OK
- You will see the Dashboard
- Inside the settings.py of the software change the DATABASES section according to your superuser and password.
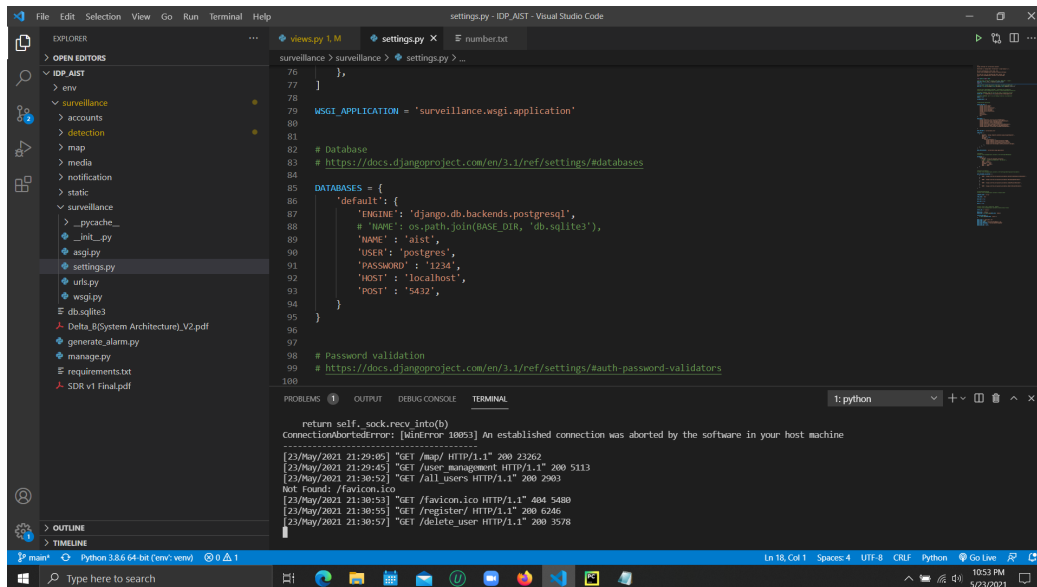
That's it to PostgreSQL installation.

****** after postgres installation some setting need to be applied(one is -> migration set,) ******

3.2.4 Setting up the Email Notification

Your software can automatically generate email notifications for detection log and user creation. For that reason, you need to set up the email configuration. For configuring the email do the following:
- Go to settings.py inside **YourSoftwareDirectory > surveillance > surveillance > settings.py** and set the following:
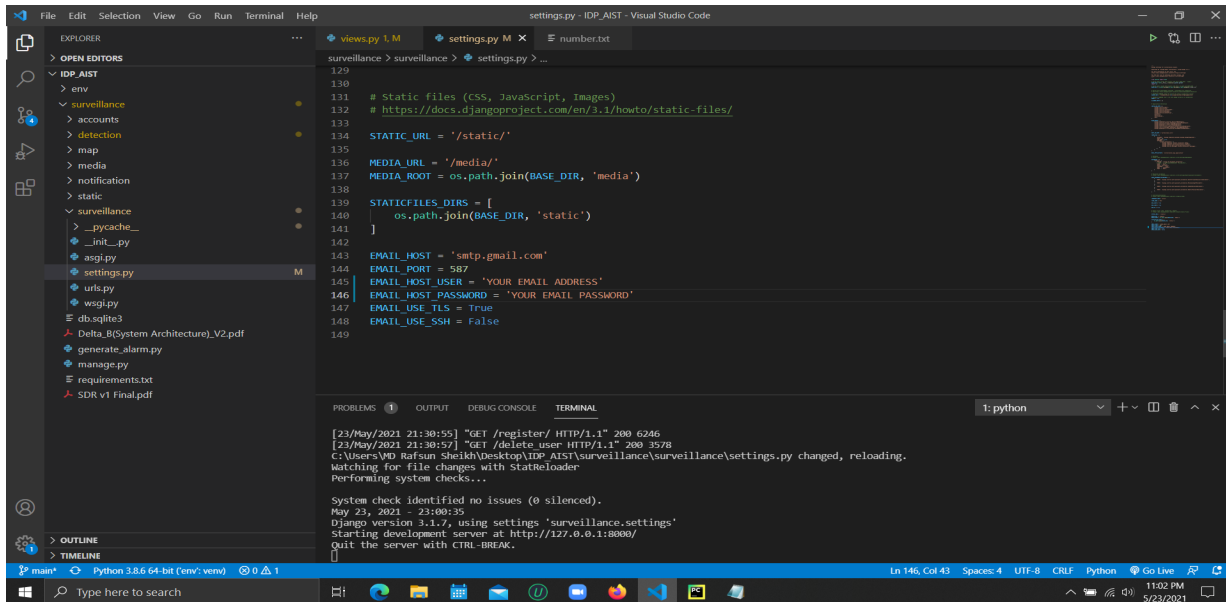
3.2.5 Creating admin users

To create admin users:
- First we'll need to create a user who can log in to the admin site. Run the following command:
  python manage.py createsuperuser
- Enter your desired username and press enter.
  Username: admin
- You will then be prompted for your desired email address:
  Email address: admin@example.com
- The final step is to enter your password. You will be asked to enter your password twice, the second time as a confirmation of the first.
  Password: *******
  Password (again): *********
  Superuser created successfully.**

4.0 USER ACCESS

- Users can access in two modes. As Admin user and as operator. To login, the software user needs to start the development server by
 **python manage.py runserver**

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- Then go to the following link for the local server access: **http://127.0.0.1:8000/**
- The first page is the login page. Give your login credential and log in to the system.

4.1 Admin User

- For login as an admin user use your superuser credentials.

4.1.1 Admin User Panel

- To login into the admin user panel goes to the following link: **http://127.0.0.1:8000/admin**
- Give your super user credentials to login. You will find a page similar to this. This is django admin user panel. You can do some stuff here:
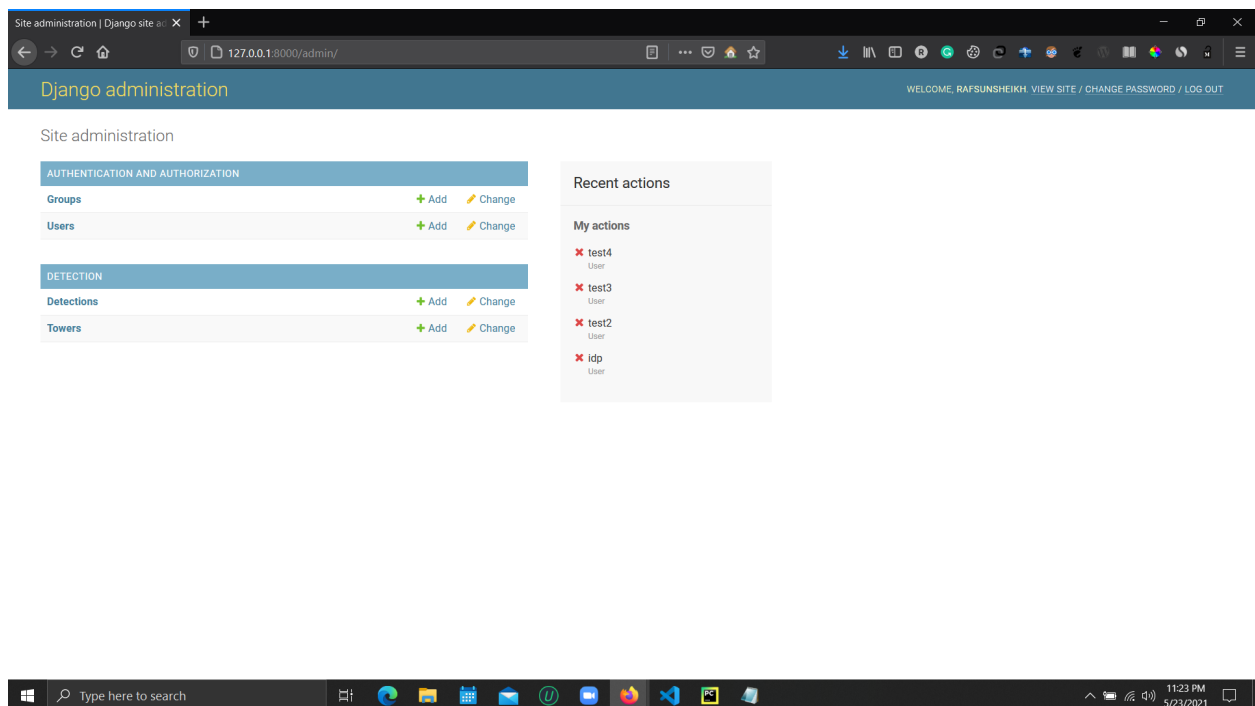
4.2 Operator User

At the starting of the launch of the new tower, there is no operator user. Admin must create an operator user for login access as an operator. That will be covered in section **5.1.5.1 Create User.**

- After the creation of the operator user go to the following link: **http://127.0.0.1:8000/**
- Use your given credentials to log in as an operator
- You will land into the operator dashboard
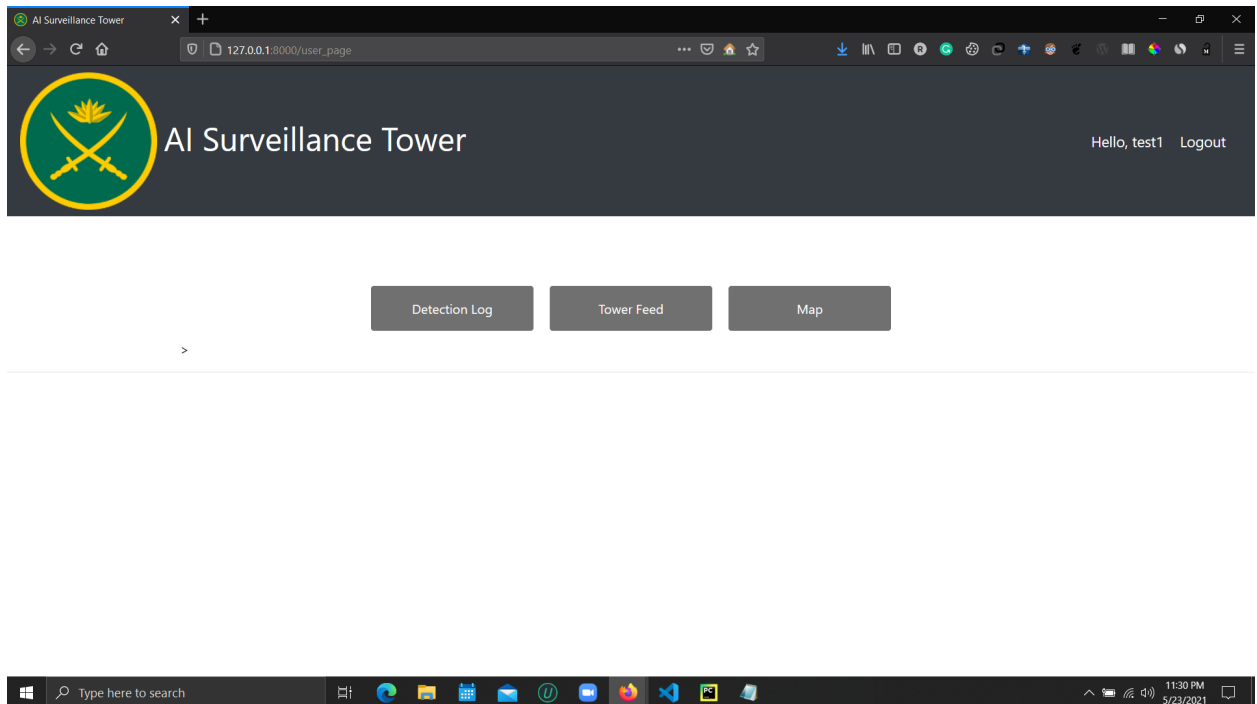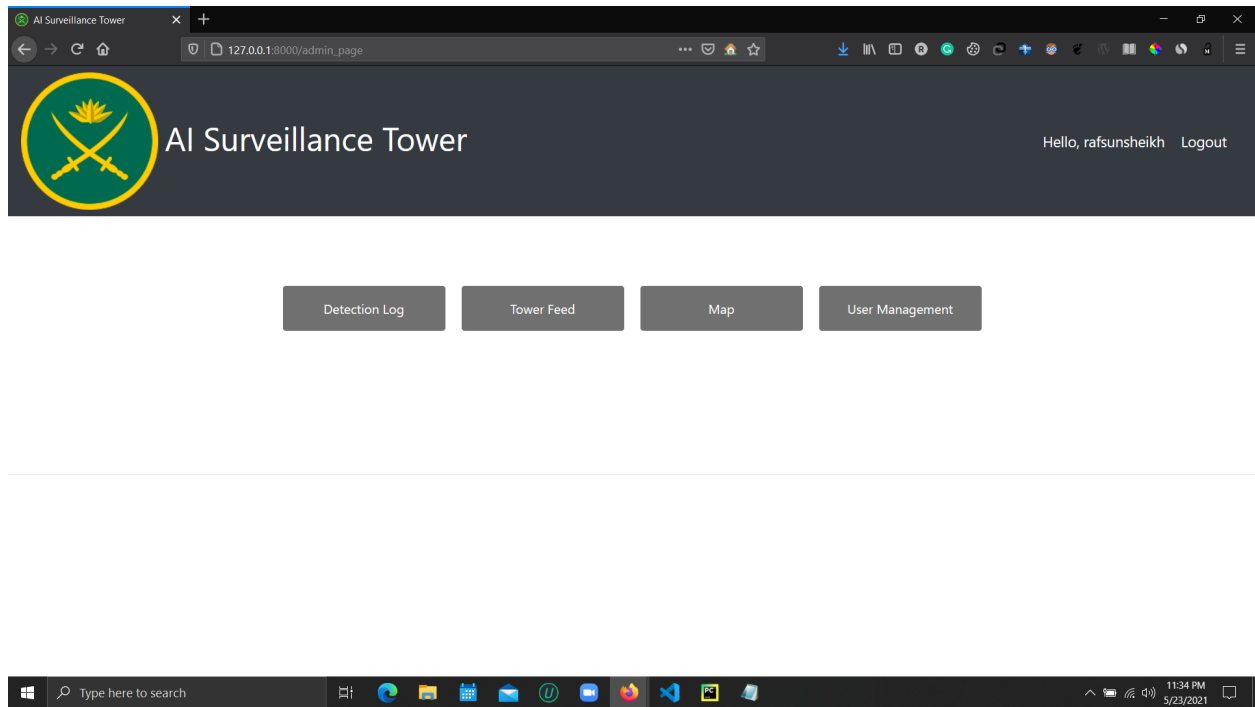

5.0 USING THE SYSTEM

Let's find out how to use the software. You can use the software as an Admin user and Operator User.

5.1 Using the System as Admin User

To use the system as Admin user login as Admin user at the home page.
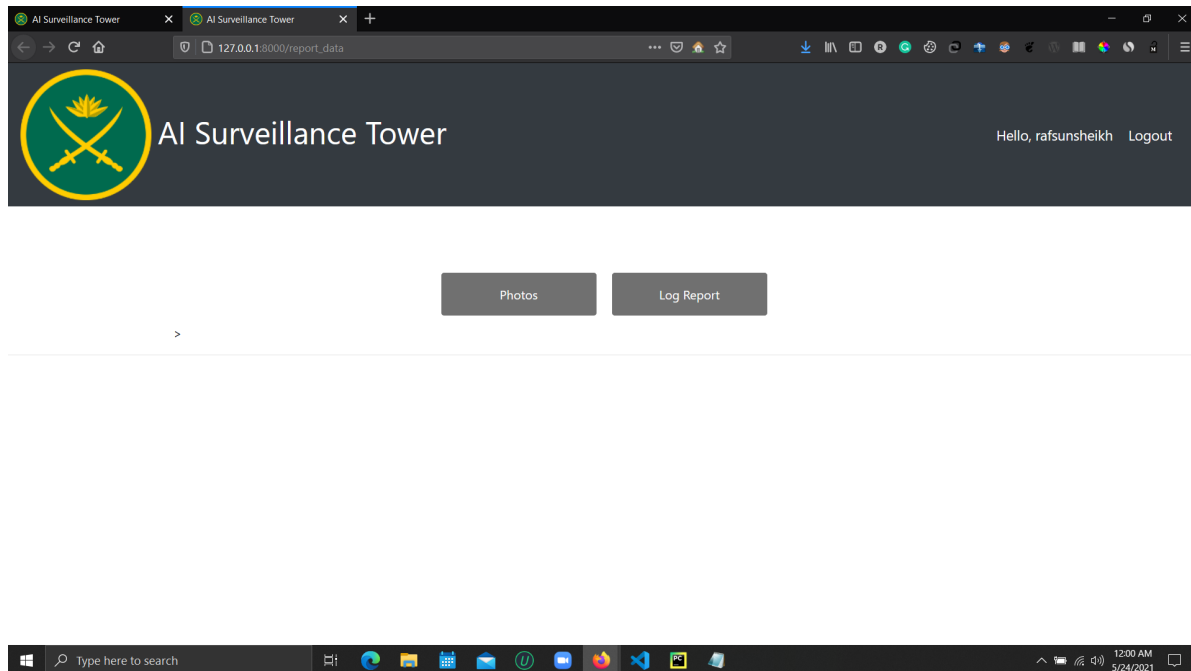
5.1.1 Admin Dashboard Overview

- After you successfully login to the system as an admin user you will find the following dashboard:

5.1.2 Detection Log

The first button at the admin panel is Detection Log. Which includes
1. Photos
2. Log Report

5.1.2.1 Photos

- On this page, all the detected photos are shown as a gallery

5.1.2.2 Log Report

- On this page, all the log reports of the detected images are shown as a list.
- Each log report includes:
    1. Name
    2. Detection Date
    3. Detection Time
    4. Image Name

5.1.3 Tower Feed

Inside this page, all the Towers in the area are shown as a single clickable button. You can start seeing the feed from any of the towers.
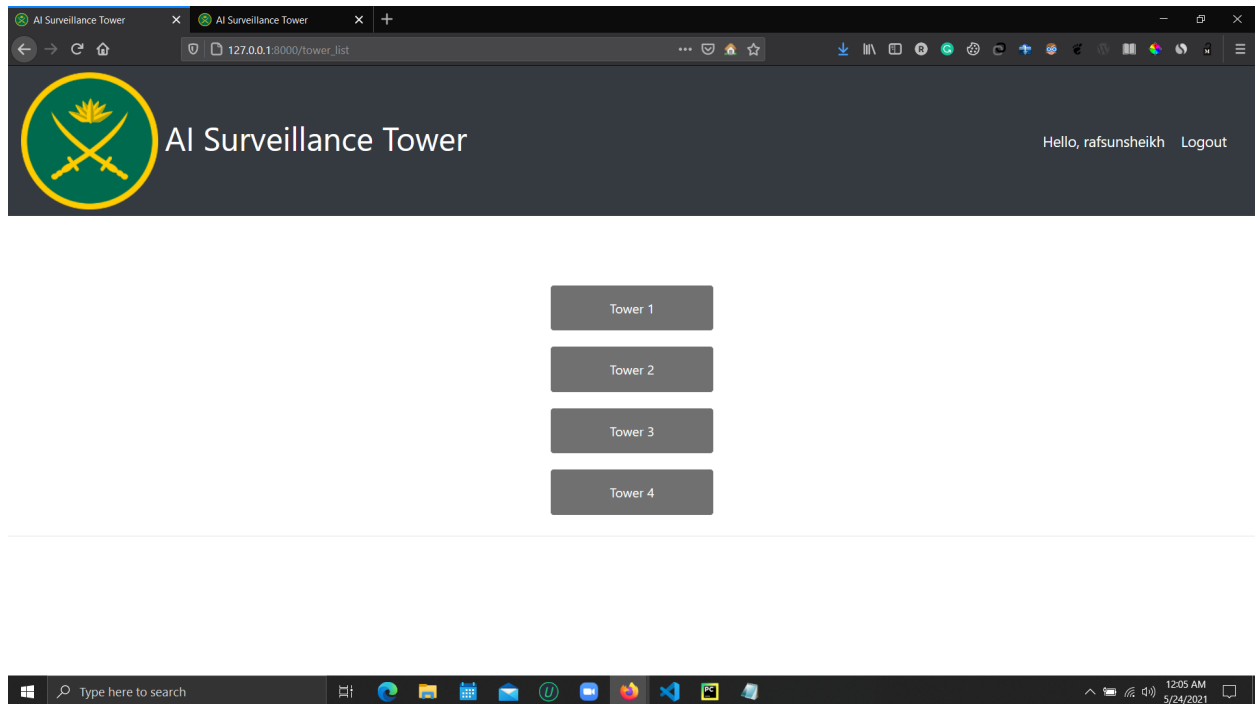
5.1.4 Map

Inside this page, all the towers in the area are shown on the map of their original location. Each tower is shown with markers. Each marker contains:

1. Name
2. Location
3. Latitude
4. Longitude
5. Tower Feed Link

5.1.5 User Management

Operators' dashboard differs from the Admin dashboard in the case of User Management. Only the admin can have access to user management. User management has the following options:

1. Create user
2. All Users
3. Delete User
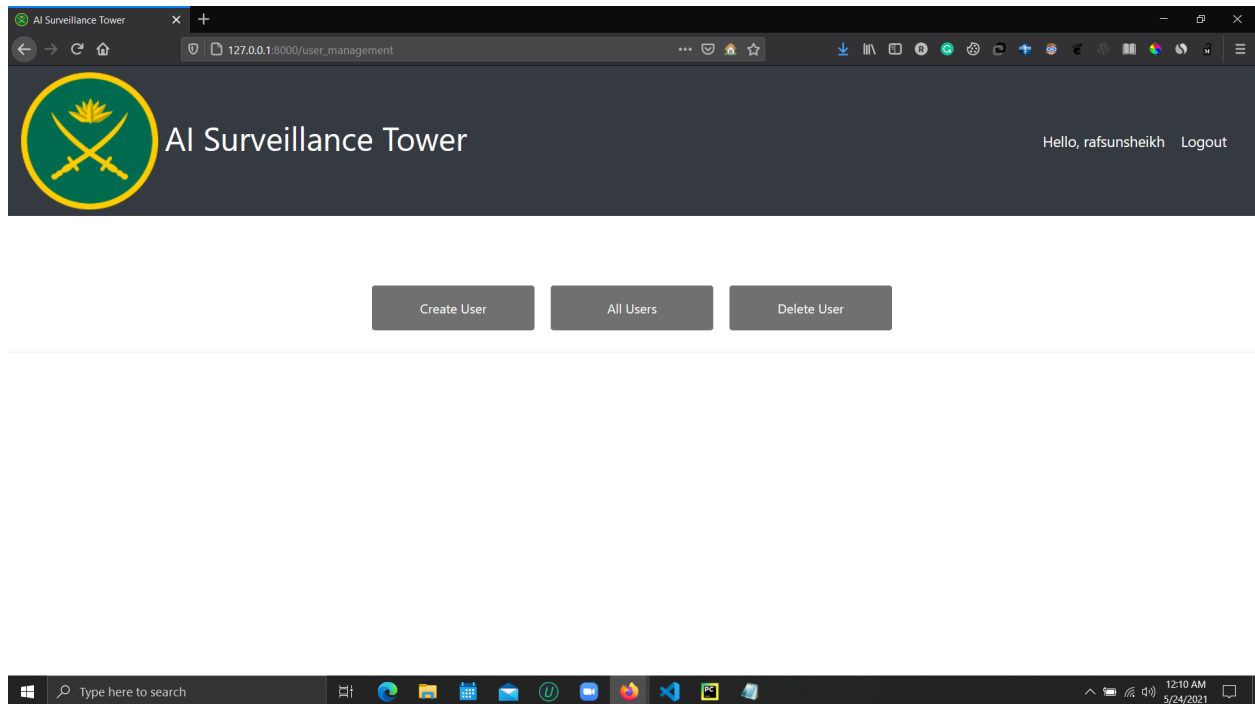
5.1.5.1 Create User

- You can create an Operator user from this option.
- To create a user provide
    1. User Name
    2. Email
    3. Password
    4. Confirm Password
- After successful creation of a user-provided email address will get a confirmation email for new user creation. But the email will not contain a password for security purposes. To get the password the operator needs to contact the admin panel.

5.1.5.2 All Users

- This option contains all the users as a list including the admin users.
- Each row in the table contains:
    1. User Name
    2. First Name

3. Second Name
4. Email
5. Date Joined
6. Last Login
7. Is Staff (whether admin user or not)

5.1.5.3 Delete User

- This option is for deleting an operator user from the system.
- Each user entries contain:
    1. User Name
    2. First Name
    3. Second Name
    4. Email
    5. Date Joined
    6. Last Login
    7. Delete
- Admin users are not shown in this list.
- Selecting delete will take you to the delete confirmation page.
- If you confirm the deletion then only the user will be deleted.

5.2 Using the System as an Operator

To use the system as an Operator, login as an operator user at the home page.
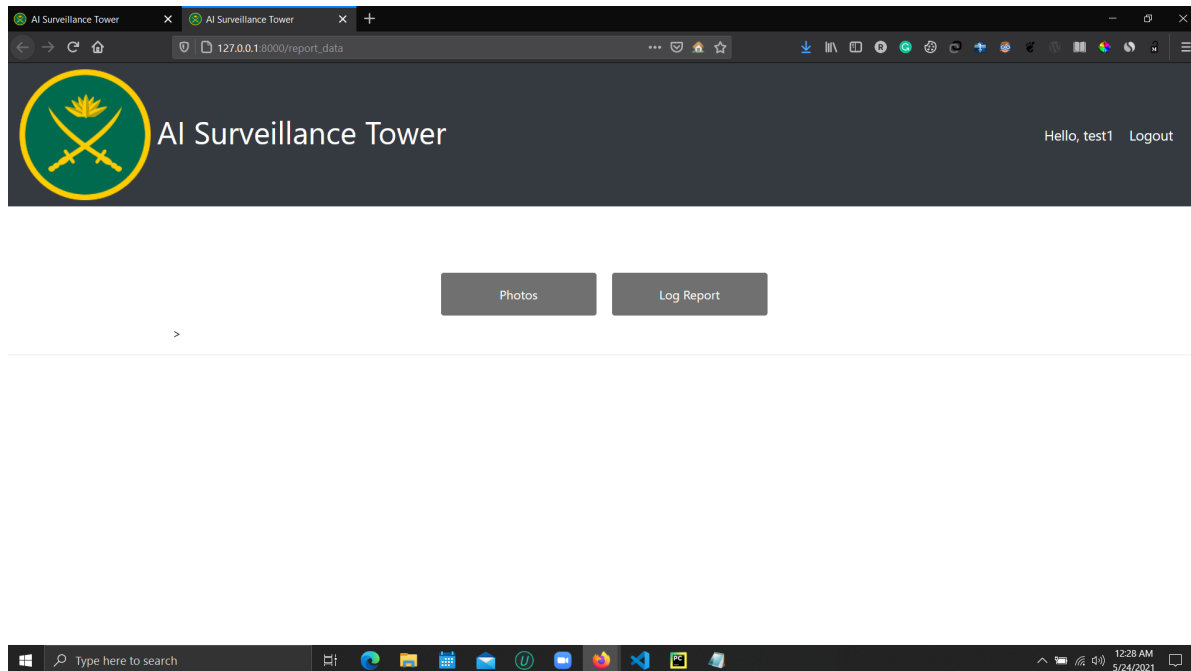
5.2.1 Operator Dashboard Overview

- After you successfully login to the system as an operator you will find the following dashboard:
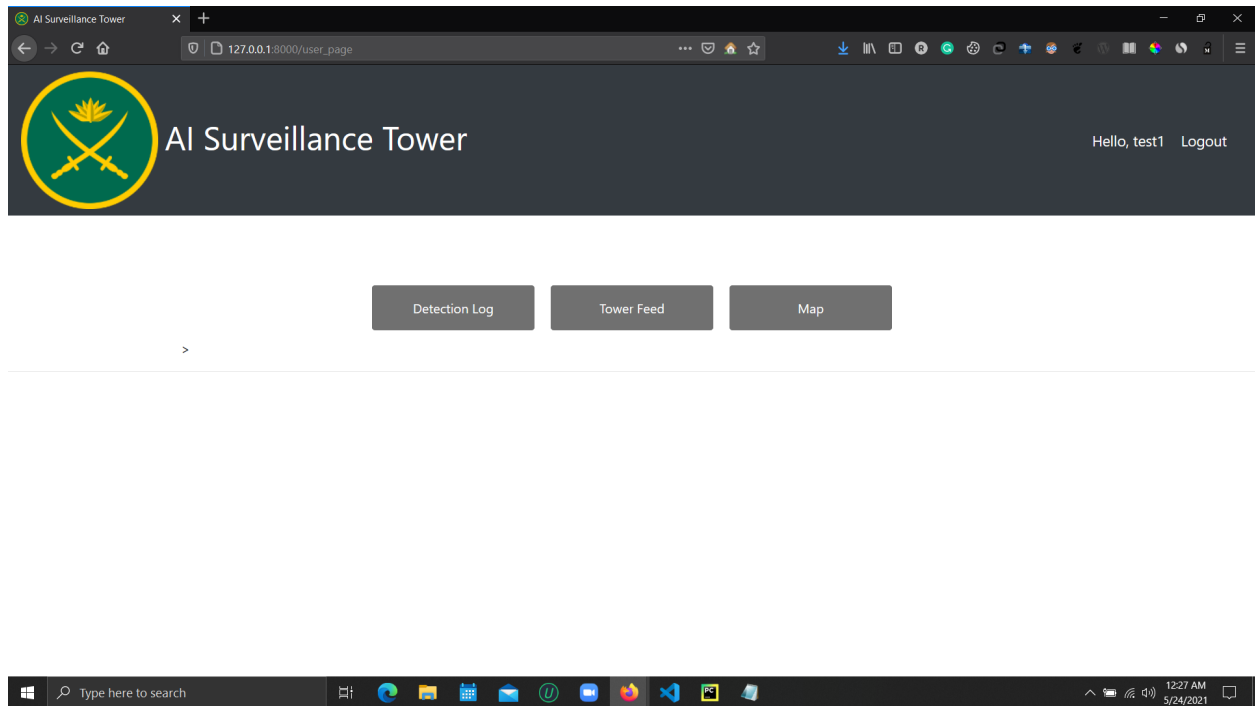
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The first button at the operator panel is Detection Log. Which includes
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- On this page, all the detected photos are shown as a gallery

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- On this page, all the log reports of the detected images are shown as a list.
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Inside this page all the Towers in the area are shown as a single clickable button. You can start seeing the feed from any of the towers.
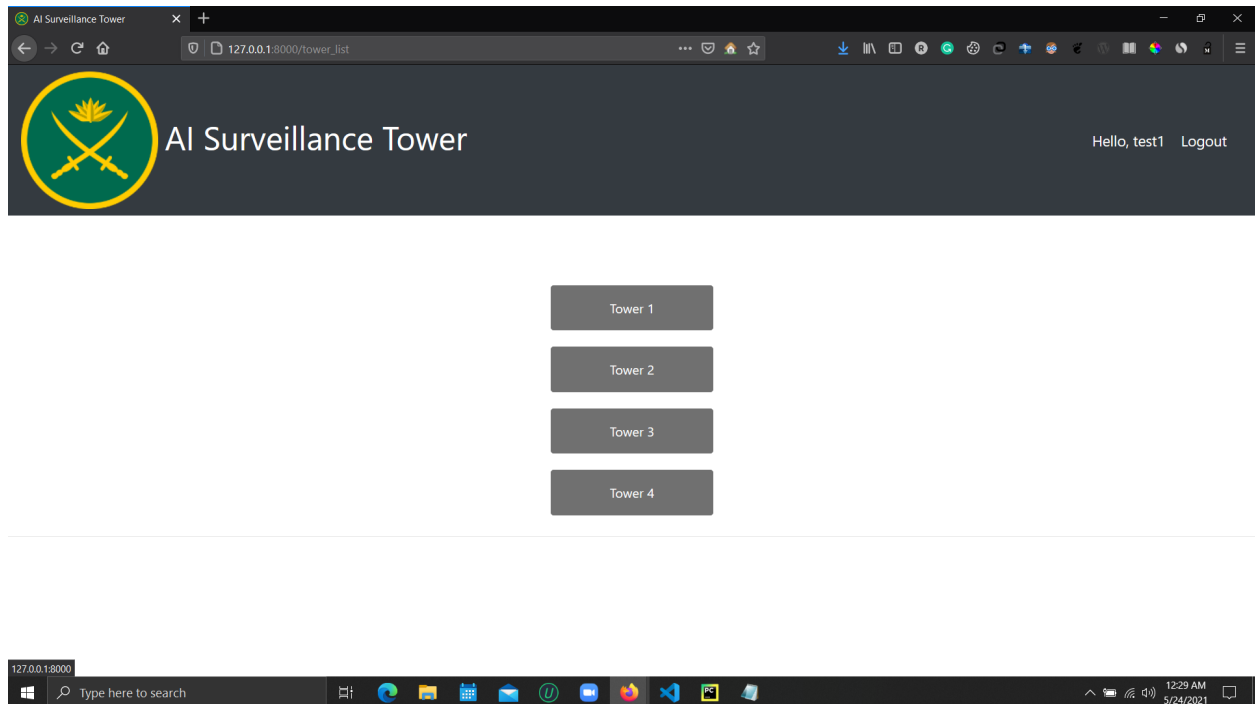
5.2.4 Map

Inside this page, all the towers in the area are shown on the map of their original location. Each tower is shown with markers. Each marker contains:

1. Name
2. Location
3. Latitude
4. Longitude
5. Tower Feed Link

6.0 RISK MANAGEMENT