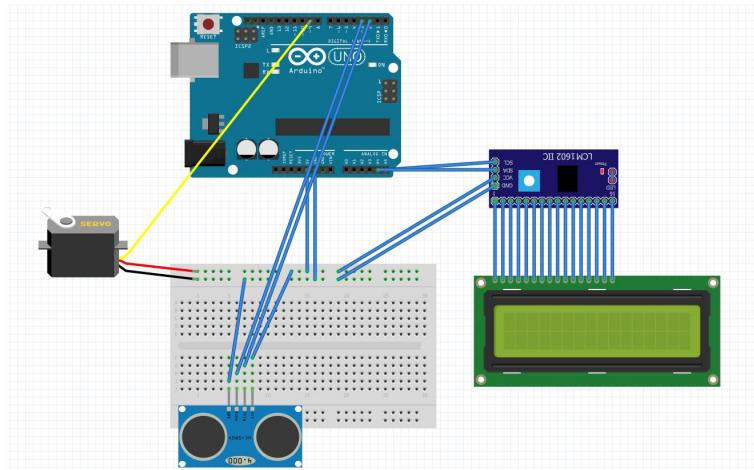


## Arduino Architecture

Figure 5.4 illustrates the sketch design of the Arduino entry gate. In the entry gate it requires the LCD to show the vehicle plate and message, a servo motor to control gate movement, an ultrasonic sensor to detect the distance for automatic gate operations, breadboard, Arduino UNO act as controller and wires to connect all the components. The trigger pin of the ultrasonic sensor needs to be connected to the digital pin 2 of the Arduino UNO. Then the echo pin of the ultrasonic sensor needs to be connected to the digital pin 3 of the Arduino UNO. The ultrasonic sensor monitors for objects within a 10 cm range in front of the gate. If no object is detected for 2 consecutive seconds, the system will command the gate to close automatically. Then the servo motor control pin requires to connect to the digital pin 9 of the Arduino UNO. Then the LCD display's SDA and SCL pins are connected to analog pins A4 and A5. Since the Arduino UNO only have 3 GND pin, a 5V output and a 3.3V output pin. Therefore, the breadboard is used to extend the GND and power supply to have more pins. The servo motor, ultrasonic sensor and LCD display require to connect their VCC and GND pins to the extended power supply or GND pins in order to complete the circuit. For the exit gate, the Arduino setup is identical to the entry gate but without the LCD display, as shown in Figure 5.5.



**Figure 5.1** Arduino entry gate sketch design

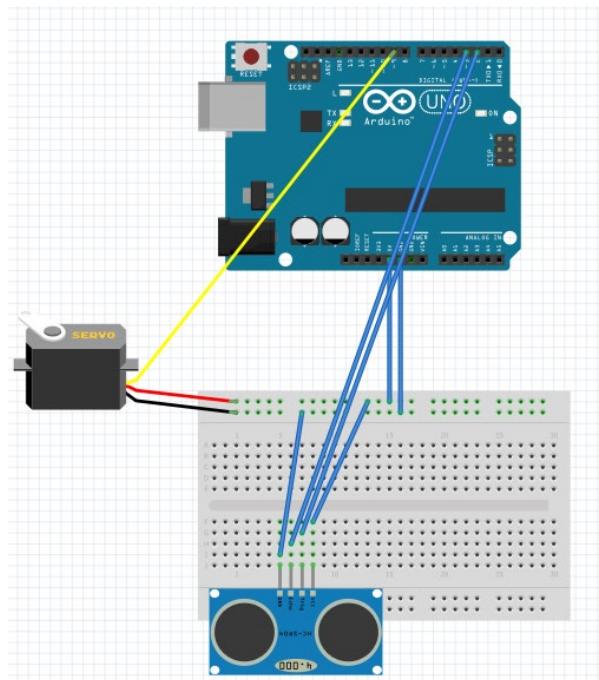


Figure 5.2 Arduino exit gate sketch design

## Actual User Interface

Figure 5.6 displays the login screen of the ANPR system. This login page is served as the initial interface for either security or administrative user to access the system. The page has two input fields, one for entering the user id another one is for inputting their corresponding password. After entering the credential, user can either click the “LOGIN” button or press “ENTER” on the keyboard, it will directly submit compare the user id and hashed password from the database.



**Figure 5.3 ANPR login page**

If the user key in the wrong credential it will have the sound effect and pop-up window that notify the user “Invalid User ID or Password” as shown in Figure 5.7.



**Figure 5.4 Wrong password or users id pop-up window**

When the user has key in wrong password more than 3 times in a minute than the account will be suspended for 3 minutes as shown in Figure 5.8. During this suspension period, a timer will display the remaining time before the user is allowed to attempt logging in again.

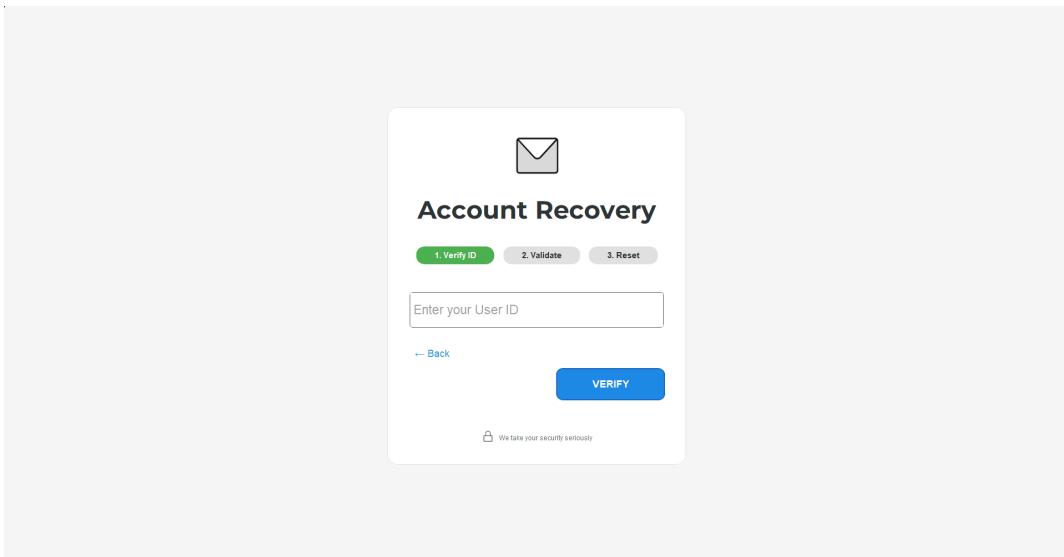


**Figure 5.5 Account being suspended for 3 minutes**



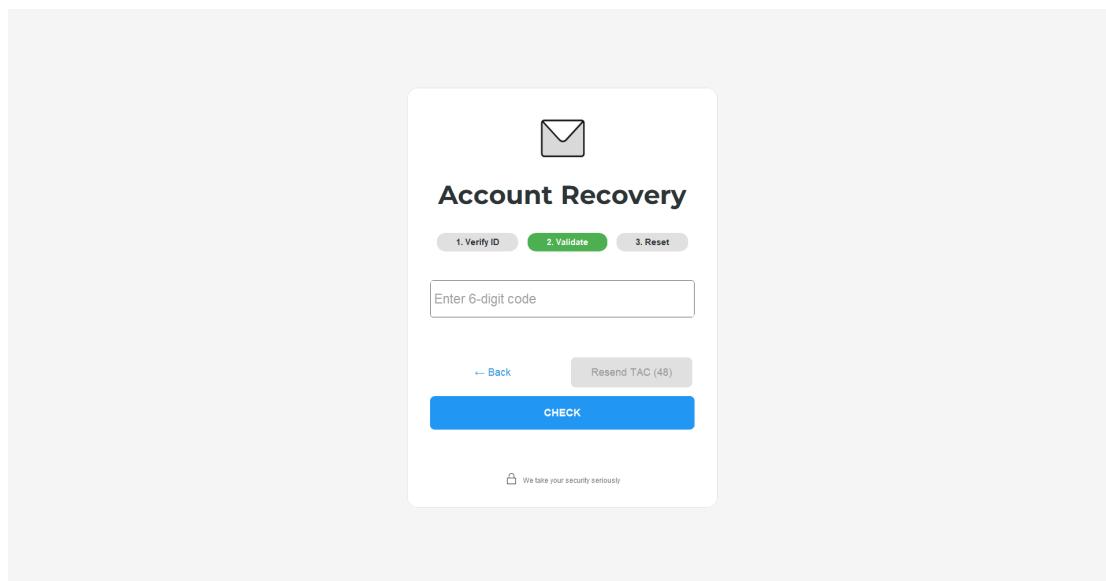
**Figure 5.6 Timer to update the suspended time**

The login page includes a feature to assist users who have forgotten their passwords. If users forget both their user id and password, they will need to contact the admin to retrieve their user id. However, if users only forget their password, they can click the “Forgot Password?” button, which will navigate them to the user verification page in Figure 5.10.



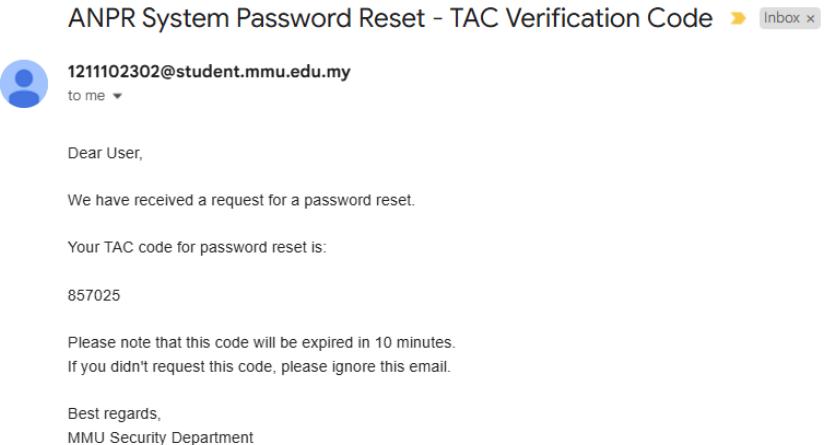
**Figure 5.7 User verification page**

In this user verification page user is required to key in their user id, then a TAC code will be sent to the user registered email address.



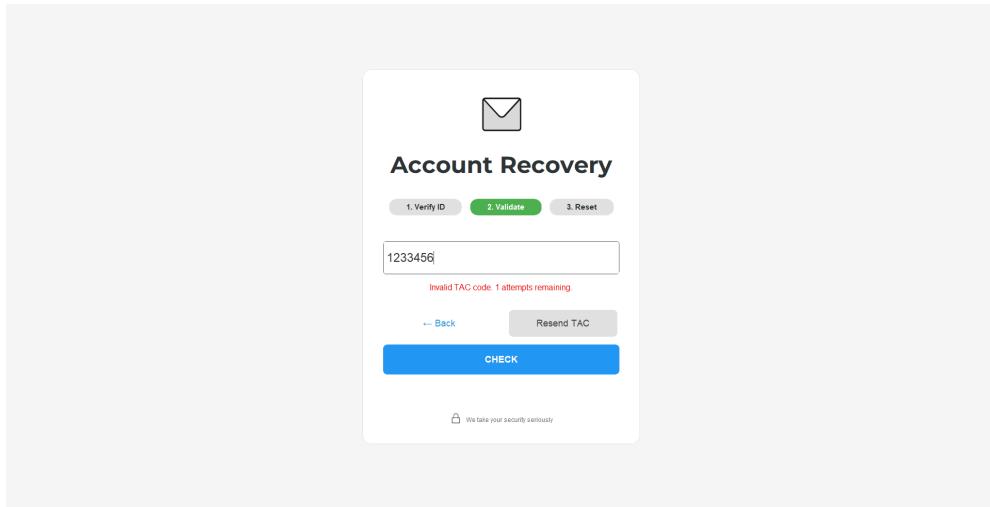
**Figure 5.8 TAC verification page**

In Figure 5.12 shows that the format of the email being sent to the user. User can resend the TAC code only after the timer for TAC is clear.



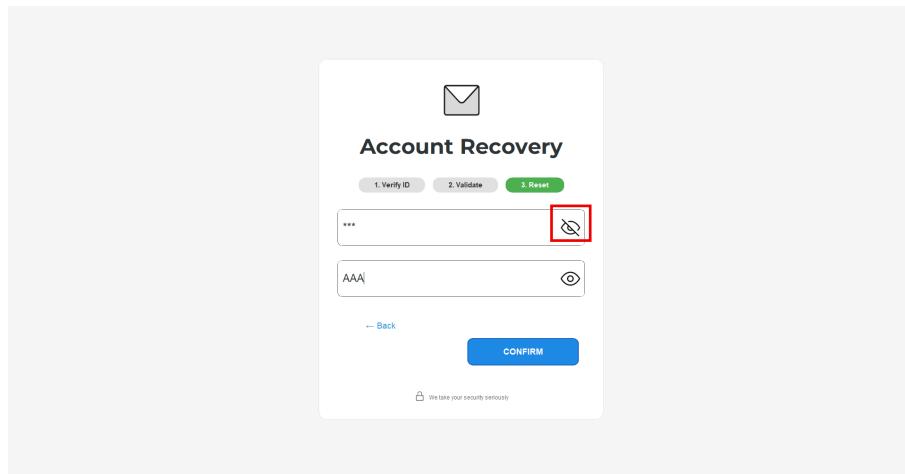
**Figure 5.9 Email format of the TAC code**

In this TAC verification page, if the user type in three consecutive wrong TAC code it will navigate back to the login page. The TAC code will be expired after 10 minutes.



**Figure 5.10 Validation for the TAC code**

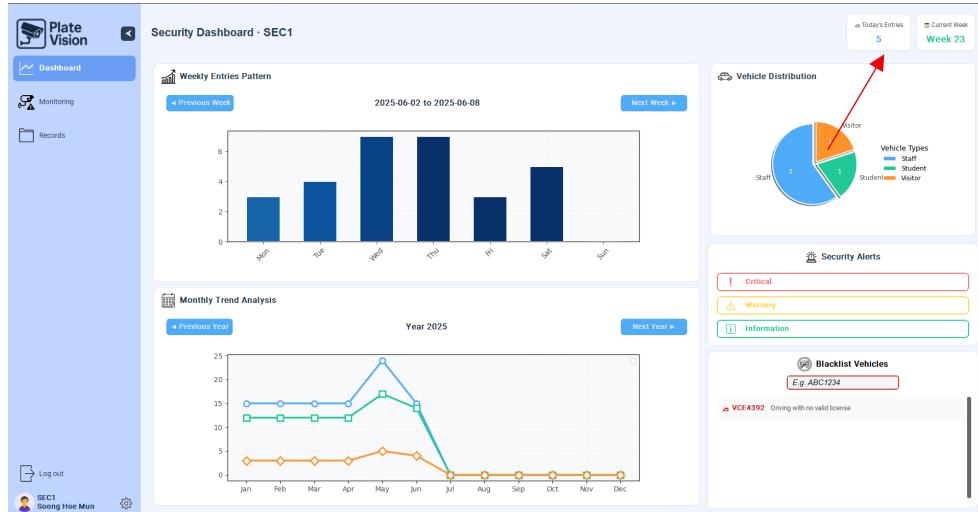
In Figure 5.14 shows the reset password page. The system will verify that the new password entered by the user meets the required criteria of at least 8 characters, including at least one letter, one number, and one special character. It will then check whether the two passwords entered by the user match. If the passwords do not match, a pop-up message will appear, prompting the user to re-enter the passwords. Additionally, the user can use the eye icon to toggle between showing and hiding the entered password for easier verification during input.



**Figure 5.11 Reset password interface**

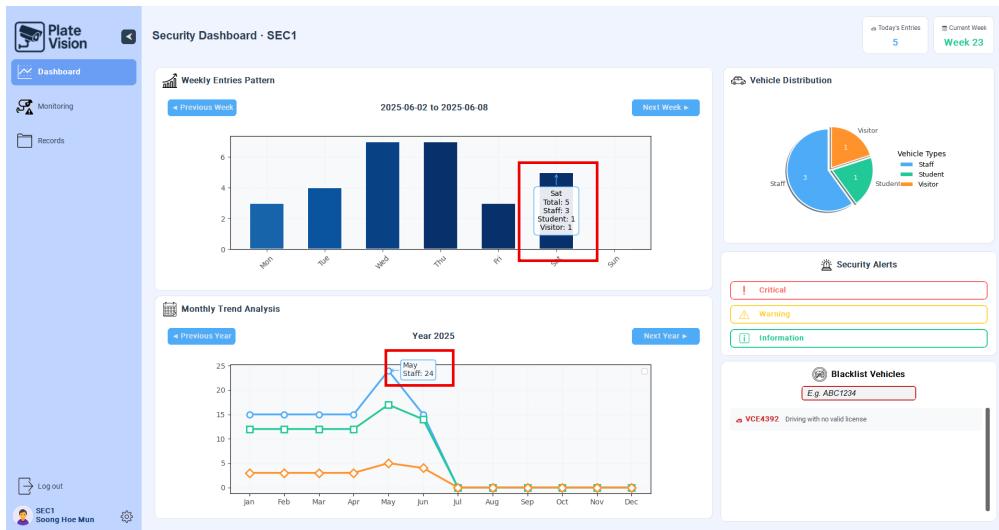
## Security User Interface

Once the security user has successfully login to the system it will redirect the user to the security personal dashboard as shown in Figure 5.15. In this interface it will show the real time information retrieve from the database. In the upper right corner, the cards will show the real-time information of today car entries amount and show the current week in the year.



**Figure 5.12 Security Dashboard design layout**

When the security hover to the weekly car entries bar chart it will have a small window to show the entry number of staff, student and visitor of that specific day. Similarly, when the user hovers over the monthly line graph, a tooltip will show the number of vehicle entries corresponding to the selected point within that month as shown in Figure 5.16.



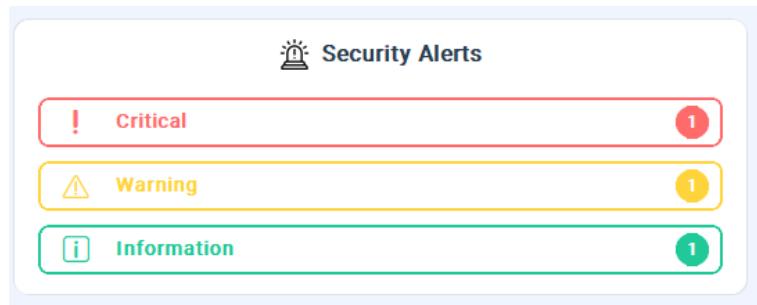
**Figure 5.13 Example of hover to weekly bar chart and monthly line graph**

The user is unable to view the future year or the future week from the bar chart and line graph. The system will provide warning message to the user as shown in Figure 5.17.



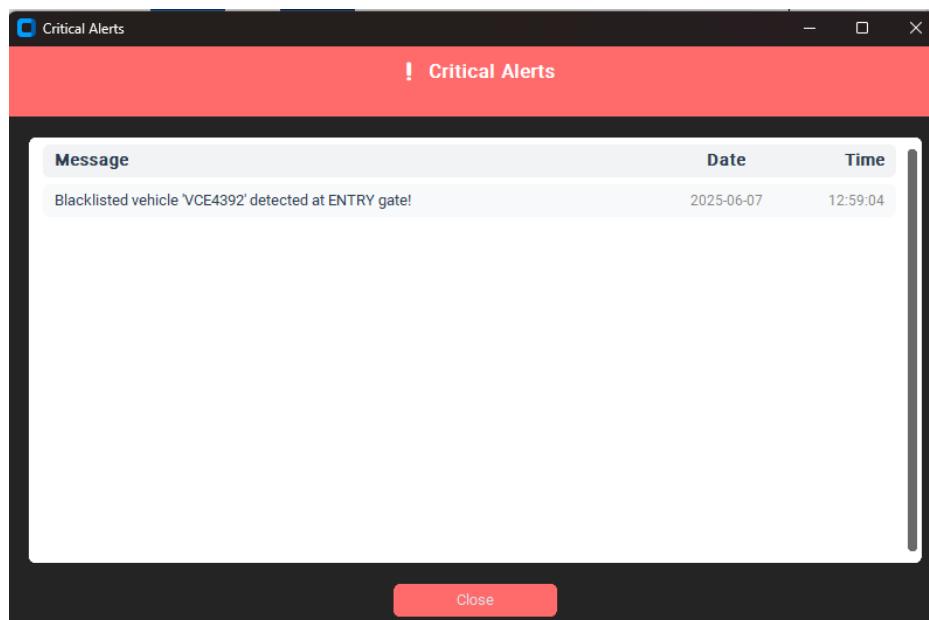
**Figure 5.14 Warning message to prevent user to view future data**

Alerts for “Critical,” “Warning,” and “Information” are triggered in real time, with a notification count displayed on the side as shown in Figure 5.18.

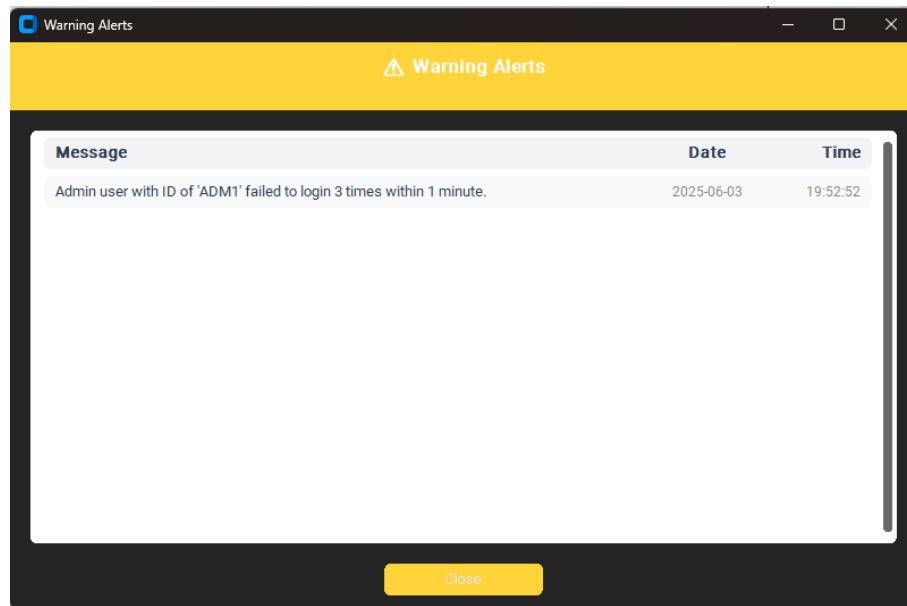


**Figure 5.15 Design of the button when alert is being trigger**

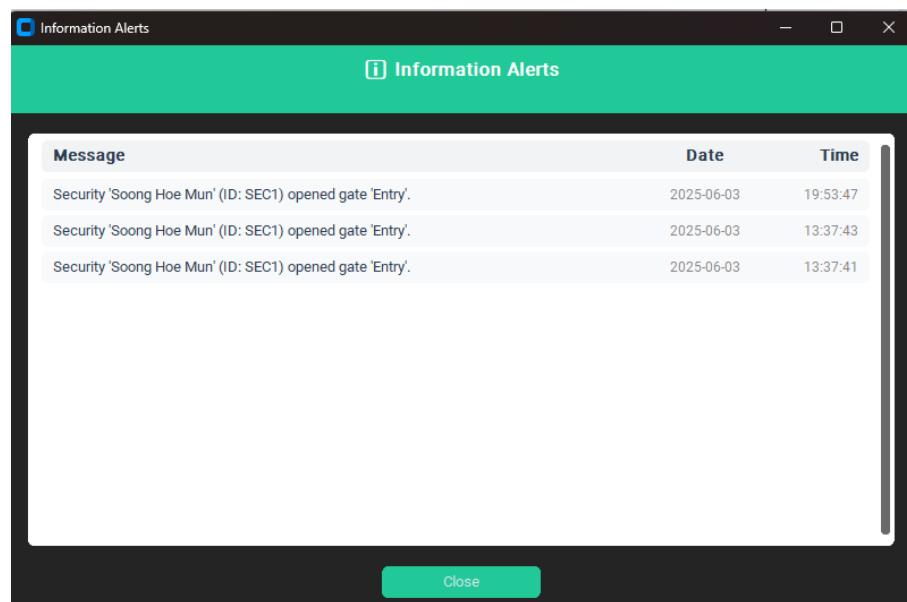
The “Critical” alert is to show any blacklisted vehicle detected at the gate. The system will automatically record the message, date and time to the database. The “Warning” alert will be trigger when there is a user trying to login many times in the login page. If the user id is not included inside the database, it will not trigger this alarm. “Information” alert is trigger when there is a security user trying to open the gate manually either in entry or exit.



**Figure 5.16 Critical Alert pop-up window**

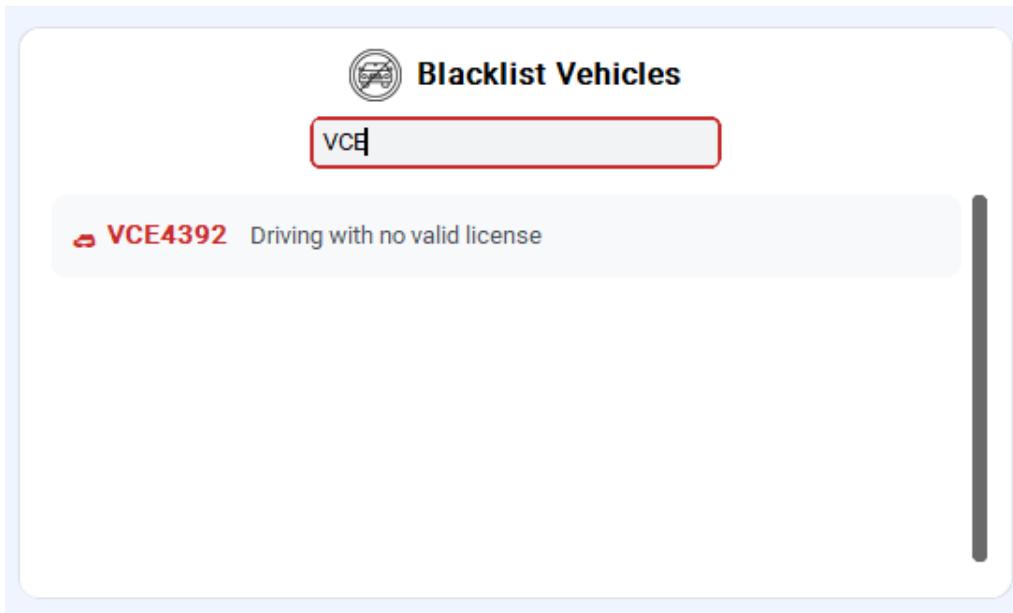


**Figure 5.17 Warning Alert pop-up window**



**Figure 5.18 Information Alert pop-up window**

In the blacklist vehicle record section, security users can directly search for a blacklisted vehicle by entering its plate number. The system will then display the reason why the vehicle was blacklisted.



**Figure 5.19** Searching in blacklist vehicle section

When the security user selects the “Records” option from the navigation menu, the system will redirect them to the Records interface as shown in Figure 5.23. If the user attempts to navigate beyond the first or last page of the record table. The system will display a notification message to inform the user, as illustrated in Figure 5.24 and Figure 5.25.

The screenshot shows the 'Records' interface of the Plate Vision system. On the left, there is a sidebar with icons for Dashboard, Monitoring, Records (which is highlighted in blue), and Log out. The main area is titled 'Records' and contains a table of vehicle entries. The table has the following columns: No, Vehicle Plate, Brand, Model, Owner Identity, Entry Date, Entry Time, Exit Date, Exit Time, and Entry Reason. The table lists 24 entries, each with specific details like vehicle number, make, model, owner type, and entry/exit times. At the bottom right of the table, there is a page number '1 of 9'.

No	Vehicle Plate	Brand	Model	Owner Identity	Entry Date	Entry Time	Exit Date	Exit Time	Entry Reason
1	JFJ9829	Toyota	Camry	staff	2025-06-07	18:02	2025-06-07	18:57	registered
2	VNV8801	Perodua	Axia	student	2025-06-07	12:48	2025-06-07	12:49	registered
3	MDE292	Toyota	Corolla	visitor	2025-06-07	12:47	N/A	N/A	To fetch son
4	MBQ9838	Toyota	Vios	staff	2025-06-07	12:19	2025-06-07	13:55	registered
5	PQR2345	Perodua	Aruz	staff	2025-06-07	08:34	2025-06-07	09:36	registered
6	MBQ9838	Toyota	Vios	staff	2025-06-06	18:59	2025-06-06	20:37	registered
7	VNV8801	Perodua	Axia	student	2025-06-06	17:51	2025-06-06	19:00	registered
8	STU6789	Honda	Civic	staff	2025-06-06	16:25	2025-06-06	18:31	registered
9	MDE292	Toyota	Yaris	visitor	2025-06-05	18:06	2025-06-05	20:38	Fetch son
10	JKL3456	Toyota	Yaris	student	2025-06-05	17:09	2025-06-05	19:52	registered
11	GHI9012	Perodua	Bezza	student	2025-06-05	16:30	2025-06-05	19:03	registered
12	GHI9012	Perodua	Bezza	student	2025-06-05	15:11	2025-06-05	18:09	registered
13	PRE3221	Perodua	Alza	student	2025-06-05	12:13	2025-06-05	12:49	registered
14	JKL3456	Toyota	Yaris	student	2025-06-05	11:55	2025-06-05	14:53	registered
15	JFJ9829	Toyota	Camry	staff	2025-06-05	10:05	2025-06-05	11:16	registered
16	JFJ9829	Toyota	Camry	staff	2025-06-04	18:33	2025-06-04	20:15	registered
17	MDE292	Toyota	Yaris	visitor	2025-06-04	16:26	2025-06-04	17:22	Fetch son
18	GHI9012	Perodua	Bezza	student	2025-06-04	15:32	2025-06-04	16:06	registered
19	PQR2345	Perodua	Aruz	staff	2025-06-04	15:26	2025-06-04	18:10	registered
20	BCD8901	Perodua	Myvi	staff	2025-06-04	10:58	2025-06-04	11:58	registered
21	PRE3221	Perodua	Alza	student	2025-06-04	09:56	2025-06-04	12:20	registered
22	MBQ9838	Toyota	Vios	staff	2025-06-04	07:20	2025-06-04	09:04	registered
23	MDE292	Toyota	Yaris	visitor	2025-06-03	15:27	2025-06-03	16:53	Fetch son
24	JKL3456	Toyota	Yaris	student	2025-06-03	13:06	2025-06-03	13:57	registered

**Figure 5.20** Records interface design

No	Vehicle Plate	Brand	Model	Owner Identity	Entry Date	Entry Time	Exit Date	Exit Time	Entry Reason
1	JFJ9829	Toyota	Camry	staff	2025-06-07	18:02	2025-06-07	18:57	registered
2	VNV8801	Perodua	Axia	student	2025-06-07	12:48	2025-06-07	12:49	registered
3	MDE292	Toyota	Corolla	visitor	2025-06-07	12:47	N/A	N/A	To fetch son
4	MBQ9838	Toyota	Vios	staff	2025-06-07	12:19	2025-06-07	13:55	registered
5	PQR2345	Perodua	Aruz	staff	2025-06-07	08:34	2025-06-07	09:36	registered
6	MBQ9838	Toyota	Vios	staff	2025-06-06	18:59	2025-06-06	20:37	registered
7	VNV8801	Perodua	Axia	student	2025-06-06	17:51	2025-06-06	19:00	registered
8	STU6769	Honda	Civic	staff	2025-06-06	16:25	2025-06-06	18:31	registered
9	MDE292	Toyota	Yaris	visitor	2025-06-05	18:06	2025-06-05	20:38	Fetch son
10	JKL3456	Toyota	Yaris	student	2025-06-05	17:09	2025-06-05	19:52	registered
11	GH9012	Perodua	Bezza	staff	2025-06-05	16:30	2025-06-05	19:03	registered
12	GH9012	Perodua	Bezza	student	2025-06-05	15:11	2025-06-05	18:09	registered
13	PRE3221	Perodua	Bezza	staff	2025-06-05	12:13	2025-06-05	12:49	registered
14	JKL3456	Toyota	Camry	student	2025-06-05	11:55	2025-06-05	14:53	registered
15	JFJ9829	Toyota	Camry	staff	2025-06-05	10:05	2025-06-05	11:16	registered
16	JFJ9829	Toyota	Camry	staff	2025-06-04	18:33	2025-06-04	20:15	registered
17	MDE292	Toyota	Yaris	visitor	2025-06-04	16:26	2025-06-04	17:22	Fetch son
18	GH9012	Perodua	Bezza	student	2025-06-04	15:32	2025-06-04	16:06	registered
19	PQR2345	Perodua	Aruz	staff	2025-06-04	15:26	2025-06-04	18:10	registered
20	BCD9901	Perodua	Myvi	staff	2025-06-04	10:58	2025-06-04	11:58	registered
21	PRE3221	Perodua	Alza	student	2025-06-04	09:56	2025-06-04	12:20	registered
22	MBQ9838	Toyota	Vios	staff	2025-06-04	07:20	2025-06-04	09:04	registered
23	MDE292	Toyota	Yaris	visitor	2025-06-03	15:27	2025-06-03	16:53	Fetch son
24	JKL3456	Toyota	Yaris	student	2025-06-03	13:06	2025-06-03	13:57	registered

Figure 5.21 Navigate to the first page

No	Vehicle Plate	Brand	Model	Owner Identity	Entry Date	Entry Time	Exit Date	Exit Time	Entry Reason
1	PQR2345	Perodua	Aruz	staff	2025-01-05	18:51	2025-01-05	19:45	registered
2	MBQ9838	Toyota	Vios	staff	2025-01-05	17:26	2025-01-05	18:52	registered
3	STU6769	Honda	Civic	staff	2025-01-05	17:04	2025-01-05	19:03	registered
4	GH9012	Perodua	Bezza	student	2025-01-05	13:40	2025-01-05	14:31	registered
5	VNV8801	Perodua	Axia	student	2025-01-05	07:40	2025-01-05	10:14	registered
6	GH9012	Perodua	Bezza	student	2025-01-04	07:57	2025-01-04	09:46	registered
7	JFJ9829	Toyota	Camry	staff	2025-01-03	14:39	2025-01-03	17:15	registered

Figure 5.22 Navigate to the last page

The user can click the “Add Record” button to add a new record to the system. By default, the owner identity is set to “Student” and the entry reason is set to “Registered”. If the user changes the owner identity to “Visitor”, the system will remove the requirement for an owner id and the entry reason set to “Others”.

The screenshot shows the 'Add Record' form in the Plate Vision application. The left sidebar has 'Records' selected. The main form fields are:

- Vehicle Plate: ABC1234
- Brand & Model: Perodua Alza
- Owner Identity: student
- Owner Name: Ali
- Owner IC: 123456789012
- Owner Phone: 0123456789
- Owner ID: 123456789
- Entry Date: 2025-05-06
- Entry Time: 23:11
- Entry Reason:  Registered  Others

Buttons at the bottom: Save (blue), Cancel (grey).

**Figure 5.23 When the owner identity is student and staff**

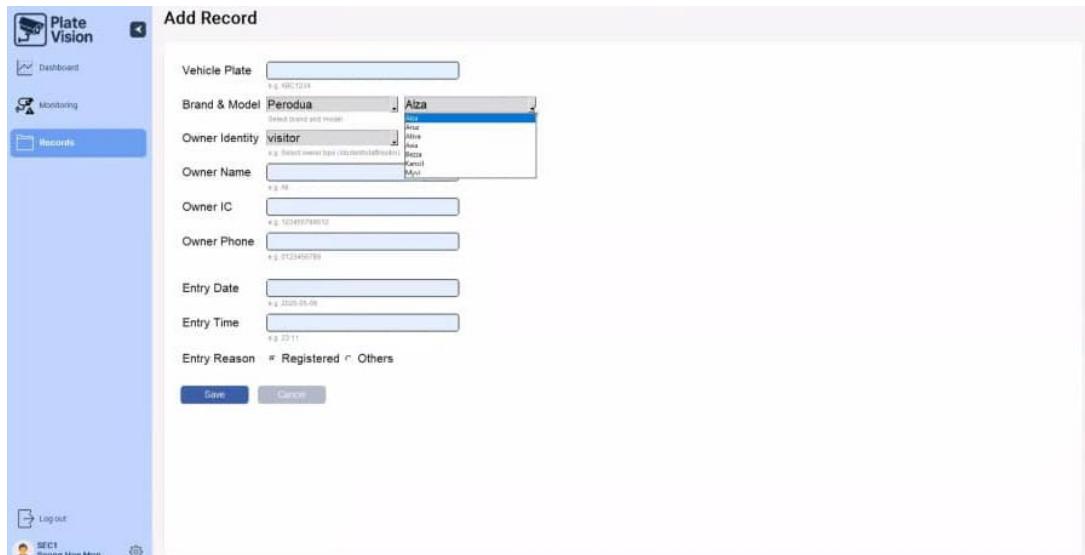
The screenshot shows the 'Add Record' form in the Plate Vision application. The left sidebar has 'Records' selected. The main form fields are:

- Vehicle Plate: ABC1234
- Brand & Model: Perodua Alza
- Owner Identity: visitor
- Owner Name: Ali
- Owner IC: 123456789012
- Owner Phone: 0123456789
- Owner ID: 123456789
- Entry Date: 2025-05-06
- Entry Time: 23:11
- Entry Reason:  Registered  Others
- Reason: (empty input field)

Buttons at the bottom: Save (blue), Cancel (grey).

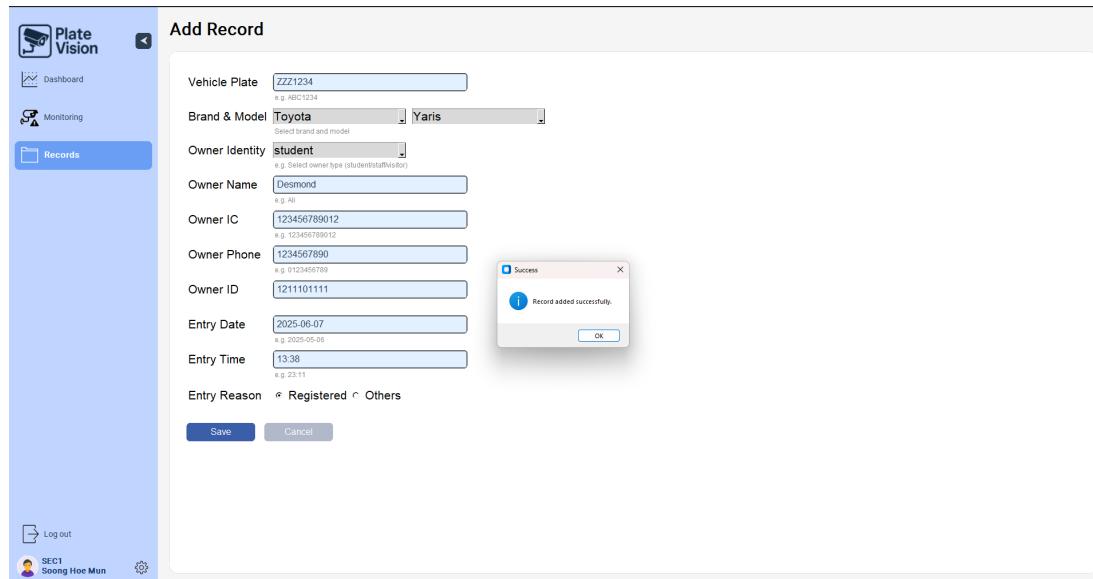
**Figure 5.24 When the owner identity is visitor**

The vehicle brand options are fixed into Perodua, Toyota and Honda. Then each brand has their own prefixed car modal to choose as shown in Figure 5.28.



**Figure 5.25 Car modal selection**

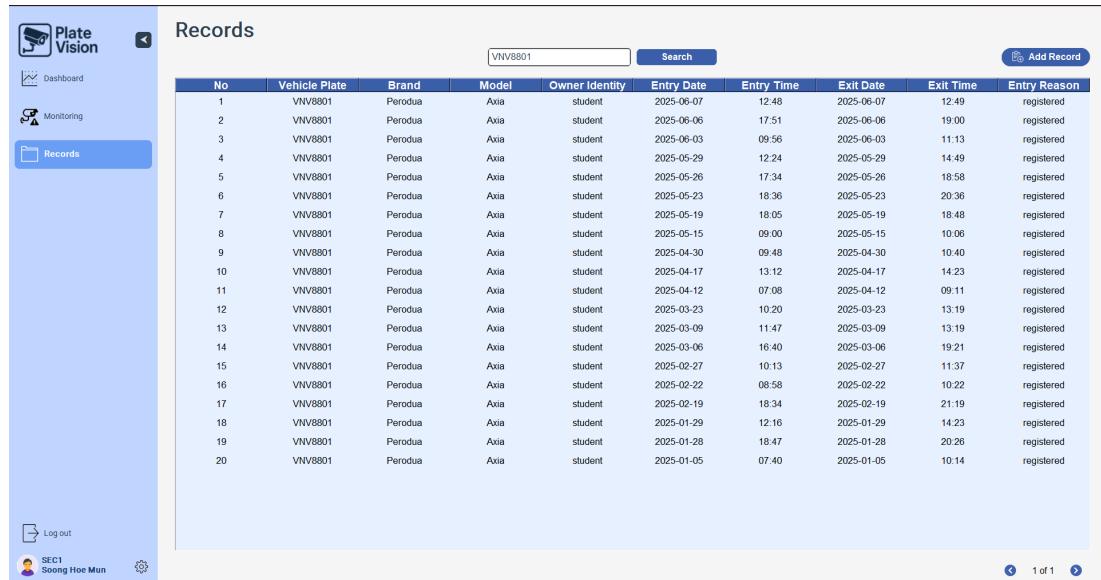
There are some validations have been implemented inside the system. The owner IC is required to enter 12 digits, the owner phone is either 10 or 11 digits, the entry date and exit date must be with the format YYYY-MM-DD, the entry time and exit time must be in 24 hours format. In Figure 5.29 show the example of successful saved record process.



**Figure 5.26 Pop up message to indicate successful saved record**

In the record interface, users can view detailed records by using the search function. This search function can either search the record by vehicle plate or owner identity. The record

will be displayed in descending order based on the date and time. Which means that the latest date will be displayed on top as shown in Figure 5.30.

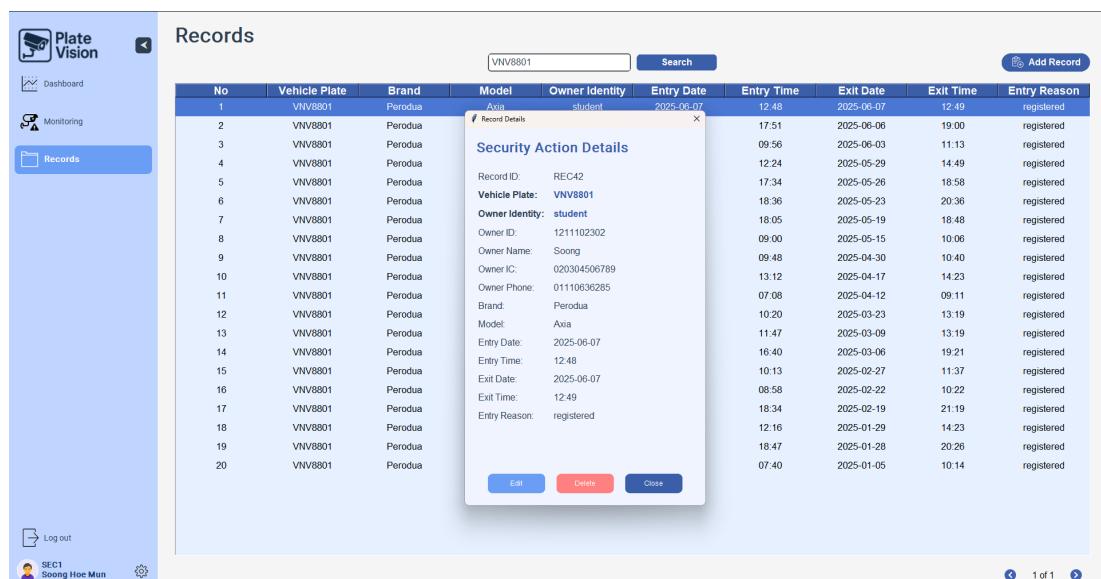


The screenshot shows the 'Records' section of the Plate Vision application. On the left is a sidebar with icons for Dashboard, Monitoring, Records (which is selected and highlighted in blue), and Log out. The main area has a title 'Records' and a search bar with the value 'VNV8801'. A 'Search' button is next to it, followed by an 'Add Record' button. Below the search bar is a table with the following columns: No, Vehicle Plate, Brand, Model, Owner Identity, Entry Date, Entry Time, Exit Date, Exit Time, and Entry Reason. The table contains 20 rows of data. At the bottom right of the table is a page number '1 of 1'.

No	Vehicle Plate	Brand	Model	Owner Identity	Entry Date	Entry Time	Exit Date	Exit Time	Entry Reason
1	VNV8801	Perodua	Axia	student	2025-06-07	12:48	2025-06-07	12:49	registered
2	VNV8801	Perodua	Axia	student	2025-06-06	17:51	2025-06-06	19:00	registered
3	VNV8801	Perodua	Axia	student	2025-06-03	09:56	2025-06-03	11:13	registered
4	VNV8801	Perodua	Axia	student	2025-05-29	12:24	2025-05-29	14:49	registered
5	VNV8801	Perodua	Axia	student	2025-05-26	17:34	2025-05-26	18:58	registered
6	VNV8801	Perodua	Axia	student	2025-05-23	18:36	2025-05-23	20:36	registered
7	VNV8801	Perodua	Axia	student	2025-05-19	18:05	2025-05-19	18:48	registered
8	VNV8801	Perodua	Axia	student	2025-05-15	09:00	2025-05-15	10:06	registered
9	VNV8801	Perodua	Axia	student	2025-04-30	09:48	2025-04-30	10:40	registered
10	VNV8801	Perodua	Axia	student	2025-04-17	13:12	2025-04-17	14:23	registered
11	VNV8801	Perodua	Axia	student	2025-04-12	07:08	2025-04-12	09:11	registered
12	VNV8801	Perodua	Axia	student	2025-03-23	10:20	2025-03-23	13:19	registered
13	VNV8801	Perodua	Axia	student	2025-03-09	11:47	2025-03-09	13:19	registered
14	VNV8801	Perodua	Axia	student	2025-03-06	16:40	2025-03-06	19:21	registered
15	VNV8801	Perodua	Axia	student	2025-02-27	10:13	2025-02-27	11:37	registered
16	VNV8801	Perodua	Axia	student	2025-02-22	08:58	2025-02-22	10:22	registered
17	VNV8801	Perodua	Axia	student	2025-02-19	18:34	2025-02-19	21:19	registered
18	VNV8801	Perodua	Axia	student	2025-01-29	12:16	2025-01-29	14:23	registered
19	VNV8801	Perodua	Axia	student	2025-01-28	18:47	2025-01-28	20:26	registered
20	VNV8801	Perodua	Axia	student	2025-01-05	07:40	2025-01-05	10:14	registered

Figure 5.27 Display search records in table

When user require to view full details record, the user just select the row and double click it. Then the system will pop up a window to display, edit or delete record as shown in Figure 5.31.



The screenshot shows the 'Records' section of the Plate Vision application. The interface is similar to Figure 5.27, but a modal dialog box is overlaid on the table. The dialog is titled 'Record Details' and contains the following information for the first row:

- Record ID: REC42
- Vehicle Plate: VNV8801
- Owner Identity: student
- Entry Date: 2025-06-07
- Entry Time: 12:48
- Exit Date: 2025-06-07
- Exit Time: 12:49
- Entry Reason: registered

Below this information are three buttons: 'Edit', 'Delete', and 'Close'.

Figure 5.28 Full details record with button to edit or delete

When user click edit, it will navigate to the edit record interface as shown in Figure 5.32. If the user does not require to edit the record, then just press cancel button.

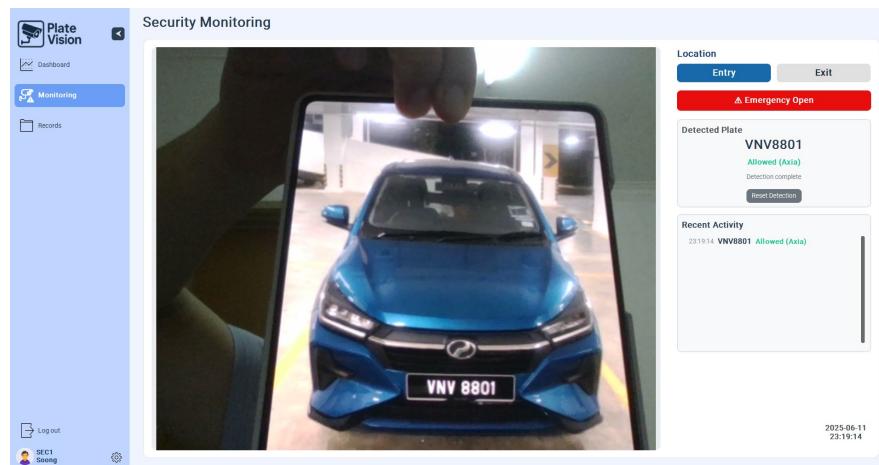
**Figure 5.29 Edit record interface**

When the user requires to delete a record, it will display a confirmation box to confirm the actions.

No	Vehicle Plate	Brand	Model	Owner Identity	Entry Date	Entry Time	Exit Date	Exit Time	Entry Reason
1	JFJ9829	Toyota	Camry	staff	2025-06-07	18:02	2025-06-07	18:57	registered
2	ZZZ1234	Toyota	Yaris	student	2025-06-07	13:38	N/A	N/A	registered
3	VNV8801	Perodua	Axia	student	2025-06-07	12:48	2025-06-07	12:49	registered
4	MDE292	Toyota	Corolla	visitor	2025-06-07	12:47	N/A	N/A	To fetch son
5	MBQ9838	Toyota	Vios	staff	2025-06-07	12:19	2025-06-07	13:55	registered
6	PQR2345	Perodua	Aruz	staff	2025-06-07	08:34	2025-06-07	09:36	registered
7	MBQ9838	Toyota	Vios	staff	2025-06-06	18:59	2025-06-06	20:37	registered
8	VNV8801	Perodua	Axia	student	2025-06-06	17:51	2025-06-06	19:00	registered
9	STU6789	Honda	Civic	staff	2025-06-06	16:25	2025-06-06	18:31	registered
10	MDE292	Toyota	Yaris	student	2025-06-05	18:06	2025-06-05	20:38	Fetch son
11	JKL3456	Toyota	Camry	staff	2025-06-05	17:09	2025-06-05	19:52	registered
12	GH19012	Perodua	Alza	student	2025-06-05	16:30	2025-06-05	19:03	registered
13	GH19012	Perodua	Bezza	student	2025-06-05	15:11	2025-06-05	18:09	registered
14	PRE3221	Perodua	Alza	student	2025-06-05	12:13	2025-06-05	12:49	registered
15	JKL3456	Toyota	Yaris	student	2025-06-05	11:55	2025-06-05	14:53	registered
16	JFJ9829	Toyota	Camry	staff	2025-06-05	10:05	2025-06-05	11:16	registered
17	JFJ9829	Toyota	Camry	staff	2025-06-04	18:33	2025-06-04	20:15	registered
18	MDE292	Toyota	Yaris	visitor	2025-06-04	16:26	2025-06-04	17:22	Fetch son
19	GH19012	Perodua	Bezza	student	2025-06-04	15:32	2025-06-04	16:06	registered
20	PQR2345	Perodua	Aruz	staff	2025-06-04	15:26	2025-06-04	18:10	registered
21	BCD9801	Perodua	Myvi	staff	2025-06-04	10:58	2025-06-04	11:58	registered
22	PRE3221	Perodua	Alza	student	2025-06-04	09:56	2025-06-04	12:20	registered
23	MBQ9838	Toyota	Vios	staff	2025-06-04	07:20	2025-06-04	09:04	registered
24	MDE292	Toyota	Yaris	visitor	2025-06-03	15:27	2025-06-03	16:53	Fetch son

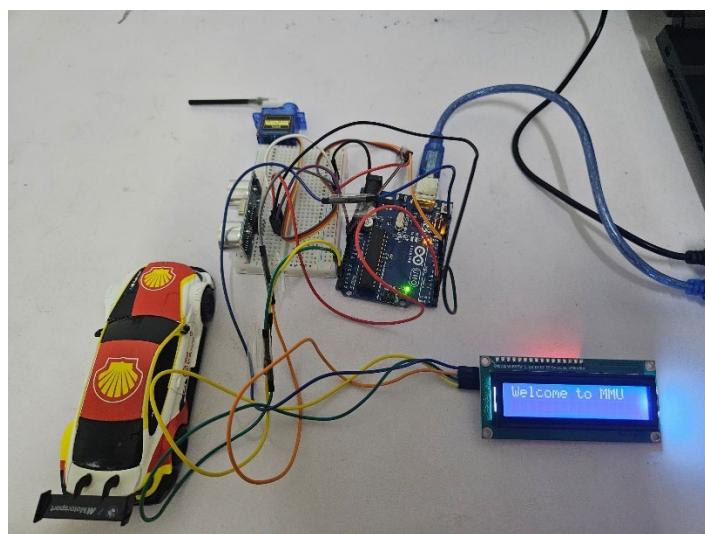
**Figure 5.30 Delete record message box**

When the security user selects the “Monitoring” from the sidebar it will navigate user to the Monitoring interface as shown in Figure 5.34. In this interface, the user can choose to view either the entry gate or exit gate camera and can manually control the gate to open if needed. In the bottom right of the interface, it has the feature to display the current time and date. Additionally, when a vehicle with valid entry permission approaches the Arduino-controlled gate, the system will automatically record the vehicle and open the gate.

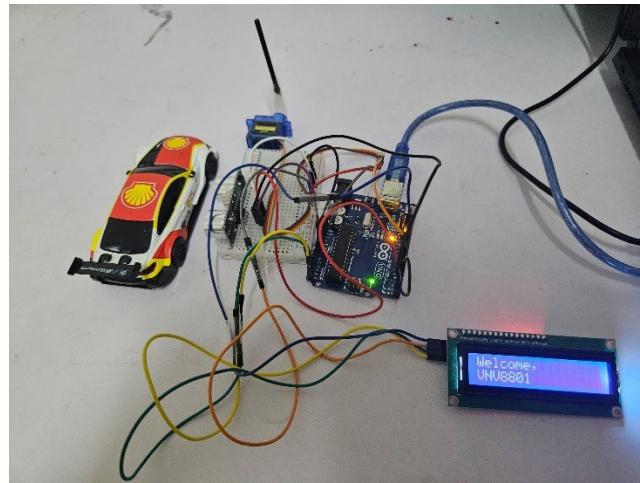


**Figure 5.31 Monitor screen interface**

The LCD display at the entry gate for the Arduino system will change from the text “Welcome to MMU” to “Welcome, vehicle plate number” as shown in Figure 5.35 and Figure 5.36. The gate will close when the vehicle has passed the sensor.

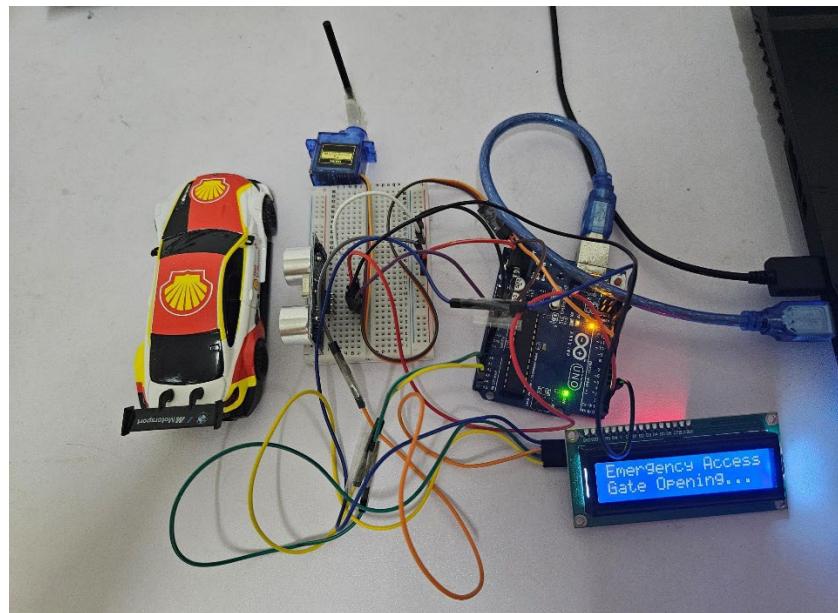


**Figure 5.32 Arduino LCD when there is no vehicle**



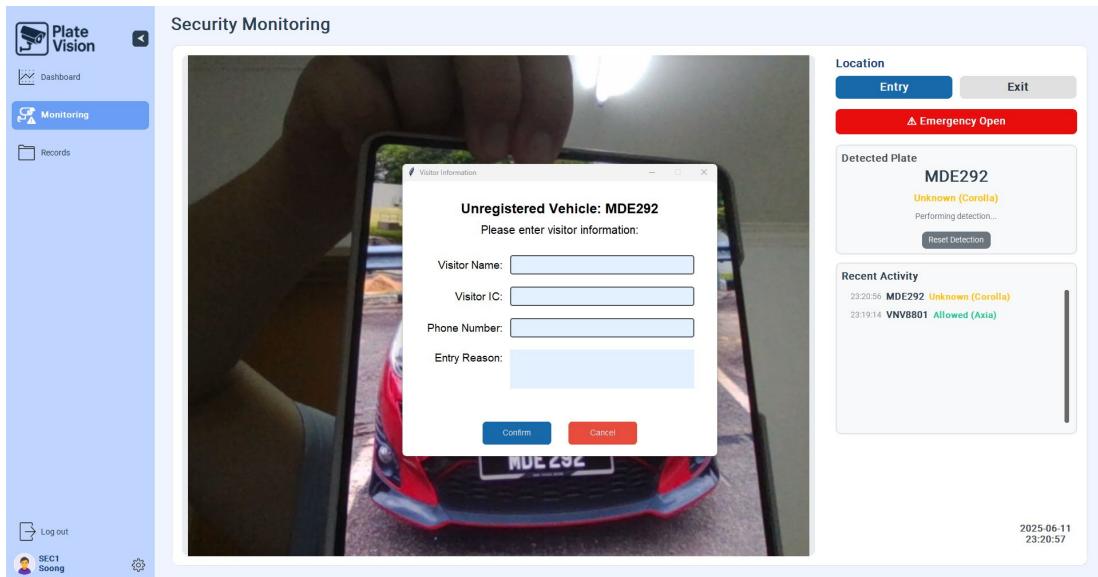
**Figure 5.33 Arduino LCD when the vehicle is allowed to pass through**

When the security user needs to open the gate to allow an ambulance to enter the campus, they can press the emergency button. The Arduino LCD will then display the message “Emergency Access Gate Opening...” as shown in Figure 5.37. The action of the security user opening the gate will be recorded in the information alerts for tracking purposes.



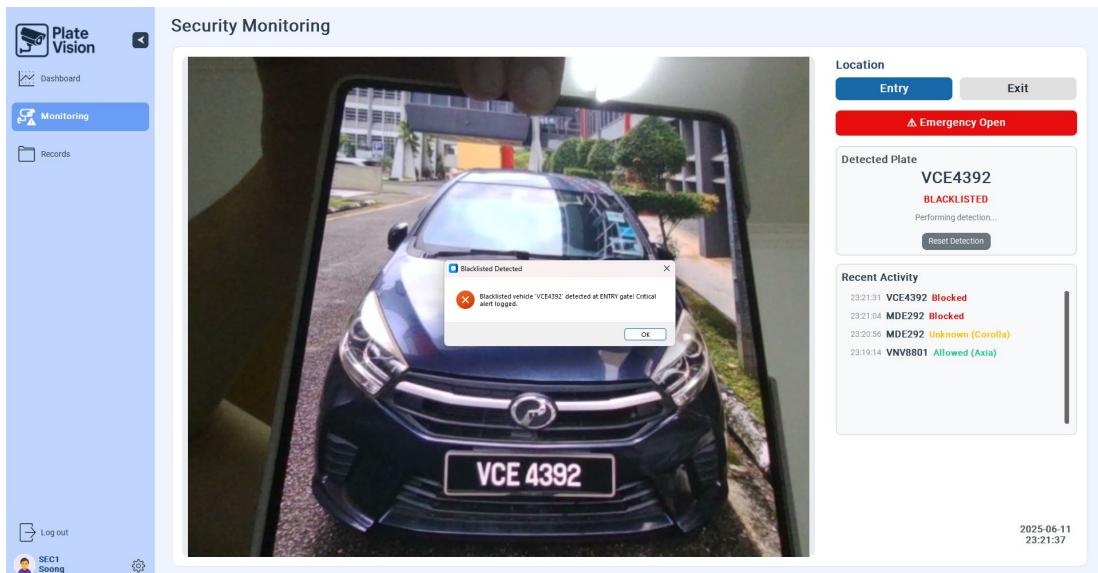
**Figure 5.34 Arduino LCD when the emergency open was press**

When the visitor requires to enter the campus, the system will prompt the security user to obtain the information from the visitor. Once the security user approves, the gate will open to allow the visitor to enter. If the security user does not allow, the gate will not open.



**Figure 5.35 Security user record visitor information window**

When a blacklisted vehicle is detected at the entry gate, the system will log a critical alert and pop up a window to notify the security user not to allowed them to enter as shown in Figure 5.39.



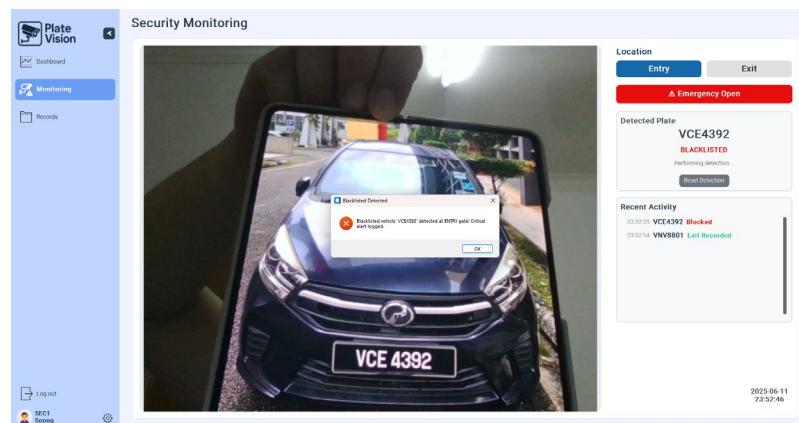
**Figure 5.36 Blacklisted vehicle approach to the entry gate**

When the vehicle has entered more than 3 times a day it will trigger the warning to notify the security user as shown in Figure 5.40. This will be updated into the warning alerts to inform other security and admin to check for this vehicle abnormal entries behaviour.

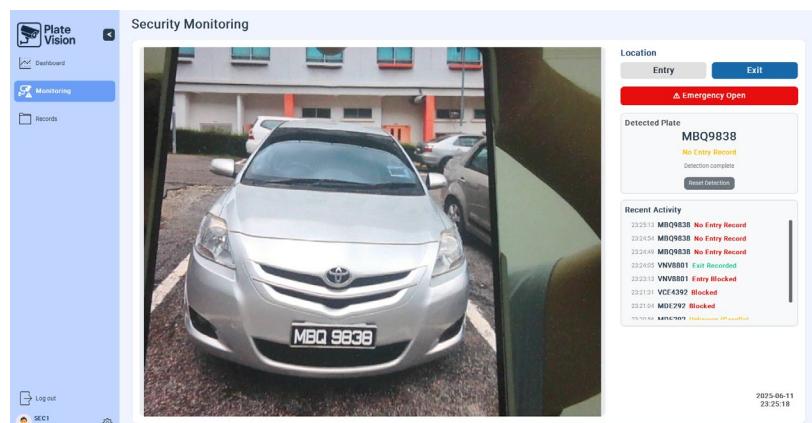


**Figure 5.37 Warning alert trigger when vehicle has abnormal entries behaviour**

The system will prevent a vehicle from entering the campus if it has a recorded entry without a corresponding exit as shown in Figure 5.41. Similarly, as shown in Figure 5.42, the system will block a vehicle from exiting if there is no recorded entry for that vehicle.

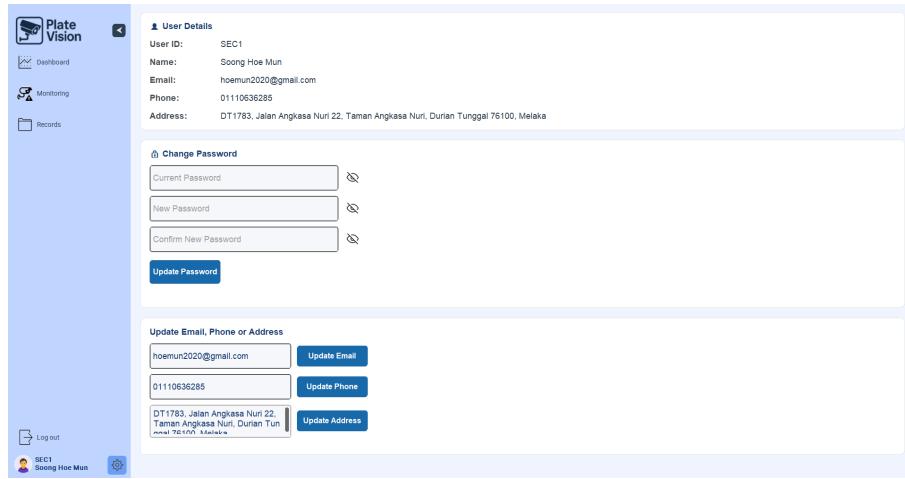


**Figure 5.38 Vehicle does not have previous exit record**

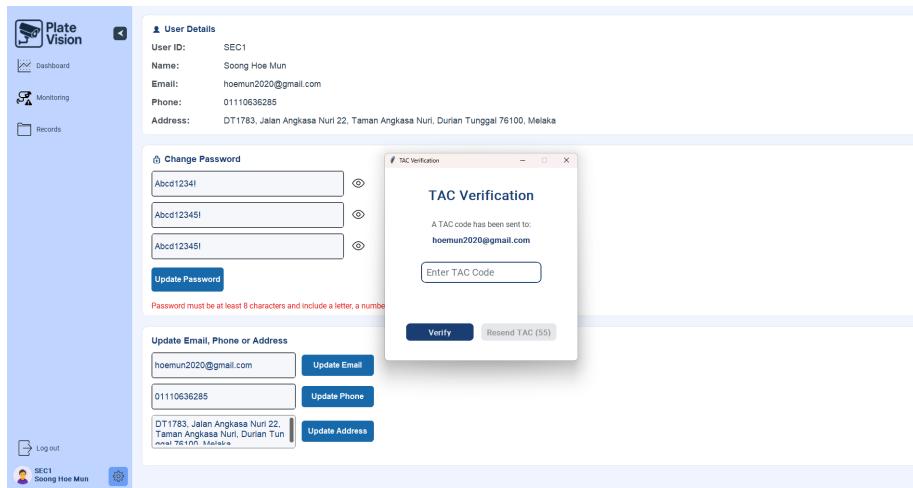


**Figure 5.39 Vehicle does not have previous entry record**

When the setting icon being selected, the user is navigating to the setting page. In this page user is allowed to update their personal information such as the email, phone or address as shown in Figure 5.43. If the user needs to change their password, the system will send a TAC code to their registered email. Before receiving the TAC code, the user must enter their current password and the new password. The new password needs to match with the confirm new password otherwise it will not update to the database.



**Figure 5.40 Setting interface to update personal information**



**Figure 5.41 Pop up window for TAC verification**

The user details will be change to the latest information that the security user modified. Then when the security user presses the logout button it will redirect them back to the login page.

## Admin Interface

When the user login as admin user it will navigate admin to the admin dashboard interface as shown in Figure 5.45. This is the default interface for the admin when login to the system. The staff and student vehicle on the top is showing how many staff and student vehicle have been registered. Then this week and today entries is shown beside the total number of students registered.

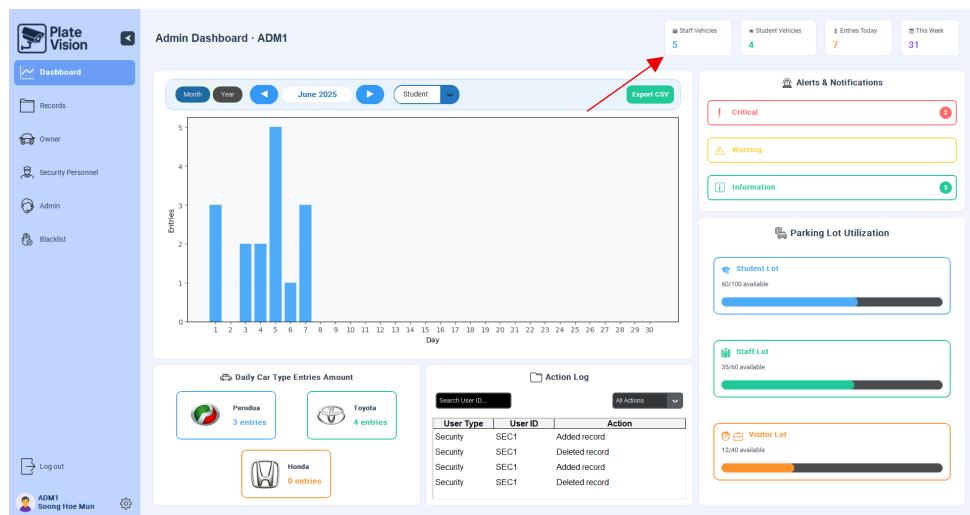


Figure 5.42 Admin Dashboard interface

This interface allows the admin to view the actions performed by each user within the system and displayed in the action log. The admin can search for a specific user ID to review the changes made by that user, as shown in Figure 5.46.

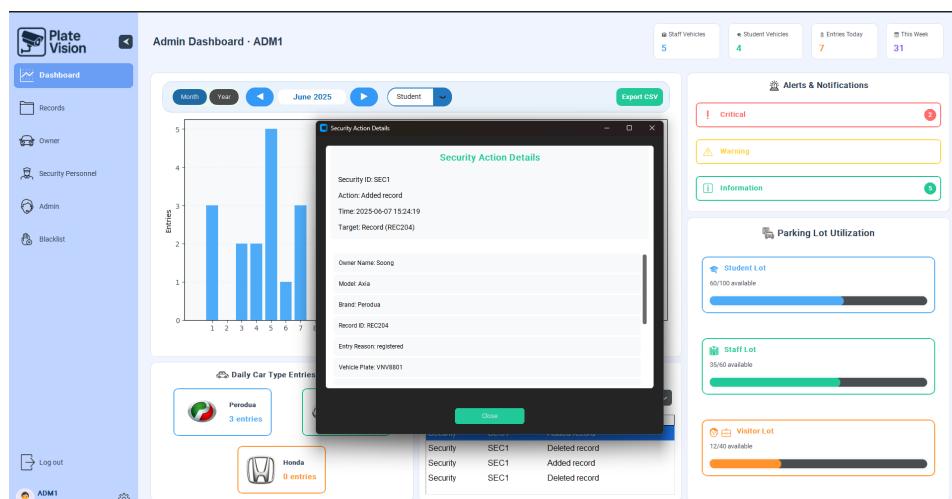
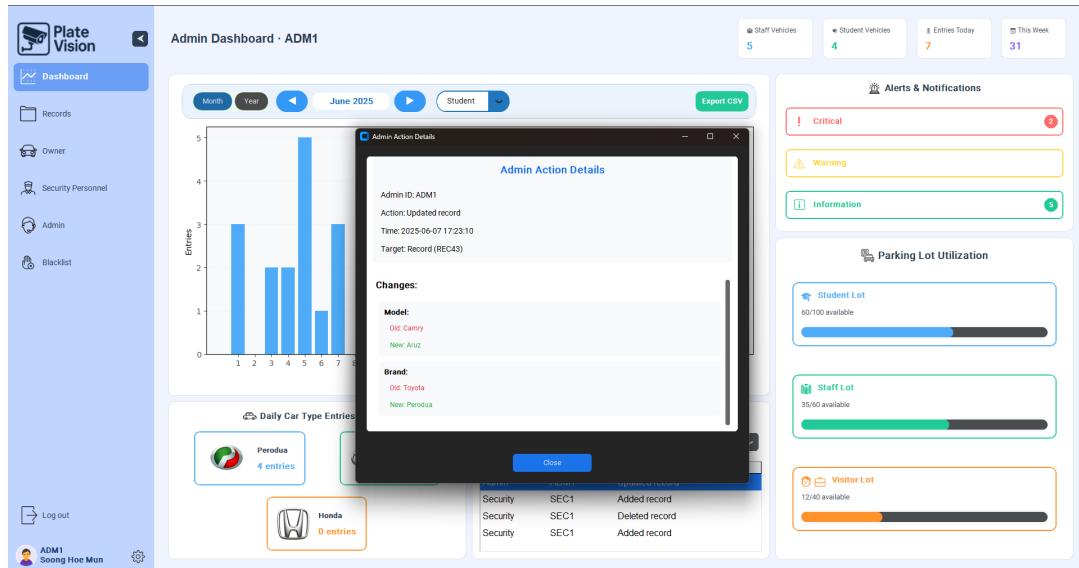


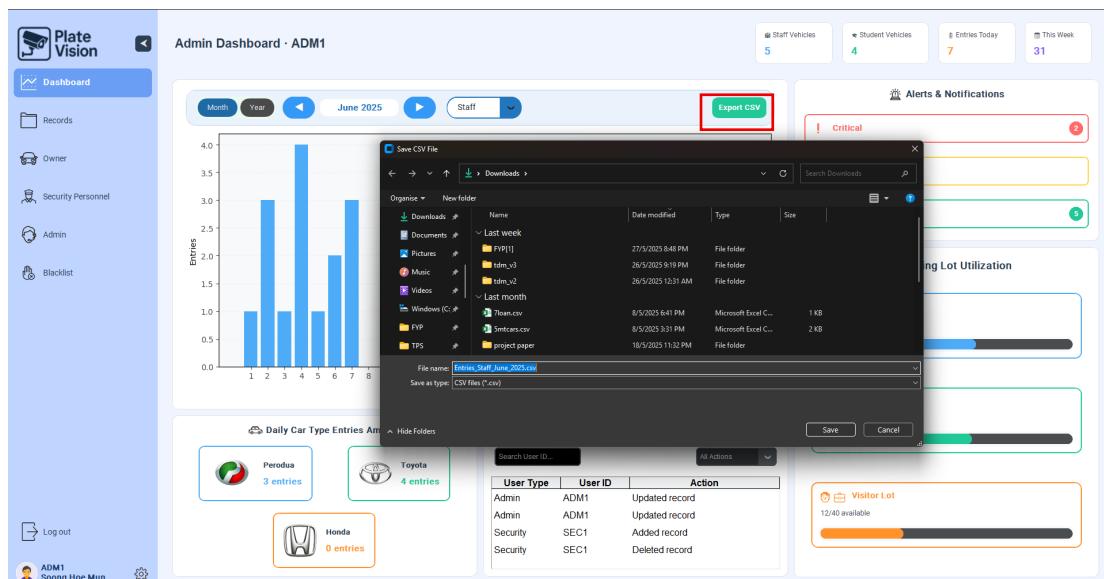
Figure 5.43 Display the action done by the security user

The system can record the old and new changes done by the user. Besides that, it can record the date and time when the changes are performed as shown in Figure 5.47.



**Figure 5.44 Pop up window to display the changes performed by the user**

In the graph section there is a green button called “Export CSV”. After user press this button, it will allow the user to export the the current record being view by the user. User can choose to store at any directory as shown in Figure 5.48.



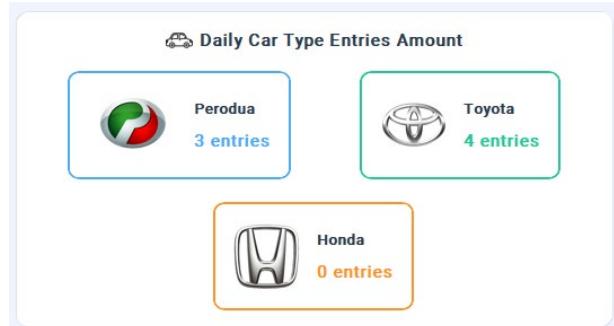
**Figure 5.45 Pop up to select directory to store the data**

The csv file will store the user type, days and entries amount from the currently view graph data as shown in Figure 5.49. This file can be used by the management to do analysis and discover any patterns that can help to control the traffic flow at the gate.

Day	Entries
1	1
2	3
3	1
4	4
5	1
6	2
7	3
8	0
9	0
10	0
11	0
12	0
13	0
14	0
15	0
16	0
17	0
18	0
19	0
20	0
21	0
22	0
23	0
24	0
25	0
26	0
27	0
28	0
29	0
30	0
31	0
32	0
33	
34	
35	
36	
37	

**Figure 5.46 Format for the CSV file**

In Figure 5.50 display how many car entries daily sorted based on their brand.



**Figure 5.47 Section to display daily car entries based on brand**

When the user selects “Owner” in the sidebar the system will navigate to Figure 5.51. In this interface it will display the total amount of owner being registered inside the system. The owner that can be registered inside the system either is a student or a staff member. If the owner is a visitor, it will not be allowed to register in here. To add an owner just simply click the “Add Owner” button then it will be redirected to Figure 5.52.

No	Owner ID	Owner Name	IC Number	Owner Identity	Vehicle Plate	Brand	Model	Phone Number	Email	Status
1	1211102979	Pang Yong Seng	032458765111	staff	JFJ9829	Toyota	Camry	0177285608	1211102979@student.com	Active
2	1211308875	George	112233445566	staff	BCD8901	Perodua	Myvi	01123456789	1211308875@gmail.com	Active
3	1221303641	Isabella	789012345678	staff	STU6789	Honda	Civic	0189012345	1221303641@gmail.com	Active
4	1211102931	Melvin	456789012345	student	JKL3456	Toyota	Yaris	0156789012	1211102931@student.com	Active
5	1211103616	James	678901234567	staff	PQR2345	Perodua	Aruz	0178901234	1211103616@gmail.com	Active
6	1211102170	Bob	345678901234	student	GH19012	Perodua	Bezza	0145678901	1211102170@gmail.com	Active
7	1211101296	Alice	234567890123	staff	MBQ9838	Toyota	Vios	0134567890	1211101296@gmail.com	Active
8	1211103334	Johnny	123456789012	student	PRE3221	Perodua	Alza	0123456789	1211103334@student.com	Active
9	1211102302	Soong	020304506789	student	VNV8801	Perodua	Axia	01110636285	hoemun2020@gmail.com	Active

1 of 1

**Figure 5.48 Design of owner interface**

In the add owner interface, the user is required to complete all fields in the form before the owner can be registered. By default, once an owner is added, they will have an active status valid for one year from the registration date as shown in Figure 5.53. If the owner's status changes to "Expired", the admin can update it back to "Active" granting the owner a new one-year validity period. However, in the edit owner interface, the admin cannot modify the owner ID, as it serves as the primary key for storing owner records in the system.

**Figure 5.49 Add owner interface design**

**Figure 5.50 Edit owner interface design**

In the owner interface when the admin double clicks on the record it will show the details record of the selected owner. Then the admin can choose either to alter or delete the owner.

No	Owner ID	Owner Name	IC Number	Owner Identity	Vehicle Plate	Brand	Model	Phone Number	Email	Status
1	1211102979	Pang Yeng Seng	032458765111	staff	JFJ9829	Toyota	Camry	0177285608	1211102979@stud...	Active
2	1211308875	George	112233445566	staff	BCD8901	Perodua	Myvi	01123456789	1211308875@gmail...	Active
3	1221303641	Isabella	789012	Owner Details		Honda	Civic	0189012345	1221303641@gmail...	Active
4	1211102931	Melvin	456789	Owner ID: 1211102302		Toyota	Yaris	0156789012	1211102931@stud...	Active
5	1211103616	James	678901	Owner Name: Soong		Perodua	Aruz	0178901234	1211103616@gmail...	Active
6	1211102170	Bob	345678	IC Number: 020304506789		Perodua	Betza	0145678901	1211102170@gmail...	Active
7	1211101296	Alice	234567	Identity: student		Toyota	Vios	0134567890	1211101296@gmail...	Active
8	1211103334	Johnny	123456	Phone: 01110636285		Perodua	Alza	0123456789	1211103334@stud...	Active
9	1211102302	Soong	020304506789	Email: hoemun2020@gmail.com		Perodua	Axia	01110636285	hoemun2020@gmail...	Active

**Figure 5.51 Pop up window for display, edit or delete owner**

The search function allow admin to search the owner based on their owner ID, name and vehicle plate. Then the table can be sorted to display the owner with “Active”, “Expired” or “All” status as shown in Figure 5.55.

Owner										
No	Owner ID	Owner Name	IC Number	Owner Identity	Vehicle Plate	Brand	Model	Phone Number	Email	Status
1	1211102302	Soong	020004500789	student	VNV8801	Perodua	Axia	01110636285	hoemun2020@gmail.com	Active

**Figure 5.52 Search and sort by “Active” status**

Figure 5.56 shows the security personnel interface design. The admin can search the security user based on the security ID and name.

Security Personnel						
No	Security ID	Name	IC	Email	Phone	Address
1	SEC1	Soong	111111111111	hoemun2020@gmail.com	1111111111	Bukit Beruang Melaka

**Figure 5.53 Security Personnel interface**

When the admin clicks the “Add Security” button at the top right it will redirect admin to the Figure 5.57. The admin is required to fill up all the information in the form only can registered new security personnel. Make sure that the email address for the security personnel need to be fill in correctly because it will be used for the system to send TAC code to perform action related to changing password. If the admin needs to edit the information for the security user, they can double click on the security user then it will navigate to the Figure 5.58. In the edit security personnel interface, user is unable to modify the security ID. If the admin does

not require to change the password for the security user can just leave it blank. If the admin modifies the security password it will log an action record as shown in Figure 5.59.

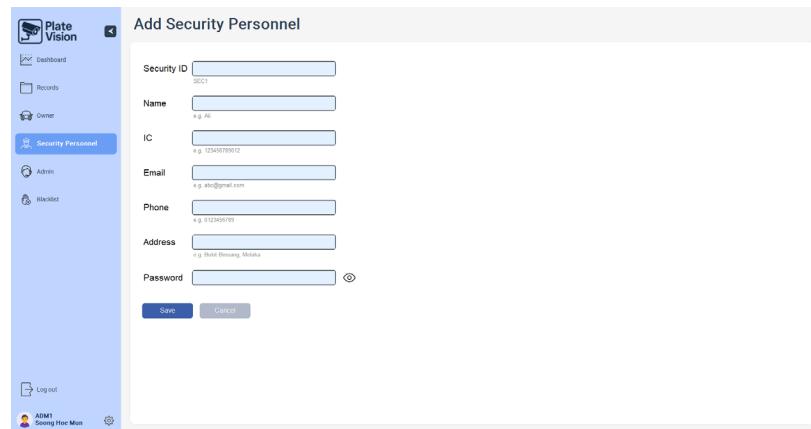


Figure 5.54 Add Security Personnel interface

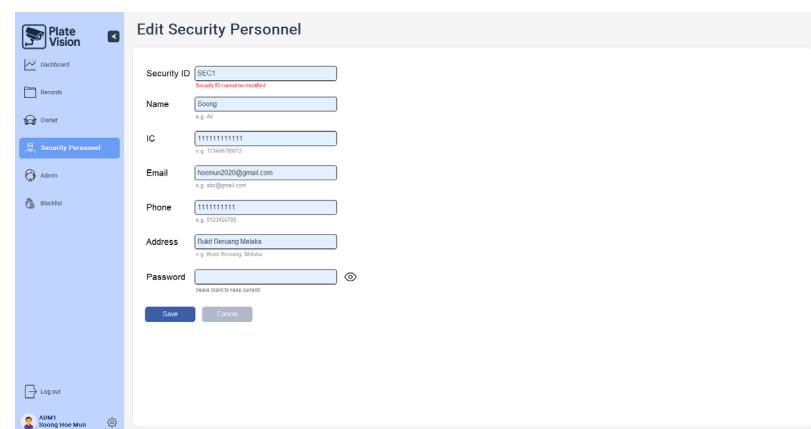


Figure 5.55 Edit Security Personnel interface

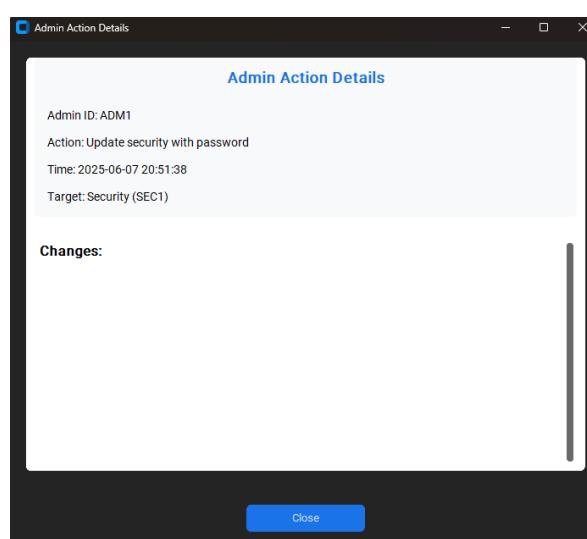
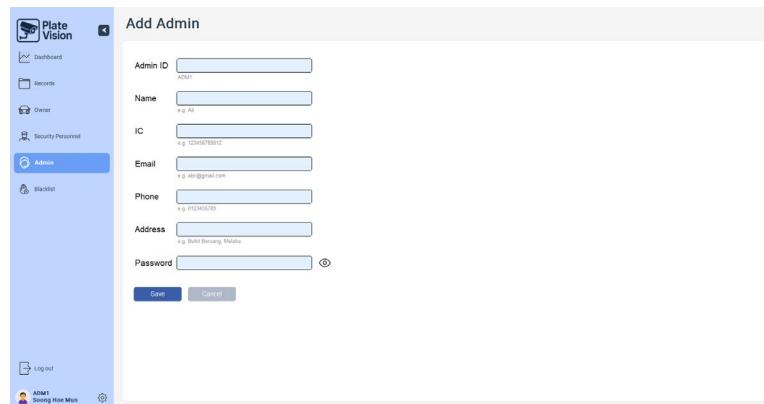


Figure 5.56 Log action regarding security password modification

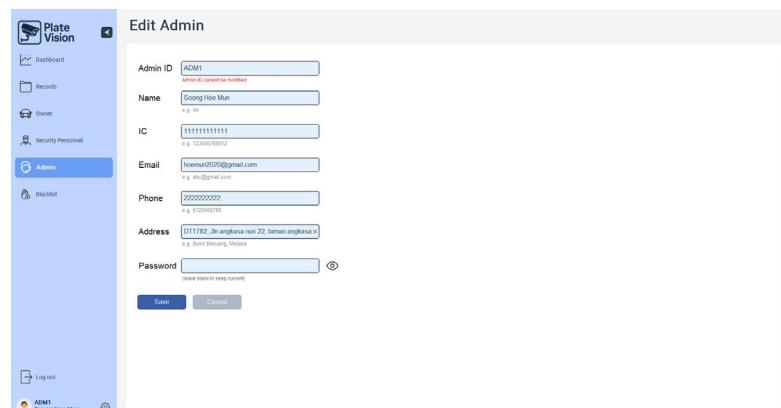
In the admin interface it has the same design and logic with the security interface. Logic like searching admin user, adding new admin user, editing admin and deleting admin user similar from security personnel will be included for the admin interface.



**Figure 5.57 Admin interface design**

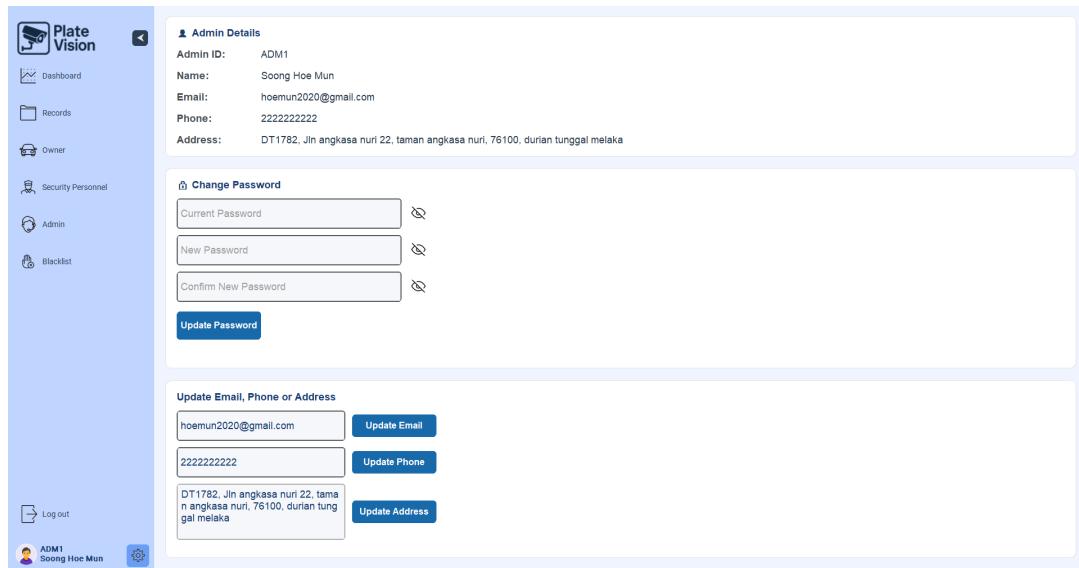


**Figure 5.58 Add Admin interface design**



**Figure 5.59 Edit Admin interface design**

The design of the admin setting is similar to the security setting. It can be shown in the Figure 5.63. When the admin requires to change the password, it requires to key in the current password and make sure the new password is match with the confirm password. Then a TAC code will be sent to confirm this action.



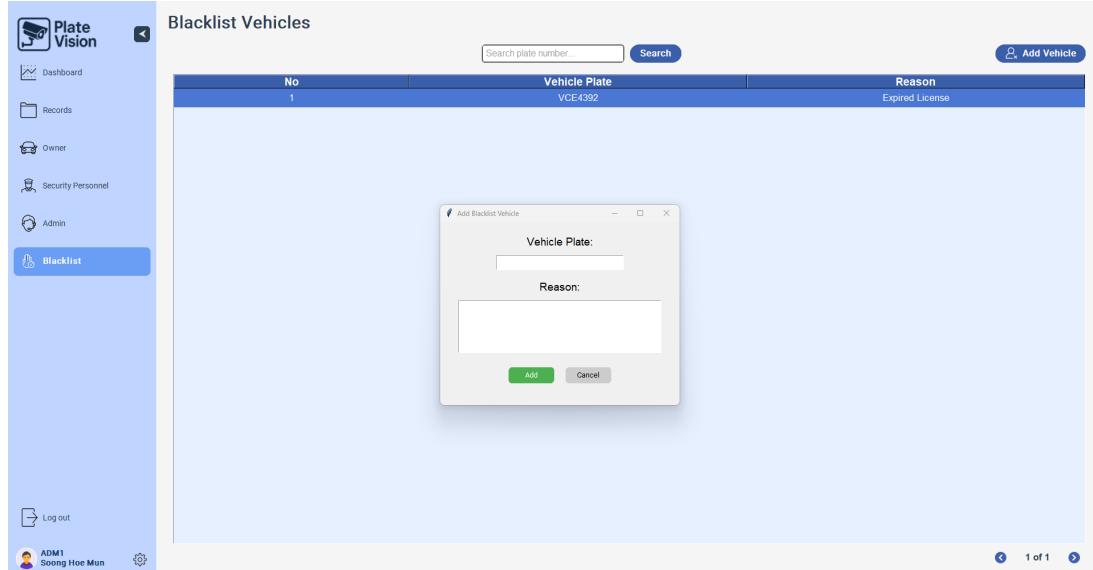
**Figure 5.60 Admin setting interface design**

When the admin selects the “Blacklist” from the sidebar it will navigate to the vehicle blacklist record as shown in Figure 5.64.

Blacklist Vehicles		
No	Vehicle Plate	Reason
1	VCE4392	Expired License

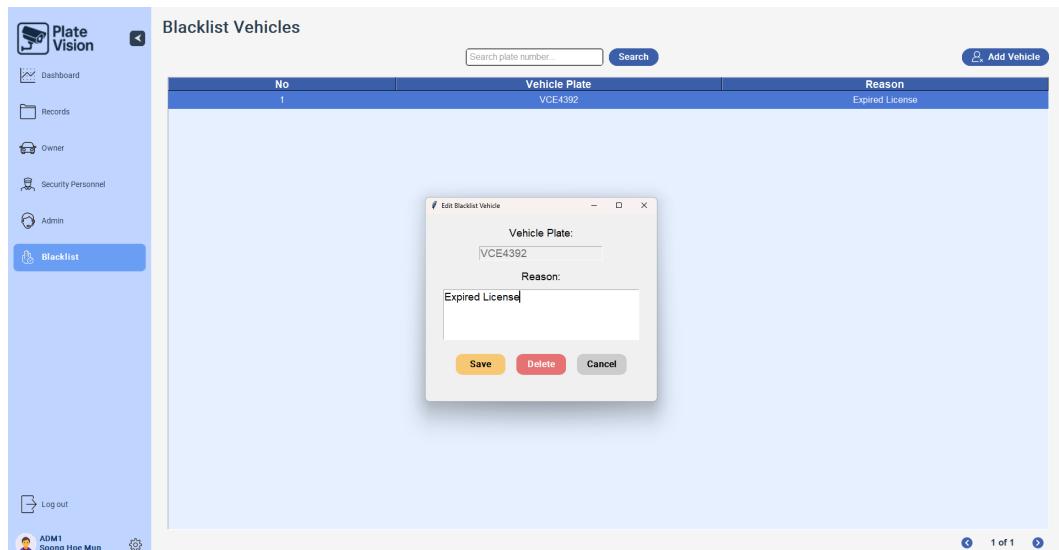
**Figure 5.61 Blacklist vehicle interface design**

If the admin requires to add new blacklist vehicles simply press the “Add Vehicle” button, then a pop-up window will appear at the center of the screen asking for the user input the vehicle plate and blacklist reason.



**Figure 5.62 Add blacklist vehicle**

When the user requires to edit or delete the blacklist vehicle simply double click on the record then it will pop-up a window to allow the user to edit or delete as shown in Figure 5.66. However, during the edit process, the user can only modify the reason for blacklisting and cannot change the vehicle plate number.



**Figure 5.63 Pop-up window to edit or delete blacklist vehicle**