

Comp 3005 Fall 2022

Project Report

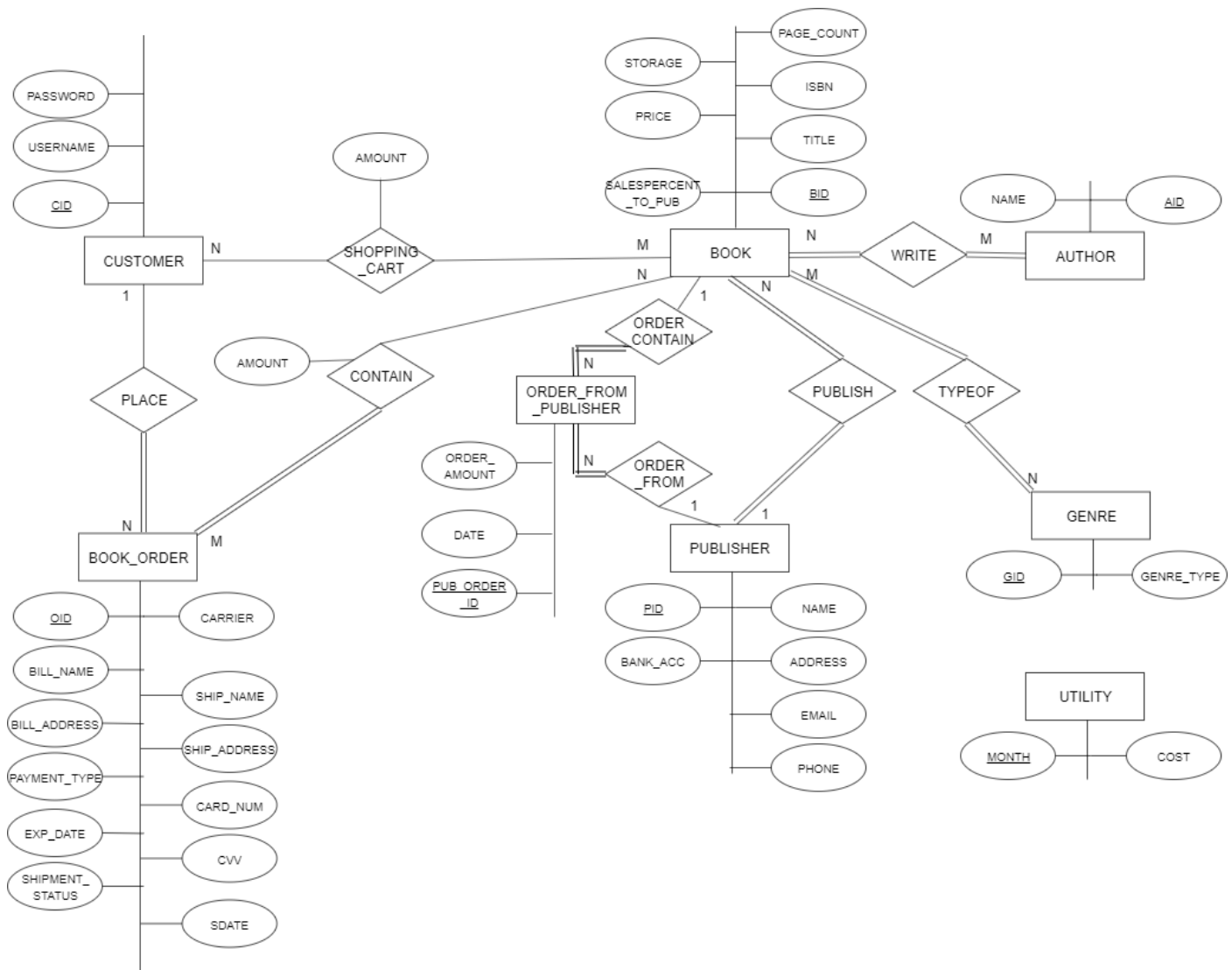
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Conceptual Design

ER-diagram:



Assumptions regarding the ER diagram:

1. assume each book is published by only one publisher, one publisher can publish many books.
2. assume books may have same title
3. assume the ISBN of book is unique and the ISBN is 13 digits, stored as varchar type
4. assume the address in the database is stored within one attribute as varchar type
5. assume all publisher stored in database must publish a book
6. assume all author stored in database must write a book
7. assume authors could not have the same name
8. assume one author can write many books, one book can have more than one author.
9. assume publisher have unique name, but could have same bank account, same address, same phone and email (owed by same boss/person)
10. assume customer username must be unique

Other assumptions:

1. assume utility entity is updated every year, that is, database only save the utility for the current year
2. assume the bookstore opened the date of 2022/01/01
3. assume only the owner can only review the reports in the current year

Reduction to Relation Schemas

PUBLISHER

<u>PID</u>	BANK_ACC	NAME	ADDRESS	EMAIL	PHONE
------------	----------	------	---------	-------	-------

BOOK

<u>BID</u>	TITLE	ISBN	PAGE_COUNT	STORAGE	PRICE	SALESPERCENT_TO_PUB	PID
------------	-------	------	------------	---------	-------	---------------------	-----

GENRE

<u>GID</u>	GENRE_TYPE
------------	------------

TYPEOF

<u>GID</u>	<u>BID</u>
------------	------------

AUTHOR

<u>AID</u>	NAME
------------	------

WRITE

<u>AID</u>	<u>BID</u>
------------	------------

CUSTOMER

<u>CID</u>	USERNAME	PASSWORD
------------	----------	----------

SHOPPING_CART

<u>CID</u>	<u>BID</u>	AMOUNT
------------	------------	--------

BOOK_ORDER

<u>OID</u>	CARRIER	SHIP_NAME	SHIP_ADDRESS	BILL_NAME	BILL_ADDRESS	CARD_NUM
CVV	SDATE	EXP_DATE	PAYMENT_TYPE	SHIPMENT_STATUS	CID	

CONTAIN

<u>OID</u>	<u>BID</u>	AMOUNT
------------	------------	--------

ORDER_FROM_PUBLISHER

<u>PUB_ORDER_ID</u>	PID	BID	DATE	ORDER_AMOUNT
---------------------	-----	-----	------	--------------

UTILITY

<u>MONTH</u>	COST
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Normalization of Relation Schemas

Here I denote set of functional dependencies as F for each schema

PUBLISHER TABLE:

$F = \{PID \rightarrow BANK_ACC, NAME, ADDRESS, EMAIL, PHONE\}$

$NAME \rightarrow BANK_ACC, PID, ADDRESS, EMAIL, PHONE\}$

pid is superkey for publisher table, name is superkey for publisher table. Therefore, BCNF holds.

BOOK TABLE:

$F = \{BID \rightarrow TITLE, ISBN, PAGE_COUNT, STORAGE, PRICE, SALESPERCENT_TO_PUB, PID\}$

$ISBN \rightarrow TITLE, BID, PAGE_COUNT, STORAGE, PRICE, SALESPERCENT_TO_PUB, PID\}$

BID is superkey for BOOK table, ISBN is superkey for BOOK table. Therefore, BCNF holds.

GENRE TABLE

$F = \{GID \rightarrow GENRE_TYPE\}$

$GENRE_TYPE \rightarrow GID\}$

GID is superkey for GENRE table, GENRE_TYPE is superkey for GENRE table. Therefore, BCNF holds.

TYPEOF TABLE

$F = \emptyset$, functional dependencies is empty for TYPEOF table, BCNF holds

AUTHOR TABLE

$F = \{AID \rightarrow NAME\}$

$F = \{NAME \rightarrow AID\}$

AID is superkey for AUTHOR table. NAME is superkey for AUTHOR table. Therefore, BCNF holds

WRITE TABLE

$F = \emptyset$, functional dependencies is empty for WRITE table, BCNF holds

CUSTOMER

$F = \{CID \rightarrow USERNAME, PASSWORD\}$

$USERNAME \rightarrow CID, PASSWORD\}$

CID is superkey for CUSTOMER table, USERNAME is superkey for CUDTOMER table. Therefore, BCNF holds.

SHOPPING_CART TABLE

$F = \{CID, BID \rightarrow AMOUNT\}$

(CID,BID) is superkey for SHOPPING_CART table. Therefore, BCNF holds.

BOOK_ORDER TABLE

$F = \{OID \rightarrow CARRIER, SHIP_NAME, SHIP_ADDRESS, BILL_NAME, BILL_ADDRESS, CARD_NUM,$

$CVV, SDATE, EXP_DATE, PAYMENT_TYPE, SHIPMENT_STATUS, CID\}$

$CARD_NUM \rightarrow CVV, EXP_DATE, PAYMENT_TYPE, BILL_NAME, BILL_ADDRESS\}$

OID is superkey for BOOK_ORDER table.

However, $CARD_NUM \neq CVV, EXP_DATE, PAYMENT_TYPE, BILL_NAME, BILL_ADDRESS$

We know that CARD_NUM is not superkey for BOOK_ORDER table. This table needs to be decomposed.

Let R be the old table book_order

Let result = R, $\alpha = CARD_NUM$, $\beta = CVV, EXP_DATE, PAYMENT_TYPE, BILL_NAME, BILL_ADDRESS$

FIRST LOOP:

$$result = (R - \beta) \cup (\alpha, \beta) =$$

(OID, CARRIER, SHIP_NAME, SHIP_ADDRESS, SDATE, SHIPMENT_STATUS, CID, CARD_NUM) \cup
(CARD_NUM, CVV, EXP_DATE, PAYMENT_TYPE, BILL_NAME, BILL_ADDRESS)

Check if $(R - \beta)$ in BCNF:

Since $OID \rightarrow CARRIER, SHIP_NAME, SHIP_ADDRESS, SDATE, SHIPMENT_STATUS, CID, CARD_NUM$,
 OID is the superkey of $(R - \beta)$. Therefore, $(R - \beta)$ is in BCNF

So, BOOK_ORDER TABLE is decomposed to

BOOK_ORDER:

<u>OID</u>	CARRIER	SHIP_NAME	SHIP_ADDRESS	CARD_NUM	SDATE	SHIPMENT_STATUS	CID
------------	---------	-----------	--------------	----------	-------	-----------------	-----

PAYMENT_CARD:

<u>CARD_NUM</u>	CVV	EXP_DATE	PAYMENT_TYPE	BILL_NAME	BILL_ADDRESS
-----------------	-----	----------	--------------	-----------	--------------

CONTAIN TABLE

$F = \{OID, BID \rightarrow AMOUNT\}$

(OID, BID) is superkey for CONTAIN table. Therefore, BCNF holds.

ORDER_FROM_PUBLISHER TABLE

$F = \{PUB_ORDER_ID \rightarrow PID, BID, DATE, ORDER_AMOUNT\}$

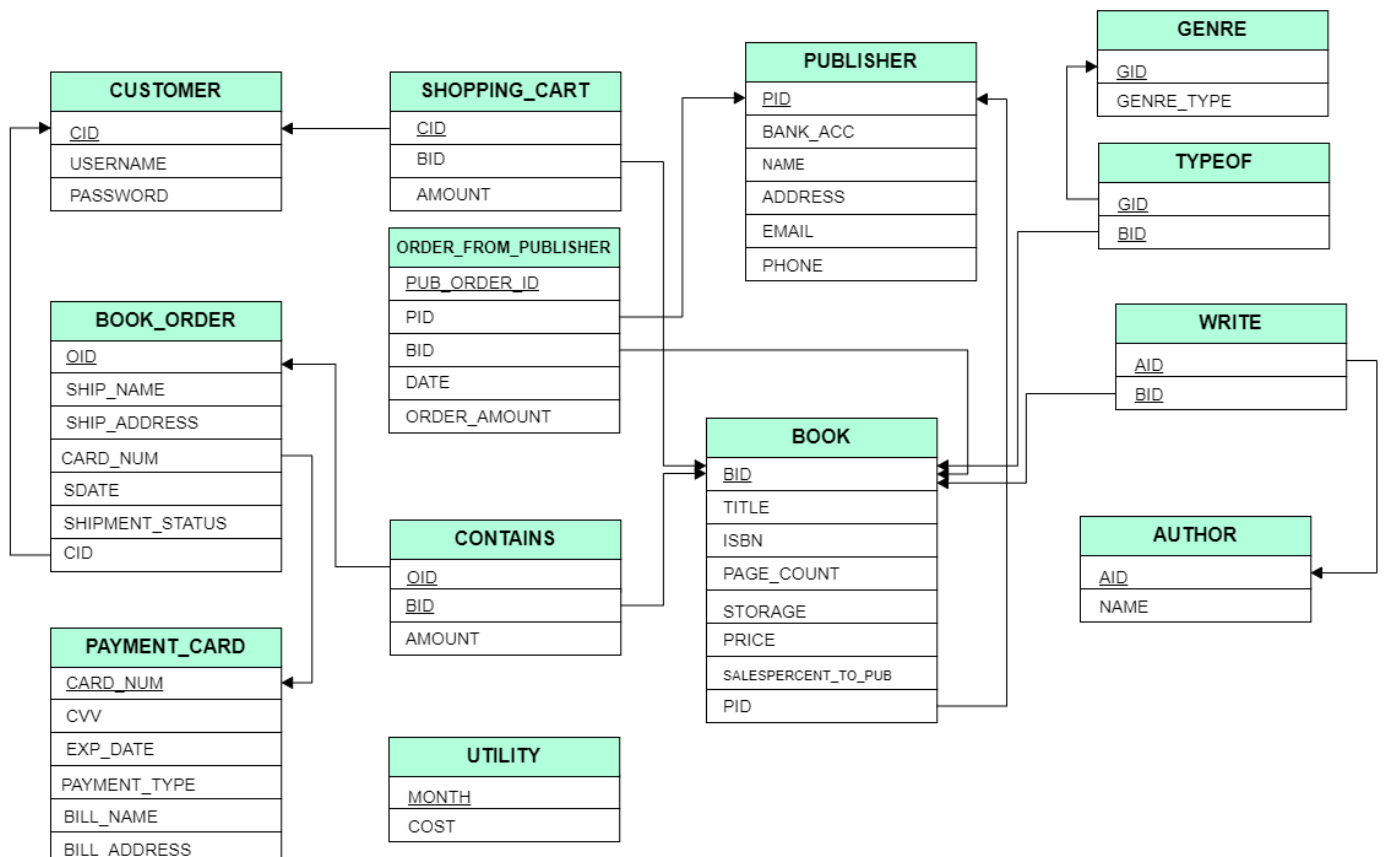
PUB_ORDER_ID is superkey for CONTAIN table. Therefore, BCNF holds.

UTILITY TABLE

$F = \{MONTH \rightarrow COST\}$

$MONTH$ is superkey for UTILITY table. Therefore, BCNF holds.

Database Schema Diagram



Implementation

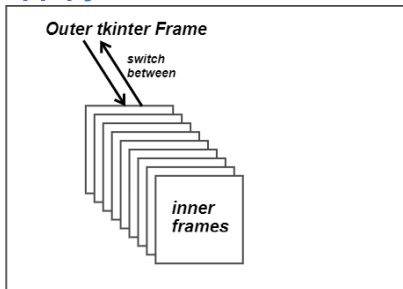
This program is written in Python, tkinter is used to build up GUIs, postgresql is the choice of database.

This program mainly contains two modules: dbinitializer.py and app.py

The database is connected to an online PostgreSQL database: <https://www.elephantsql.com/>

dbinitializer.py builds up the database using DDL and input the initial data into database including 606 books information download from online database, 255 fake publishers' information, 500 fake customer and 3000 fake book orders.

app.py contains the structure of the desktop app:



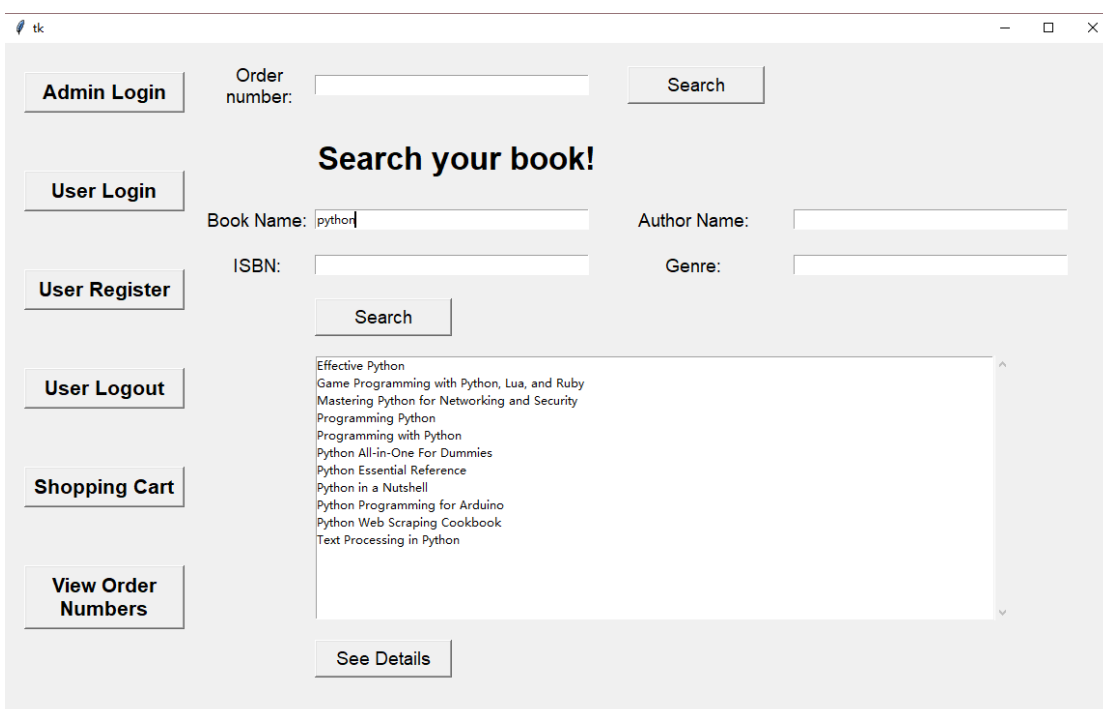
It contains one outer frame class and 15 inner frame classes:

Outer frame class: BookStoreAppGUI

This class builds up the outer frame of the app. It is passed as parent frame to other class. By controlling the swithc_frame() function in this class, we can go to any pages(these pages are built as inner frames).

Page class (inner frame class):

1. adminLoginPage: log in page for administration / the bookstore owner. After logging in through this page, owner will jump to the admin interface.
2. UserLoginPage: log in page for customer, after logging in, customer can add books to shopping cart and check out
3. UserRegPage: register page for customer
4. FirstPage: First Pages for both customer and owner. Owner can go to admin login page from this page. Customer can login/register from this page. Also, customer can search books in this page. The author name and genre should be enter only one name or genre type each time. Customer can also search orders by order numbers after logging in.



Customer interface:

5. BookPage: shows the details of a book, customer can add this book to shopping cart after logging in

The screenshot shows a window titled 'tk' with a light gray background. At the top, the text 'Effective Python' is centered. Below it, the following details are listed: 'Author: Brett Slatkin', 'Genre: Computers', 'Publisher: Addison-Wesley Professional', 'Number of Pages: 256', 'ISBN: 9780770325000', and 'Price: \$38.33'. A button labeled 'Back to search page' is positioned below the price. Further down, there is a label 'Please enter amount:' followed by a text input field. At the bottom, a button labeled 'Add to Shopping Cart' is displayed.

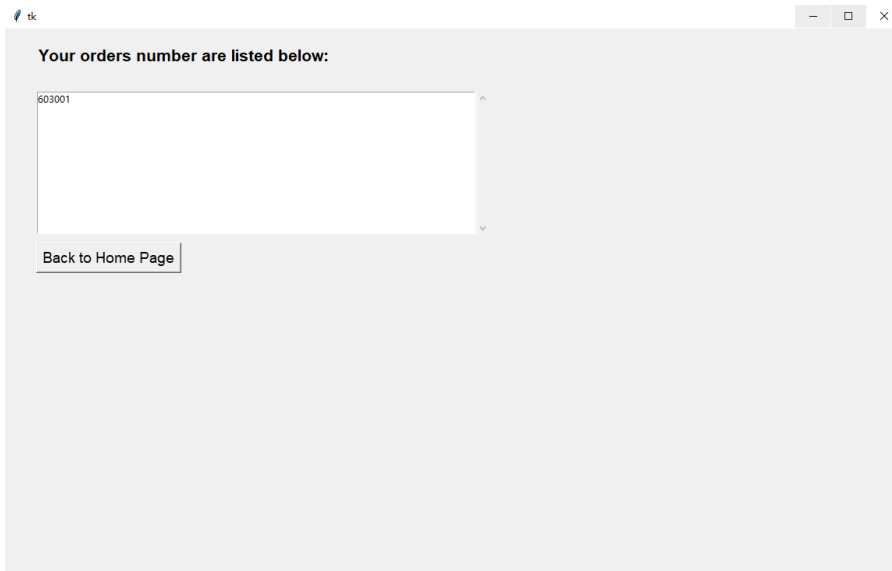
6. CartPage: shows all the books in customer's shopping cart, check out button redirect to check out page

The screenshot shows a window titled 'tk' with a light gray background. At the top, there are two buttons: 'clear shopping cart' and 'Go back to home page'. Below these, the text 'These are the books in your shopping cart:' is displayed. Underneath, there is a scrollable list box containing one item: 'Title: Effective Python Amount: 1'. At the bottom of the window, a button labeled 'Check out' is visible.

7. CheckoutPage: customer enter bill/ship information and place order in this page, after clicking place order button, an order number will be given.

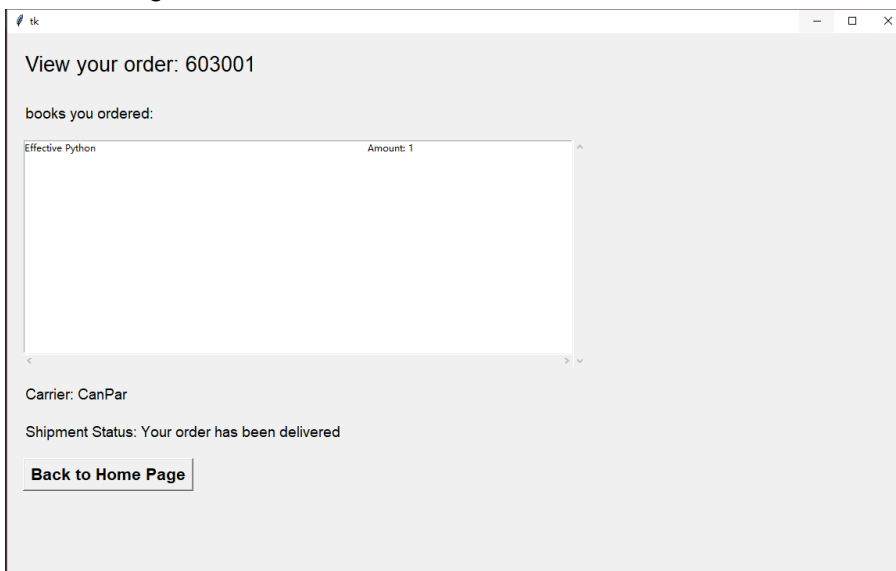
The screenshot shows a window titled 'tk' with a light gray background. The title 'Checking Out...' is at the top. Below it, there are four labels with corresponding text input fields: 'Billing name:', 'Billing address:', 'Shipping name:', and 'Shipping address:'. Below these, there is a 'Visa' logo. Further down, there are three more labels with text input fields: 'Expire Date(mm/yr):', 'CVV(3 digits):', and 'Card Number(16 digits no space):'. At the bottom, there are two buttons: 'Place Order!' and 'Back to Home Page'.

8. GetOrderNumberPage: If the customer forgot their order number, they can click the view order numbers button in the first page and view all the history order numbers in this page



The screenshot shows a web browser window with a title bar containing a logo and the text 'tk'. The main content area has a heading 'Your orders number are listed below:'. Below this heading is a large, empty rectangular box with a light gray border and a small upward arrow on the right side. At the bottom of the page, there is a button labeled 'Back to Home Page'.

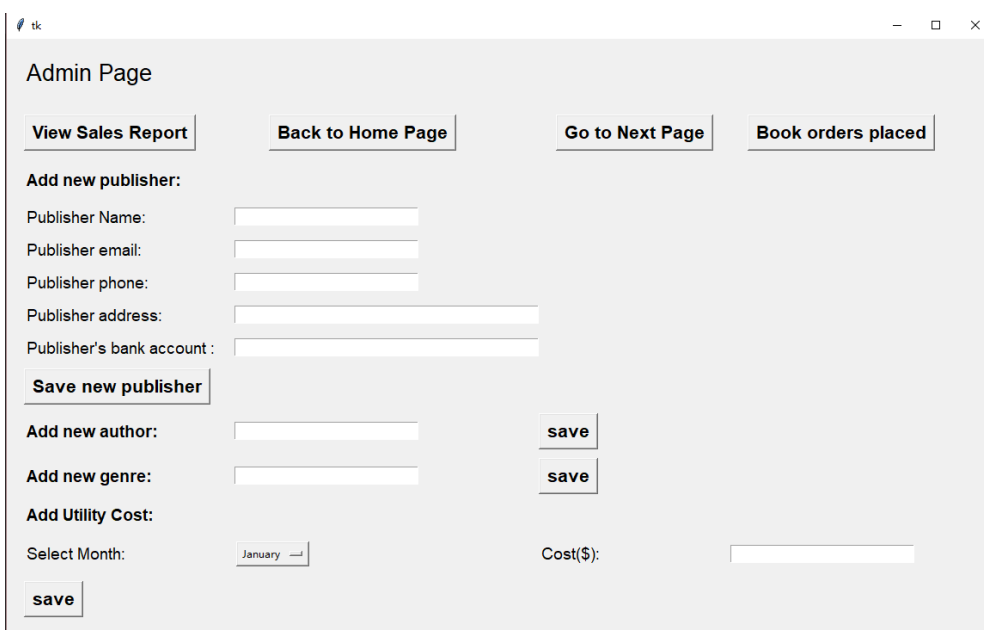
9. OrderPage: shows the details of the order number searched.



The screenshot shows a web browser window with a title bar containing a logo and the text 'tk'. The main content area has a heading 'View your order: 603001'. Below this heading is a section titled 'books you ordered:'. Under this section is a large, empty rectangular box with a light gray border and a small upward arrow on the right side. Below the box, there is a label 'Carrier: CanPar' and a label 'Shipment Status: Your order has been delivered'. At the bottom of the page, there is a button labeled 'Back to Home Page'.

Admin interface:

10. adminFirstPage: Accessed after completing the admin login page.



The screenshot shows a web browser window with a title bar containing a logo and the text 'tk'. The main content area has a heading 'Admin Page'. Below this heading are four buttons: 'View Sales Report', 'Back to Home Page', 'Go to Next Page', and 'Book orders placed'. Below these buttons is a section titled 'Add new publisher:'. Under this section are five input fields: 'Publisher Name:', 'Publisher email:', 'Publisher phone:', 'Publisher address:', and 'Publisher's bank account :'. Below these fields is a button labeled 'Save new publisher'. Below this button are three sections: 'Add new author:' with an input field and a 'save' button, 'Add new genre:' with an input field and a 'save' button, and 'Add Utility Cost:'. The 'Add Utility Cost:' section has a label 'Select Month:' with a dropdown menu showing 'January' and a label 'Cost(\$):' with an input field. Below these fields is a button labeled 'save'.

Owners can add new publisher, new author, new genre, and record utility cost in this page. Owner must add single author name and single genre type per time.

11. adminSecondPage: owners can add/delete books in this page. Owner can enter multiple authors, genres (separate them with comma), the percentage sent to publisher must entered as decimal number, if the publisher is not added, owner must go to adminFirstPage and add the full information of the publisher, if the author or genre are not added, the system will add the author and genre automatically in this page

12. OrderfromPubPage: The page is accessed by the 'books order placed' button in the admin first page. It shows the previous order automatically placed by the bookstore when the storage of a book is less than 20. The email sending component is not implemented in this project, but the information used to write to email is stored in the database and shown as record in this table.

Publisher	email	Book Title
SIAM	SIAM@gmail.com	Domain-based Parallelism and P
Springer Science Business Media	Springer_S@gmail.com	Chaos in Classical and Quantum
Berrett-Koehler Publishers	Berrett-Ko@gmail.com	Eat That Frog!: 21 Great Ways
Alyson Publications	Alyson_Pub@gmail.com	Gaywyck
Bonechi	Bonechi@gmail.com	New Orleans. Ediz. inglese
HarperCollins UK	HarperColl@gmail.com	The Red Signal: An Agatha Chri
Springer Science Business Media	Springer_S@gmail.com	Chaos in Classical and Quantum
Harper Collins	Harper_Col@gmail.com	Angels
HarperCollins UK	HarperColl@gmail.com	A Game of Thrones: The Story C
Bonechi	Bonechi@gmail.com	New Orleans. Ediz. inglese
Springer Science Business Media	Springer_S@gmail.com	Chaos in Classical and Quantum
HarperCollins UK	HarperColl@gmail.com	The Red Signal: An Agatha Chri
HarperCollins UK	HarperColl@gmail.com	The Mysterious Affair at Style
American Bar Association	American_B@gmail.com	Bioethical and Evolutionary Ap
Bonechi	Bonechi@gmail.com	New Orleans. Ediz. inglese
Thornton House Pub Graphics	Thornton_H@gmail.com	Apple parers
Routledge	Routledge@gmail.com	Key Debates in Anthropology
Thornton House Pub Graphics	Thornton_H@gmail.com	Apple parers
Del Rey	Del_Rey@gmail.com	Darksiders: The Abomination Va
Del Rey	Del_Rey@gmail.com	The Infernal City: An Elder Sc
HarperCollins UK	HarperColl@gmail.com	The Painted Man (The Demon Cyc
CRC Press	CRC_Press@gmail.com	The Complete Guide to Blender
CRC Press	CRC_Press@gmail.com	The Complete Guide to Blender
HarperCollins UK	HarperColl@gmail.com	A Game of Thrones: The Story C

13. reportFirstPage: This page is accessed by clicking the view sales report button in the first page. Owner can select the month of report they want to view.

tk

Report Page One

Back to Admin Page

Back to Home Page

Select the month you want to view:

January

February

March

April

May

June

July

August

September

October

November

December

14. reportSecondPage: Accessed after selecting the month, owner choose which report they want to view

tk

Report Page Two

Back to Admin Page

Back to Home Page

Select the report you want to view:

Sales vs Author

Sales vs Genres

Sales vs Expenditure

Money sent to Publisher

Change Month

15. reportThirdPage: Accessed after chosen the type of reports. There are four reports shown in this page:

tk

Sales vs Author Report of February

Author Name: Joint Committee on Southeast Asia	Sales: 886.08
Author Name: Jessica Keyes	Sales: 844.11
Author Name: Casenote Legal Briefs	Sales: 677.90
Author Name: Wendelin Van Draanen	Sales: 457.26
Author Name: Guy Hart-Davis	Sales: 347.06
Author Name: Fred Patten	Sales: 295.26
Author Name: Kathy Nemeh	Sales: 288.64
Author Name: Brent Weeks	Sales: 283.40
Author Name: David Mark	Sales: 275.52
Author Name: Nintendo	Sales: 267.70
Author Name: Ralph Keyes	Sales: 243.69
Author Name: Tom Taylor	Sales: 240.12
Author Name: Brian Tracy	Sales: 237.47
Author Name: Robert Greene	Sales: 224.97
Author Name: Peter V. Brett	Sales: 205.54
Author Name: Jeffrey Haugaard	Sales: 200.73
Author Name: Colleen E. Kriger	Sales: 198.36
Author Name: Jonathan Saggau	Sales: 196.84
Author Name: Willis F. Overton	Sales: 196.84
Author Name: Joachim Bondo	Sales: 196.84
Author Name: Alex C. Michalos	Sales: 196.84
Author Name: Joe Pezzillo	Sales: 196.84
Author Name: Kenneth C. Land	Sales: 196.84
Author Name: Ben Smith	Sales: 196.84
Author Name: Tom Harrington	Sales: 196.84

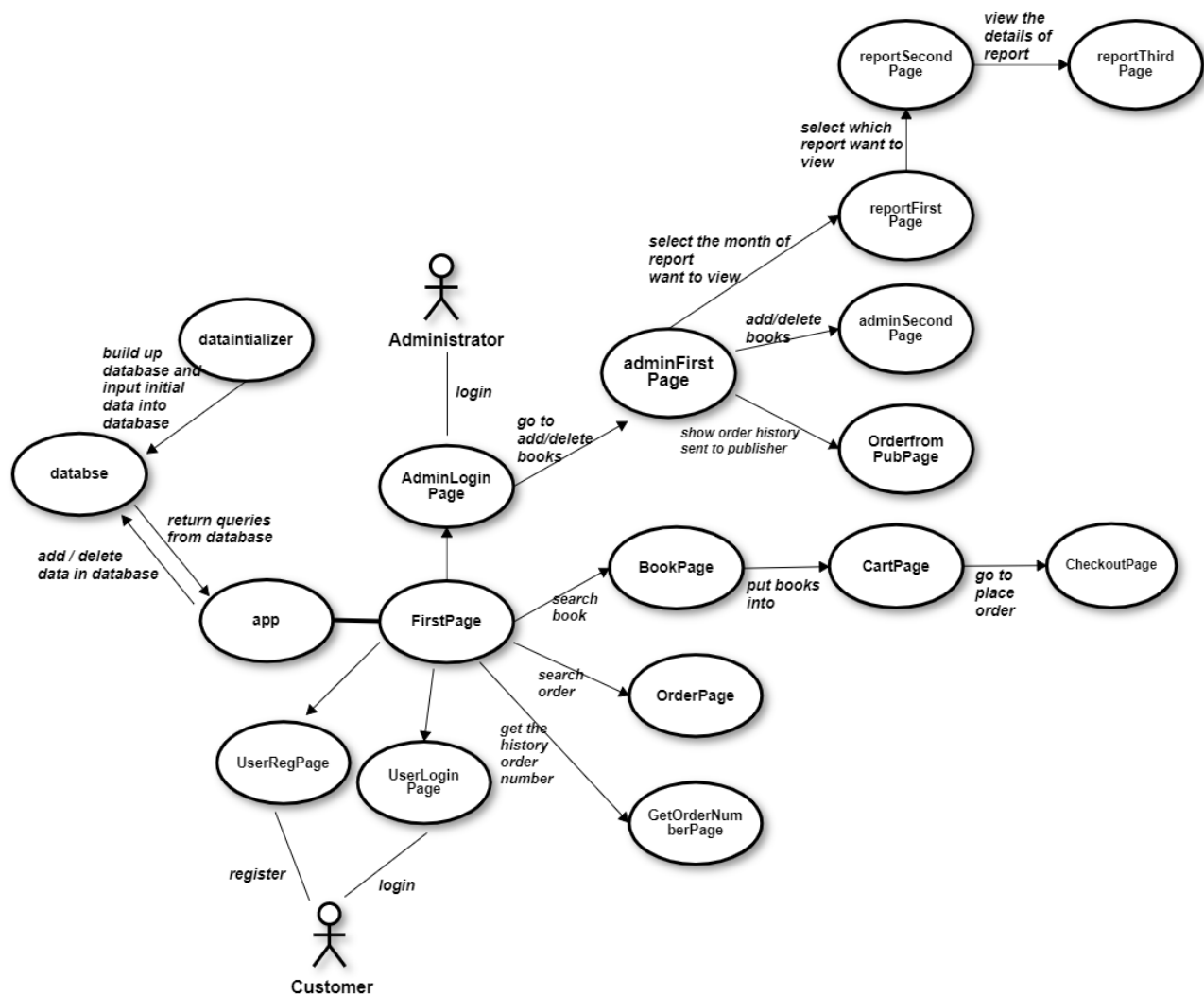
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Sales vs Genres Report of February		
Genre Type: General	Sales:	4814.07
Genre Type: Fiction	Sales:	3348.90
Genre Type: Computers	Sales:	2558.73
Genre Type: Economics	Sales:	2345.57
Genre Type: Business	Sales:	2345.57
Genre Type: Religion	Sales:	1204.81
Genre Type: Fantasy	Sales:	1089.17
Genre Type: History	Sales:	1037.65
Genre Type: Law	Sales:	816.96
Genre Type: Performing Arts	Sales:	772.81
Genre Type: Psychology	Sales:	727.15
Genre Type: Social Science	Sales:	635.30
Genre Type: Juvenile Fiction	Sales:	621.94
Genre Type: Language Arts	Sales:	562.93
Genre Type: Disciplines	Sales:	562.93
Genre Type: Thrillers	Sales:	528.45
Genre Type: Epic	Sales:	522.51
Genre Type: Medical	Sales:	519.91
Genre Type: Self-Help	Sales:	504.34
Genre Type: Autobiography	Sales:	465.18
Genre Type: Biography	Sales:	465.18
Genre Type: Reference	Sales:	431.68
Genre Type: Suspense	Sales:	425.24
Genre Type: Education	Sales:	411.60
Genre Type: Graphic Novels	Sales:	362.05
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Sales vs Expenditure Report of February	
Sales: \$23409.74	
Expenditure: \$14861.96	
Profit: \$8547.78	
Utility: \$1988.93	
Money Paid to Publisher: \$12873.03	
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Money sent to Publisher Report of February		
Name: Hachette UK	Sales: 605.1	Bank Account: 4538852024486269
Name: University of Hawaii Press	Sales: 531.6	Bank Account: 4312615658748709
Name: CRC Press	Sales: 515.1	Bank Account: 4598716912274020
Name: John Wiley Sons	Sales: 459.0	Bank Account: 4983217112206368
Name: Penguin	Sales: 448.1	Bank Account: 4534522839929021
Name: Marvel Entertainment	Sales: 375.8	Bank Account: 4967402314978063
Name: Springer Science Business Media	Sales: 357.9	Bank Account: 4103108121741709
Name: Wolters Kluwer Law Business	Sales: 353.9	Bank Account: 4963484132055502
Name: Harper Collins	Sales: 330.7	Bank Account: 4024899467895078
Name: Del Rey	Sales: 283.3	Bank Account: 4558532297755531
Name: Simon and Schuster	Sales: 278.0	Bank Account: 4817674689684101
Name: Springer	Sales: 273.8	Bank Account: 4109848215955260
Name: DC	Sales: 244.6	Bank Account: 4903419884226942
Name: Routledge	Sales: 234.2	Bank Account: 4623475084533636
Name: Apress	Sales: 191.9	Bank Account: 4541692919237182
Name: HarperCollins UK	Sales: 171.8	Bank Account: 4682820881319908
Name: Gale / Cengage Learning	Sales: 167.4	Bank Account: 4272970418139153
Name: Random House	Sales: 165.9	Bank Account: 4123857668548987
Name: Knopf Books for Young Readers	Sales: 159.7	Bank Account: 4366555183926404
Name: Elsevier	Sales: 156.1	Bank Account: 4169965293787648
Name: McGraw Hill Professional	Sales: 148.7	Bank Account: 4993301449221730
Name: Stone Bridge Press Inc.	Sales: 147.6	Bank Account: 4979444834082072
Name: Dark Horse Comics	Sales: 136.5	Bank Account: 4719337284295058
Name: Da Capo Press	Sales: 135.5	Bank Account: 4462797588243849
Name: Profile Books	Sales: 128.2	Bank Account: 4752266276717808
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Below is the diagram of the application's architecture:



Bonus Features

approximate search for books: user can search book by title or author by entering any parts of the words. For example: if user search "enny", the result will include authors named "Jenny, Benny..."

GitHub Repository

<https://github.com/catherine28shiro/3005project>

Appendix I

My availability is 2pm-5pm 12th 2022

Appendix II

The password and username of the online database: <https://www.elephantsql.com/>

username: catherineli3@gmail.carleton.ca

psw: Database3005!

The source of the book data: <https://www.kaggle.com/datasets/bilalyussef/google-books-dataset>