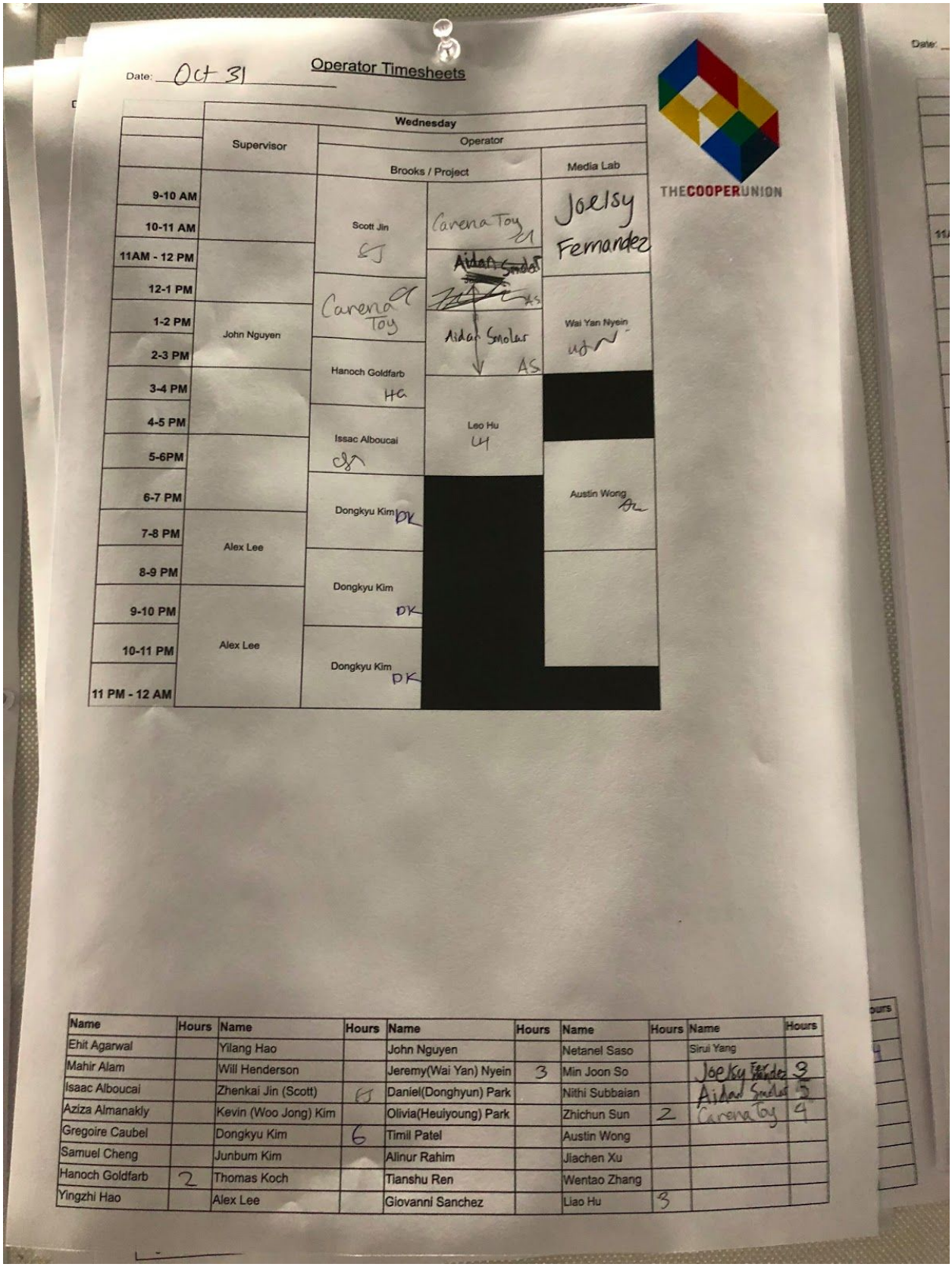
Sara Huang
ECE464 Final Project Writeup
Payment System for Cooper Union Computer Center

Abstract
Currently, the Cooper Union Computer Center (CUCC) has a payment process that is inefficient and old-fashioned at best. Daily timesheets track the schedule, operating hours, and signature proof of having worked. At the end of every fortnight, the timesheets are collected and approved by a supervisor or student manager, who then sends over the information to the Business Office (Payroll) so that the workers can get paid. There are many problems with this since the possibility of loss or incorrect time reporting leads to slower processing of payment and high risk of not getting funds should there be data loss. In order to make the payment process more efficient and manageable, an online database that would essentially record the same information as the timesheets is used using SQL relational schemas and models. Querying this data would then be done on a program so that the user interface would be easy to use. For the payment period of 11/03/2018-11/16/2018, the online database stored names, work information, and pay information for the CUCC and a trial was conducted that had positive feedback and great success. The new design is virtually identical to the paper design, with the caveat of conserving resources, ease of access, and better use. The program is designed so that supervisors can clock in information to the Workeds table and view the payment information of operators, who can only clock in their hours worked.

Description of Data
Pictures of the timesheets on the CUCC bulletin board were taken everyday for the duration of the 11/03/2018-11/16/2018 pay period. Figure 1 shows a sample of a timesheet for the date November 3rd, 2018. A timesheet was printed on 11x17” paper and had the date in the upper left corner, along with the time schedule for that day. The time schedule would have blocks or slots, indicating who would work in each slot, along with the operator name, supervisor name, and location. If there was a change in the worker prior to the timesheet printed and used for that date, the name originally scheduled for that block would be crossed out and replaced with who actually worked during that block. Along the bottom of the timesheet, there are tables with worker names and hours worked columns. For that date, the worker would put their initials in the block of time they worked (signifying proof of having worked for that block) and additionally write down the number of hours worked in the corresponding column in the tables at the bottom. Figure 2 shows a sample of a supervisor timesheet. Noticeably, there are clear differences in that no time schedule is on the supervisor timesheet and the size is considerably smaller. A separate 8.5x11” paper for the supervisors had their names along with their hours worked for certain dates. Usually, the supervisors do not need to sign the regular 11x17” timesheet (and often, they do not sign the timesheet), thus making it hard to tell when exactly they worked, especially if a last minute change was done. A sample photo can be seen below in Figure 1. This was how the data was obtained and generated for the database.



Date: Oct 31

Operator Timesheets

THECOOPERUNION

	Wednesday		
	Supervisor	Operator	
		Brooks / Project	Media Lab
9-10 AM		Scott Jin SJ	Carena Toy CT / Joelsy Fernandez
10-11 AM			
11AM - 12 PM		Carena Toy	Aidan Smolar AS
12-1 PM			
1-2 PM	John Nguyen	Hanoch Goldfarb HG	Wai Yan Nyein WN
2-3 PM			
3-4 PM		Issac Alboucai IA	Leo Hu LH
4-5 PM			
5-6PM		Dongkyu Kim DK	Austin Wong AW
6-7 PM			
7-8 PM	Alex Lee	Dongkyu Kim DK	
8-9 PM			
9-10 PM	Alex Lee	Dongkyu Kim DK	
10-11 PM			
11 PM - 12 AM			

Name	Hours	Name	Hours	Name	Hours	Name	Hours	Name	Hours
Ehit Agarwal		Yilang Hao		John Nguyen		Netanel Saso		Sirui Yang	
Mahir Alam		Will Henderson		Jeremy(Wai Yan) Nyein	3	Min Joon So		Joelsy Fernandez	3
Isaac Alboucai		Zhenkai Jin (Scott)	SJ	Daniel(Donghyun) Park		Nithi Subbaian		Aidan Smolar	5
Aziza Almanakly		Kevin (Woo Jong) Kim		Olivia(Heuiyoung) Park		Zhichun Sun	2	Carena Toy	4
Gregoire Caubel		Dongkyu Kim	6	Timil Patel		Austin Wong			
Samuel Cheng		Junbum Kim		Alinur Rahim		Jiachen Xu			
Hanoch Goldfarb	2	Thomas Koch		Tianshu Ren		Wentao Zhang			
Yingzhi Hao		Alex Lee		Giovanni Sanchez		Liao Hu	3		

Figure 1: An operator timesheet for the date 10/31/2018.

Description of Data in the Database

Tables were then made for the database. To separate the operators from the supervisors, separate tables were made for each of them as supervisors are considered operators, but have more options and flexibility in terms of their responsibilities and management, akin to an employee-manager relationship. The operator tables include the student id (primary key) and their names. There are 33 entries in this table. The supervisor tables include the student id (primary key), names, approval date (usually only done by the student manager), date of decline, and date of submission to payroll for verification. There are 8 entries in this table. Since only the student manager and assistant student manager approve the hours worked for the entire computer center, they will have those fields as not null in the supervisors table. The student manager and assistant student manager respectively are the first two entries of the supervisors table. Unfortunately, to protect student privacy and security, real student IDs were not disclosed for use to me and thus, improvisation of student IDs had to be made. In order to differentiate between the regular operators and supervisors, the supervisors' IDs are at least 3 digits long and differ by 100, whereas the operators' IDs are at most two digits and differ by 1. The worked table essentially tabulates the information that is on the 11"x17" schedule sheet for the operators so that a log can be maintained. The information in this table is a worked number (serving as a surrogate/primary key to keep track of count of the log entries), worked id (that corresponds to the operator ID number), date worked, pay rate, and hours worked. There are 91 entries in this table. Similarly, an additional table, workeds, was made that was initially not done for the supervisors since they are flexible and fluid in their work hours. There are 15 entries in this table. The information in this table is a worked number (primary/surrogate key), worked ID corresponding to the supervisor ID number), date worked, pay rate, and hours worked. The data obtained for this table is taken directly from the supervisors timesheet in the computer center and tabulated here. This helps keep the differing pay rates, hours, and papers separate to match the current process so that it would not feel or be too different than what has already been established for a long time. The payroll table calculates how much each worker in the Computer Center gets paid (both supervisors and operators). It stores a payroll number (transaction ID as the primary/surrogate key), pay period date range, ID number of operator or supervisor, and gross pay earned during that timeframe. There are 41 entries in this table. It is generally assumed that direct deposit or checks will be written out once per pay period unless unforeseen events happen. Sample querying on mySQL was shown to be successful after multiple attempts. A common query to perform is shown in Figure 2. Sample querying of the ORM was also shown to be successful (they appear as comments in the program; to ensure they work, simply uncomment and rerun the program).

```
mysql> SELECT * FROM workers w, worked k WHERE w.wid = k.wkd_id ORDER BY k.wkd_id;
+-----+------------------+--------+--------+------------+----------+-----------+
| wid | wname            | wkd_no | wkd_id | wkd_date   | wkd_rate | wkd_hours |
+-----+------------------+--------+--------+------------+----------+-----------+
|   1 | Ehit Agarwal     |      1 |      1 | 11/03/2018 |       13 |         2 |
|   1 | Ehit Agarwal     |     84 |      1 | 11/16/2018 |       13 |         2 |
|   1 | Ehit Agarwal     |     51 |      1 | 11/11/2018 |       13 |         2 |
|   3 | Isaac Alboucai   |     74 |      3 | 11/14/2018 |       13 |         2 |
|   6 | Hanoch Goldfarb  |     25 |      6 | 11/07/2018 |       13 |         2 |
|   6 | Hanoch Goldfarb  |     35 |      6 | 11/08/2018 |       13 |         2 |
|   6 | Hanoch Goldfarb  |     77 |      6 | 11/14/2018 |       13 |         2 |
|   6 | Hanoch Goldfarb  |     85 |      6 | 11/16/2018 |       13 |         5 |
|   7 | Yilang Hao       |     65 |      7 | 11/13/2018 |       13 |         5 |
|   7 | Yilang Hao       |     54 |      7 | 11/12/2018 |       13 |         6 |
|   7 | Yilang Hao       |     16 |      7 | 11/06/2018 |       13 |         3 |
|   7 | Yilang Hao       |     86 |      7 | 11/16/2018 |       13 |         2 |
|   7 | Yilang Hao       |      6 |      7 | 11/05/2018 |       13 |         6 |
|   7 | Yilang Hao       |     36 |      7 | 11/08/2018 |       13 |         4 |
|  10 | Dongkyu Kim      |     52 |     10 | 11/11/2018 |       13 |         2 |
|  10 | Dongkyu Kim      |     26 |     10 | 11/07/2018 |       13 |         6 |
|  10 | Dongkyu Kim      |     50 |     10 | 11/10/2018 |       13 |         8 |
|  10 | Dongkyu Kim      |     37 |     10 | 11/08/2018 |       13 |         4 |
|  10 | Dongkyu Kim      |      2 |     10 | 11/03/2018 |       13 |         6 |
|  10 | Dongkyu Kim      |     66 |     10 | 11/13/2018 |       13 |         2 |
|  10 | Dongkyu Kim      |     17 |     10 | 11/06/2018 |       13 |         2 |
|  10 | Dongkyu Kim      |     75 |     10 | 11/14/2018 |       13 |         6 |
|  10 | Dongkyu Kim      |      3 |     10 | 11/04/2018 |       13 |         4 |
|  11 | Junbum Kim       |     67 |     11 | 11/13/2018 |       13 |         2 |
|  11 | Junbum Kim       |     55 |     11 | 11/12/2018 |       13 |         4 |
|  11 | Junbum Kim       |     18 |     11 | 11/06/2018 |       13 |         2 |
|  11 | Junbum Kim       |      7 |     11 | 11/05/2018 |       13 |         4 |
|  13 | Wai Yan Nyein    |     38 |     13 | 11/08/2018 |       13 |         2 |
|  13 | Wai Yan Nyein    |     44 |     13 | 11/09/2018 |       13 |         3 |
|  13 | Wai Yan Nyein    |     87 |     13 | 11/16/2018 |       13 |         3 |
|  13 | Wai Yan Nyein    |     78 |     13 | 11/14/2018 |       13 |         2 |
|  13 | Wai Yan Nyein    |     27 |     13 | 11/07/2018 |       13 |         3 |
|  13 | Wai Yan Nyein    |     56 |     13 | 11/12/2018 |       13 |         2 |
```

Figure 2: A query matching the operator ID with the dates worked along with hours to see how much a worker has worked for a pay period.

Description of the Functionality

The functionality of the program is a command-line program. The front-end code will directly call the queries from the back-end so that it works as intended. There are two main actions (clockin and view) that a user (either a supervisor or operator) can have. The view action is only granted to supervisors in which case they can enter in one or more operator IDs to see how much they have worked. The clockin action is available on both the operator and supervisor users so that each worker can manually enter in their hours along with other relevant information corresponding to the Worked and Workeds table.

Instructions

To use the program, simply compile it on a Linux terminal as follows:

`python program.py --user no --action [. . .]`

Sample runs of the program are shown below:

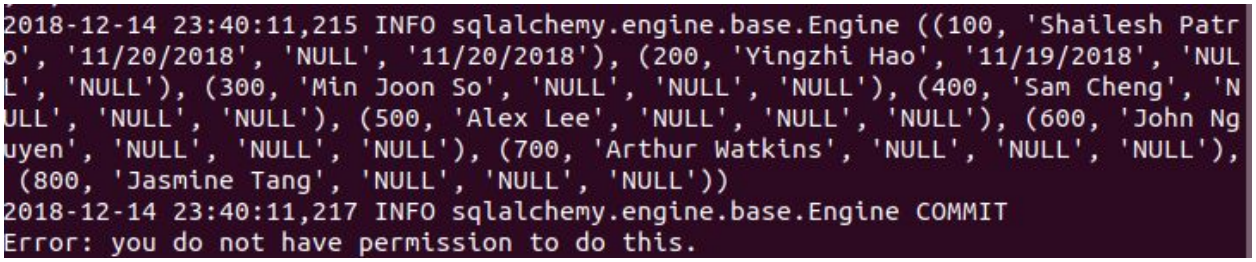


Figure 3: A sample trying to run '--view' as a valid operator

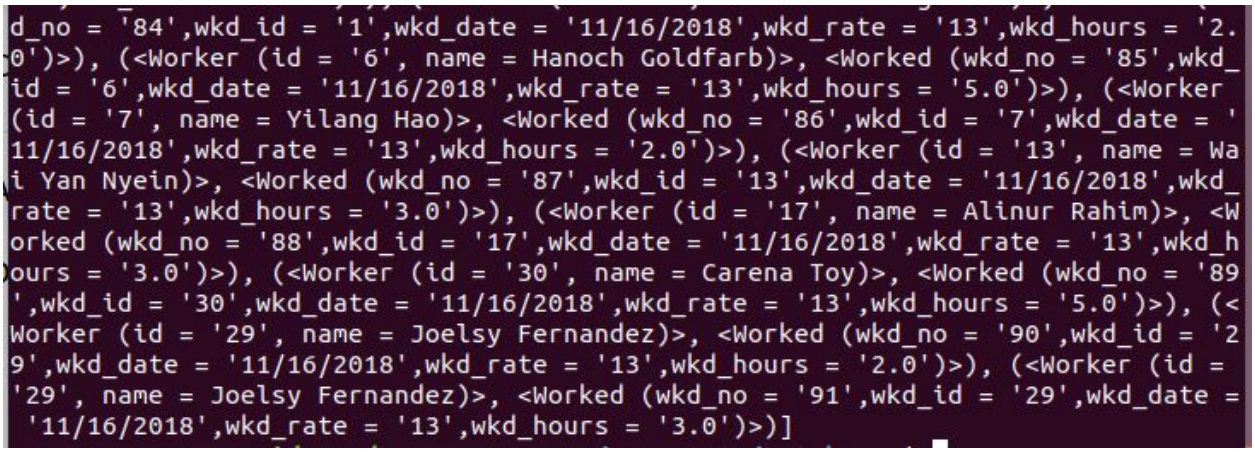


Figure 4: A sample trying to run '--view' as a valid supervisor

Description of Features & Explanations

Features that would have been nice to add on are more actions and a better, aesthetically appealing user-interface. Inclusion of actual student IDs and actual transaction IDs would have been nice also but because of privacy and protection of students, that information was not for public use. More options and actions available to users of the program could have made it more complex and interesting. Time is of the essence. Failed attempts and long hours became the primary reason of concern.

Conclusion

Overall, the project was a rewarding experience considering it was the first time using a new language to write programs in. There was some confusion over front-end, back-end work albeit a fun venture to learn about in the process. It was great to get to know how to work with and use databases. Particularly noteworthy is seeing how easy processes can become with the use of a database. The goal of improving the outdated payment system is satisfied.

Thank you, Prof. Sokolov, for being the best professor I could ever ask for.

I wish you all the best in all your future endeavors and may you always be happy and healthy.