FYP Management System

Final Year Project Final Report

COMP4801

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Abstract

The current Final Year Project (FYP) Management System consists of limited functions including Project allocation, selection and evaluation. The utilisation rate of this System throughout one academic year is low. The project “Final Year Project Management System” aims to extend the functionality of the current system by introducing a new function, namely a Scheduling System, by the use of a newly designed front-end for schedule indication, and Constraint Satisfaction Programming for schedule generation. It is the aim of this project to largely reduce the time required for teachers and system administrators for the schedule generation of FYP presentations, ultimately contributing to the University of Hong Kong in the long run.

In this paper, an introduction of the current FYP system will be given, the project implementation and results will be thoroughly discussed, and recommendations on any future works will be given.
Acknowledgment

The Final Year Project “FYP Management System” has been completed without major obstacles thanks to the continuers mentorship of Prof. K.P. Chan. The exploration of the project scope, namely the extension of a Presentation Scheduling System to the current FYP Management System, would not have been possible without the guidance, support and provision of expertise from Prof. K.P. Chan.

I would like to extend my gratitude to Mr. Daniel Hung and Mr. Ken Lau, who are both technical supporting staff of the Computer Science department at the University of Hong Kong, for offering to provide insightful expertise on the current Final Year Project management system. The information obtained was a key cornerstone in the proceeding of this project.

I also thank Prof. T. W. Chim for providing unique insight on a similar final year project topic conducted last year. It is certain that previous experience regarding undergone research, product development and difficulties encountered is greatly beneficial to the proceeding of this project.
# Table of Contents

Abstract ......................................................................................................................... 2  
Acknowledgment ......................................................................................................... 3  
Table of Contents ......................................................................................................... 4  
List of Figures ............................................................................................................... 5  
List of Tables ............................................................................................................... 7  
Abbreviations ............................................................................................................... 7  
Introduction .................................................................................................................. 8  
1 Project Background and Literature Review ............................................................ 9  
2 Objective .................................................................................................................. 14  
3 Methodology ............................................................................................................. 15  
  3.1 Front-end implementation .................................................................................... 16  
  3.2 Back-end implementation ................................................................................... 24  
  3.3 Constraint Satisfaction Programming ................................................................. 26  
  3.4 Implementation of CSP in Scheduling System ..................................................... 28  
4 Results ...................................................................................................................... 32  
5 Conclusion ................................................................................................................. 40  
References ................................................................................................................... 41
List of Figures

Figure 1. A screenshot of the Project page of the current FYP management system...10

Figure 2. Illustration of the workflow design of the Scheduling System by supervisors and students..........................................................15

Figure 3. A screenshot of the login interface for the Scheduling System with input fields for Login ID and Password..........................................................16

Figure 4. A screenshot of the Main Page of the Scheduling System for a student user. Information such as group name, project info, as well as a calendar interface is shown. The user can select and submit available time slots via dragging on the calendar, which is shown in blue in the figure..................................................18

Figure 5. A screenshot of the main page when a user have stored time slot information, with selected time slots shown in grey. ........................................19

Figure 6. A screenshot of the main page of a teacher where the teacher’s supervised groups, and if the group has indicated their availability is shown........................20

Figure 7. A screenshot of the main page of an administrator’s page. The settings are first shown at the top of the page, followed by Teachers’ and Students’ selection status, and at last, an option to generate a schedule is shown..........................21

Figure 8. Illustration of a simple constraint satisfaction problem, where there are 3 variables each of domain of {1,2,3}. All constraints has to been satisfied to come up with 3 solutions..........................................................26

Figure 9. Illustration of a more complex constraint satisfaction problem regarding time slot scheduling where there are increasing variables and domains ..................27

Figure 10. The SQL commands for retrieving the tables for generating presentation schedule. ................................................................................................................29

Figure 11. A Screenshot of a part of the generated schedule file. Each row represents the presentation time of one FYP group..........................................................30

Figure 12. A Screenshot of a part of the generated schedule file. Each row with Date “Not Satisfied” indicates the system was not able to find a common time between all parties..........................................................31

Figure 13. The main page for user ‘fyp21017’ after log in. It can be seen that the Project Name and Description is shown, as well as a calendar for indicating this group’s availability..........................32

Figure 14. The schedule page for user ‘fyp21017’ after a test schedule has been selected. As shown from the Figure, the whole day of 11th, 12th and 14th was indicated by this user..........................................................33

Figure 15. The database result of partial test schedule data for FYP groups. .............34
Figure 16. The database result of partial test schedule data for teachers. ..................35

Figure 17. The database result of test schedule data for presentation locations. .......35

Figure 18. The entire CSP generated output file for 43 FYP groups. .......................36

Figure 19. The database query for schedule of group ‘fyp21011’, supervisor ‘jpan’ and second examiner ‘chenshu’. It can be seen that there’s no overlapping (i.e. available) time for all 3 parties. .............................................................................37

Figure 20. The database query for schedule of group ‘fyp21015’, supervisor ‘cqian’ and second examiner ‘chenshu’. It can be seen that there’s no overlapping (i.e. available) time for all 3 parties. .............................................................................38
List of Tables

Table 1. Current FYP system functionalities and affected parties. ..........................10
Table 2. Functionality and utility of the FYP System throughout one academic year. 11

Abbreviations
The list of abbreviations used in this report is listed as follows:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>HKU</td>
<td>The University of Hong Kong</td>
</tr>
<tr>
<td>CS</td>
<td>The Computer Science department in HKU</td>
</tr>
<tr>
<td>FYP</td>
<td>Final Year Project</td>
</tr>
<tr>
<td>CSP</td>
<td>Constraint Satisfaction Programming</td>
</tr>
<tr>
<td>WebPA</td>
<td>Web Peer Assessment System</td>
</tr>
<tr>
<td>Web API</td>
<td>Web Application Programming Interface</td>
</tr>
</tbody>
</table>

**Introduction**
The project ‘FYP Management System’ aims to extend the current system at the University of Hong Kong and provide additional functionality of automated scheduling of first and final presentations. To date, presentation scheduling has been done manually by teachers and system administrators by either scheduling with students manually, or by randomly allocation presentation time for each FYP group. Neither of these methods are efficient nor do they have a high accuracy of providing schedules with few follow-up changes.

This project introduces a new system for indication of availability and presentation schedule generation. A new indication interface is designed for students, teachers and presentation locations, and by indicating these information, an automated generation of best suited scheduling time slots is created using Constraint Satisfaction Programming. This can greatly reduce the time required to undergo manual presentation scheduling once every semester. It is the vision of this project to contribute to the University of Hong Kong in the longer run.

The project contribution is listed below:

<table>
<thead>
<tr>
<th>#</th>
<th>Student Name</th>
<th>University ID</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CHEUNG YAN CAHK</td>
<td>3035377828</td>
<td>100%</td>
</tr>
</tbody>
</table>

1 Project Background and Literature Review
The current Final Year Project management system is a web-based system under the Computer Science framework in the University of Hong Kong (HKU). All final year Computer Science students in HKU will use this system in order to take part in a final year project. Please see Figure 1 for a screenshot of the main page of the current system.

Figure 1. A screenshot of the Project page of the current FYP management system.

As seen from Figure 1, the management system is responsible for three areas only, as listed in Table 1:

<table>
<thead>
<tr>
<th>Step</th>
<th>Functionality</th>
<th>Affected Parties</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Publication of proposed Final Year Projects</td>
<td>Supervisors</td>
</tr>
<tr>
<td>2</td>
<td>Selection, allocation and acceptance of projects</td>
<td>Supervisors and Students</td>
</tr>
<tr>
<td>3</td>
<td>Project evaluation</td>
<td>Supervisors</td>
</tr>
</tbody>
</table>

Table 1. Current FYP system functionalities and affected parties.

The three functionalities provided by the current system shown in Table 2 are only used at the beginning for Final Year Project selection and allocation, and at the end where
evaluation phase takes place. Please see Table 3 for an illustration of the usage throughout one academic year.

Table 2. Functionality and utility of the FYP System throughout one academic year.

As seen from Table 2, the utilisation rate of the current system is low. While discussing with professors in the University of Hong Kong, one of the discussed shortcomings of the current system for both supervisors and students are the lack of scheduling functionality. This include the regular scheduling of meetings between a supervisor and students, and the scheduling for first and final presentations. Currently, the use of E-mail is the primary medium for securing a common time for all parties. Students will initiate the scheduling by proposing multiple time ranges to the supervisor to choose from, and the supervisor will then reply with a desired time and requesting confirmation on the meeting. Lastly, the students will confirm the meeting via a reply. This is the most ideal case. However, do note that in most cases, more back-and-forth exchanges are required for reaching consensus on a meeting timeframe. This repetitive process results in tens of emails to be sent and received for each FYP group, and hundreds of emails to be handled by the teacher, since each teacher may also be second examining multiple FYP
groups. Assuming each email takes two minutes to reply, hours will have been taken up for scheduling alone.

In previous years, scheduling of first or final presentation is usually done by two methods. The first method is to have groups to contact their supervisor and second examiner, coming up with a suitably length time on their own, and emailing the FYP administrators afterwards regarding the negotiated time. Although this method reduces the possibility of any party being preoccupied during the designated time slot, due to all parties engaged in the process of setting up the time, two problems arise: one, the aforementioned numerous emails required for each teacher to respond to; and two, the presentation times are generally all spread out, increasing the time of teachers travelling back-and-forth to presentation venues, ultimately greatly increasing the time cost for presentations.

The second method is to randomly allocate presentation time slots manually by FYP administrators. This is done by first confirming the available period for all instructors manually, and assigning the instructor’s supervised groups and groups that are second examined by that instructor to those available time. This is a time-consuming process as not only there are a large number of instructors and FYP groups, it is also a primary objective to allocate the presentations so each instructor gets a more clustered presentation schedule instead of it being more spread-out. Moreover, the allocated time may not suit the FYP group of students’ schedule, which could lead to more rescheduling and more email exchanges, ultimately more workload for FYP administrators.
During the phase of literature review, I discovered a similar final year project topics regarding Final Year Project scheduling system in the University of Hong Kong. In the academic year 2020, an FYP on the topic ‘Smart FYP Presentation Scheduler” was conducted [1]. A similar design philosophy to this project, where there are also a calendar-like interface for indication of time slot preferences were implemented. To my best of understanding however, the developed system was never incorporated into the existing FYP management system.

From my meeting with the Computer Science department technical staff, I introduced my philosophy and deliverables for this project, as well as requested suggestions for the technical specifications regarding product development. I have gained more understanding regarding the current system architecture and framework. The current system uses MySQL database for project information storage, which aligns with the choice of programming language for this project.
2 Objective

This project aims to improve the current final year project management system by introducing one main area of features, namely a Presentation Scheduling system. The implementation of this system will facilitate both Supervisors and Students to a more efficient Final Year Project presentation process, and greatly reduce the time required for FYP administrators to generate accurate presentation schedules.


3 Methodology

In terms of implementation, the scheduling system is delivered in a format of a Web Application Programming Interface (API). A Web API is an interface where the program is allowed access towards features and data of an application or other services [9]. It provides a convenient service via Hypertext Transfer Protocol (HTTP) to display data to browsers on computers and mobile devices. A calendar is shown to both supervisor and students to indicate their availability for presentation. When all parties have completed indication or the indication deadline is reached, the system administrator can generate the CSP derived suitable time slots. Please see Figure 2 for a graphical illustration:

![Figure 2](image.png)

**Figure 2.** Illustration of the workflow design of the Scheduling System by supervisors and students.

This section will first introduce in subsection 3.1 the Scheduling System via the use of HTML, CSS, JavaScript, PHP, MySQL database and Constraint Satisfaction Problem Programming via PHP. In subsection 3.2, the implementation of WebPA as a peer assessment system will be discussed.
3.1 Front-end implementation

The scheduling system aims to greatly reduce the workload required for scheduling presentation time slots. This is done via the following steps. First, the students (as FYP groups) and teachers are instructed to indicate all their availability via the system. The FYP administrator will also indicate the availability of presentation locations. Then, once the period for indication have ended, or all parties have finished their availability indication, the FYP administrator can generate and output a full schedule of presentation time for each FYP group, with their corresponding supervisor and second examiner. The functionality will be further explained below.

For the indication of availability for different parties, I have implemented a simple login mechanism for different users to login to the scheduling system. The implementation is done via HTML and CSS programming for front-end interface, as well as JavaScript, PHP and MySQL database for back-end to verify the user. Please see Figure 3 for an illustration of the log-in interface:

![Figure 3](image)

*Figure 3.* A screenshot of the login interface for the Scheduling System with input fields for Login ID and Password.
It can be seen from Figure 2 that two fields exist for input of Login ID and Password. Once the correct credentials are entered, the webpage will be redirected to the main page. The login page will also be able to recognise if the user is an FYP group, a teacher, or a system administrator, which contributes to what the main page generates.

The main page for students consist of the logged in user information, such as the group number and project information for student users, as well as a calendar interface. Currently, a clickable calendar design is implanted via an API in the name of “FullCalendar”. FullCalendar is an open-course, Javascript-based event calendar with high customisability [10]. I selected this API as it gives a clean look for users to easily understand how to operate a selection of availability, while also giving a high flexibility to customise the calendar with different settings, such as the indicated week for selection. I have utilise this API to allow users to drag-and-select their available time slots for presentation. Please see Figure 4 for an illustration of the main page:
Welcome, fyp21017

Project Name: FYP management system (Group 1)

Project Description: This is to implement a management system that can handle project selection, allocation, and presentation scheduling. There are a lot of constraints and students are expected to handle the constraints and solve the constraint satisfaction problem.

Please select your group's desired timeslot

<table>
<thead>
<tr>
<th>Sun 1/9</th>
<th>Mon 1/10</th>
<th>Tue 1/11</th>
<th>Wed 1/12</th>
<th>Thu 1/13</th>
<th>Fri 1/14</th>
<th>Sat 1/15</th>
</tr>
</thead>
<tbody>
<tr>
<td>all-day</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9am</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>10am</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>11am</td>
<td>10:30 - 12:30</td>
<td>09:30 - 11:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12pm</td>
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<td>1pm</td>
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<td>4pm</td>
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<tr>
<td>5pm</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Selected 2022-01-10 10:30 to 2022-01-10 12:30
Selected 2022-01-11 12:30 to 2022-01-11 15:00
Selected 2022-01-13 10:30 to 2022-01-13 13:00

Submit

**Figure 4.** A screenshot of the Main Page of the Scheduling System for a student user. Information such as group name, project info, as well as a calendar interface is shown. The user can select and submit available time slots via dragging on the calendar, which is shown in blue in the figure.

As shown in Figure 4, the user is able to select time slots on the calendar, as indicated by the time selections in blue. The user can then submit the select times and the information will be saved in the database. The saving functionality is achieved via JavaScript functions which parses the selection from the API into String values, and saved to MySQL database via PHP scripts. The main page is able to check with database date to see if scheduling record has been stored, in case of any future log-ins to indicate information correctly. In case a user have already indicated their availability, the system
will indicated wording of “Your selected time slot” and display the selected time in Grey. This is achieved via retrieving the selected time from the database, parsing the data into correct event format in the FullCalendar API, and regenerating the calendar with events.

An example of a user logging in with saved schedule can be seen from Figure 5:

![Calendar with selected time slots]

**Figure 5.** A screenshot of the main page when a user have stored time slot information, with selected time slots shown in grey.

In the case for teachers, the main page is added with additional information of the instructor’s supervised groups. The supervised FYP group number will be shown, as well as their selection status, indicated by the phrase “This group has/has not selected time slots.”. This acts as additional information for instructors to get a better understanding on presentation time selection. For the appearance and functionality of the calendar and...
availability indication, it is the same as the student’s page. Please see Figure 6 for an illustration.

Figure 6. A screenshot of the main page of a teacher where the teacher’s supervised groups, and if the group has indicated their availability is shown.
For the Administrator main page, more functionality and overview has been included, and the function to generate a scheduling report via CSP is indicated and available for use. Please see Figure 7 below:

**Welcome, admin**

[Image: Welcome page of administrator's main page]

Presentation Week Start Date:

2022-01-10

Currently accepting response:

1 Update Settings Remove ALL Scheduling records

**Unselected Teachers:**

hubert thuyen wuc

**Selected Teachers:**

allenauc桤m chenshu ckcheng dlyp cqian giulio hfting jpan kpchan kykwong rbluo twchim ykchoi zhiyi

**Unselected FYP Groups:**

fyp21028 fyp21031 fyp21032 fyp21033 fyp21034 fyp21035 fyp21036 fyp21037 fyp21038 fyp21039 fyp21041 fyp21042 fyp21043 fyp21044 fyp21045 fyp21046 fyp21047 fyp21048 fyp21049 fyp21050 fyp21051 fyp21052 fyp21053 fyp21073

**Selected FYP Groups:**

fyp21028 fyp21031 fyp21032 fyp21033 fyp21034 fyp21035 fyp21036 fyp21037 fyp21038 fyp21039 fyp21041 fyp21042 fyp21043 fyp21044 fyp21045 fyp21046 fyp21047 fyp21048 fyp21049 fyp21050 fyp21051 fyp21052 fyp21062 fyp21073

[Generate Schedule using CSP]

**Figure 7.** A screenshot of the main page of an administrator’s page. The settings are first shown at the top of the page, followed by Teachers' and Students' selection status, and at last, an option to generate a schedule is shown.
First, the administrator will be able to access the system settings. Three settings are currently available: the Start Date of the presentation week, if the System is currently accepting any new responses for scheduling, and to delete all scheduling records. For the start date of presentation week, it can be inputted as a string in the format ‘YYYY-MM-DD’. Once this is changed and saved, all calendars on students’ and teachers’ main page will automatically update to show this week instead. For the accepting new response setting, ‘1’ indicates new response are being accepted, and should be set to ‘0’ once new response is no longer accepted. Lastly, for the deleting all schedules option, this is used to reset the saved schedules for every new presentation week, by removing all records stored in the database. In case someone mis-clicked this option, a confirm function is also added to prevent records wrongly removed.

Next on the page, the list of teachers and students who have, and have not, selected any availability will be shown. This is achieved via accessing the database via SQL query and crosschecking if each existing teacher and FYP group has an entry in the schedule table. If there is no entry, the user will be shown in the ‘unselected’ groups. Oppositely, the user will be displayed in the ‘Selected’ groups. This function is added so that the System administrator can have a border view and control over which users have, or have not, selected the time slot for scheduling purposes.

Lastly, the option to generate a schedule via CSP is available. Once, clicked, the system will generate a schedule using Constraint Satisfaction Programming on the server side, formulate it as a csv (comma separated values) file, and download it to the

FYP Management System
administrator’s computer. A detailed discussion on the use of CSP and output file will be illustrated in subsection 3.3 and 3.4 below.
3.2 Back-end implementation

Currently, the implementation of MySQL database makes use of the Sophia server provided by the CS department at HKU.

To illustrate further, below are a detailed explanation of the different tables in the MySQL database.

The table ‘FypGroupInfo’ are used to store group specific information. It has the following columns:

- groupNum (varchar(10)): The FYP group number in the format fypxxxxx.
- projName (varchar(200)): The project name.
- projDescr (longtext): The project description.
- TchName (varchar(50)): The account name of the Supervisor.
- SexExamName (varchar(50)): The account name of the second examiner.
- Size (int(11)): Numerical value for number of students in the group

The table ‘FypStdLogin’, ‘FypTchLogin’ and ‘FypAdminLogin’ are used to store login information to allow students (as a group), teachers and system administrators to log onto the system. It has the following columns:

- groupNum/TchName/AdminName (varchar(50)): The login ID for the user.
- PW (varchar(50)): The login Password for the user.

The table ‘FypScheduleSelect’ are used to store schedule information for students, teachers and room location. It has the following columns:
- user (varchar(50)): The user who stored this availability

- startStr (varchar(40)): The start time of the availability, in the format of

  ‘YYYY-MM-DDTHH:MM’

- endStr (varchar(40)): The end time of the availability, in the same format

To indicate which group of user (student/teacher/room) the schedule belongs, each row of user is in the format of the following:

- fypxxxxx: This user is an FYP group (Student).

- CB308/CB313/CB328/HW318: This user is a presentation location (Room).

- All others: This user is a supervisor (Teacher).

The table ‘FypSettings’ are used to set up the presentation week, as well as indicate if the system is still accepting responses. It has the following columns:

- AcceptResponse (tinyint(1)): Boolean indicating if the System still accepts response

- StartDate (varchar(15)): Indicates the start date of presentation week in the format “YYYY-MM-DD”
3.3 Constraint Satisfaction Programming

The automated scheduling of the scheduling system is achieved via the use of Constraint Satisfaction Programming (CSP). The development of CSP is based on constraint satisfaction problems, which are mathematical problems defined where in a set of Variables, each value of a variable must satisfy a set of constraints [2,3]. Please see Figure 8 for an example:

In Figure 5, there are three Variables \{A,B,C\}, and for each variable, their respective domains are \{1,2,3\}.

There are three constraints for this problem. Specifically,

\[ A > B \; ; \; A \neq C \; ; \; B \neq C. \]

To solve this problem, one would attempt to find a value in each domain of the variables where all the constraints are satisfied [4,5]. This problem is trivial due to the
small number of variables and domain. One can easily observe that the three solutions of this problem such that all constraints can be satisfied are:

1. \{A=2, B=1, C=3\}  
2. \{A=3, B=1, C=2\}  
3. \{A=3, B=2, C=1\}

With an increased scale operation, such as scheduling presentation time slots for all Computer Science students and supervisors, i.e. increased number of variables, domains and constraints, the problem becomes complex, and requires exponential time to solve. Please see Figure 9 for a graphical illustration.

Figure 9. Illustration of a more complex constraint satisfaction problem regarding time slot scheduling where there are increasing variables and domains.

As seen in Figure 9, with an increased complexity by larger number of domains, variables and constraints, constraint satisfaction problems become increasingly difficult to solve, taking exponential time to resolve with each increment of variables [6]. Therefore, computerised solution such as CSP are used to increase the efficiency of solving these problems [7][8].
3.4 Implementation of CSP in Scheduling System

Based on the function described in 3.1, the frontend interface enables student, teachers as well as system administrators to indicate availability on their, as well as the presentation location’s behalf. I have implemented CSP via the use of PHP on the server side to automatically find suitable time slot for each FYP group, and outputting the generated result in a .csv (comma-separated values) file.

In detail, the variables of this CSP are FYP groups, supervisors and different presentation locations. The domain is considered to be each party’s available schedule for presentation. Constraints established are as follows:

1. Presentation time must be within office hour (0900 - 1800)
2. Presentation time must fit everyone’s schedule, including the FYP group, Supervisor and Second Examiner.
3. Presentation time must fall within the presentation weeks
4. Presentation time should be adjusted with 20 mins per student in the group
5. There must be a location available for the presentation.

In my implementation, two tables are first retrieved from the database. One, the list of FYP group information, including Group Number, Group Size, and the name of Supervisor and Second Examiner is retrieved from the database. Two, the list of schedules indicated by students, teachers, and rooms. The SQL for retrieving the two tables are as shown in Figure 10 below:
I have included a CSP logic which aims to gather groups with the same supervisor/second examiner and arrange these groups into adjacent times lots. This is to facilitate the supervisors to have a more clustered schedule compared to it being more spread out, during the presentation weeks.

In the case where the student and/or teachers did not select any availability in the scheduling system, the system will automatically assume that the user is available across the entire presentation week, and allocate time that best suit the remaining parties’ select times.

Finally, CSP combined with the above logic will generate the final results. The generated result is stored in a results folder on the server side, and will automatically be downloaded to the admin’s computer. The outputted file has the following columns:

The generated result has the following columns:

- Date (of presentation)
- Time (of presentation)
- Group No.: The FYP group number for that group
- Group Members: Number of group members in the group
- Room: Location for presentation
- Supervisor
- Second Examiner
An example of the output csv file is shown below in Figure 11:

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Group No.</th>
<th>Group Members</th>
<th>Room</th>
<th>Supervisor</th>
<th>Second Examiner</th>
</tr>
</thead>
<tbody>
<tr>
<td>2022-01-10</td>
<td>09:00-10:00</td>
<td>fyp21005</td>
<td>3</td>
<td>CB308</td>
<td>hfting</td>
<td>ykchoi</td>
</tr>
<tr>
<td>2022-01-10</td>
<td>09:00-10:20</td>
<td>fyp21031</td>
<td>4</td>
<td>CB313</td>
<td>ckchui</td>
<td>twchim</td>
</tr>
<tr>
<td>2022-01-10</td>
<td>10:00-10:20</td>
<td>fyp21026</td>
<td>1</td>
<td>CB308</td>
<td>allenau</td>
<td>thyuen</td>
</tr>
<tr>
<td>2022-01-10</td>
<td>10:20-10:40</td>
<td>fyp21028</td>
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<td>10:20-11:00</td>
<td>fyp21056</td>
<td>2</td>
<td>CB313</td>
<td>atctam</td>
<td>twchim</td>
</tr>
<tr>
<td>2022-01-10</td>
<td>10:40-11:40</td>
<td>fyp21036</td>
<td>3</td>
<td>CB308</td>
<td>thyuen</td>
<td>allenau</td>
</tr>
<tr>
<td>2022-01-10</td>
<td>11:00-11:40</td>
<td>fyp21002</td>
<td>2</td>
<td>CB313</td>
<td>ykchoi</td>
<td>atctam</td>
</tr>
<tr>
<td>2022-01-10</td>
<td>11:40-12:40</td>
<td>fyp21029</td>
<td>3</td>
<td>CB313</td>
<td>atctam</td>
<td>ykchoi</td>
</tr>
<tr>
<td>2022-01-10</td>
<td>12:40-13:00</td>
<td>fyp21037</td>
<td>1</td>
<td>CB313</td>
<td>ykchoi</td>
<td>kykwong</td>
</tr>
<tr>
<td>2022-01-10</td>
<td>13:00-14:20</td>
<td>fyp21021</td>
<td>4</td>
<td>CB308</td>
<td>twchim</td>
<td>kpchan</td>
</tr>
<tr>
<td>2022-01-10</td>
<td>13:00-13:40</td>
<td>fyp21043</td>
<td>2</td>
<td>CB313</td>
<td>ykchoi</td>
<td>atctam</td>
</tr>
</tbody>
</table>

Figure 11. A Screenshot of a part of the generated schedule file. Each row represents the presentation time of one FYP group.

As shown in the above figure, group presentation time slots are first setup where for each student in the group, 20 minutes of presentation time is allocated. This time setting is set up as per the current presentation configuration. However, the length can also be easily adjusted within the program, in case there is a presentation length change to shorten or lengthen the time per student in the future. Then, the CSP first check the times of which the group, the supervisor, as well as the second examiner are all available.

In the case where the available time selected by the FYP group and the available time selected by the supervisor and second examiner has no overlapping (i.e. There are no possible time for presentation), the CSP will output these groups at the end of the outputted csv file, shown in the following figure:
The results and findings will be further discussed in Section 4.
4 Results

For the purpose of testing the Scheduling System, I have inputted some test scheduling data via the front end of the system. I will use the account ‘fyp21017’ as an example to illustrate below. In **Figure 13**, the main page for schedule selection is shown. For testing purposes, I have selected the group’s availability to be on the whole day of 11th, 12th, and 14th, as shown on **Figure 14**.

![Welcome, fyp21017](image)

**Figure 13.** The main page for user ‘fyp21017’ after log in. It can be seen that the Project Name and Description is shown, as well as a calendar for indicating this group’s availability.
Figure 14. The schedule page for user ‘fyp21017’ after a test schedule has been selected. As shown from the Figure, the whole day of 11th, 12th and 14th was indicated by this user.
I have repeated this random selection process for 42 FYP groups in total, as well as randomly allocate availability for teachers, and presentation locations. All selections were saved successfully to the database, and displayed to that user the next time they log in. As an illustration, Figure 15, 16 and 17 below shows a part of the inputed information into the database for student, teachers and presentation rooms respectively.

![Database result of partial test schedule data for FYP groups.](image)

**Figure 15.** The database result of partial test schedule data for FYP groups.
**Figure 16.** The database result of partial test schedule data for teachers.

```sql
SELECT s.user, s.startStr, s.endStr FROM `fypScheduleSelect` as s, fypChLogin as T WHERE s.user = T.TchName ORDER BY user
```

<table>
<thead>
<tr>
<th>user</th>
<th>startStr</th>
<th>endStr</th>
</tr>
</thead>
<tbody>
<tr>
<td>allenau</td>
<td>2022-01-10T09:00</td>
<td>2022-01-10T12:30</td>
</tr>
<tr>
<td>allenau</td>
<td>2022-01-11T13:00</td>
<td>2022-01-11T18:00</td>
</tr>
<tr>
<td>allenau</td>
<td>2022-01-12T11:00</td>
<td>2022-01-12T15:00</td>
</tr>
<tr>
<td>actam</td>
<td>2022-01-10T09:00</td>
<td>2022-01-10T18:00</td>
</tr>
<tr>
<td>actam</td>
<td>2022-01-11T09:00</td>
<td>2022-01-11T18:00</td>
</tr>
<tr>
<td>actam</td>
<td>2022-01-12T09:00</td>
<td>2022-01-12T15:30</td>
</tr>
<tr>
<td>actam</td>
<td>2022-01-13T09:00</td>
<td>2022-01-13T18:00</td>
</tr>
<tr>
<td>actam</td>
<td>2022-01-14T11:30</td>
<td>2022-01-14T18:00</td>
</tr>
<tr>
<td>chenshu</td>
<td>2022-01-12T09:00</td>
<td>2022-01-12T11:30</td>
</tr>
<tr>
<td>chenshu</td>
<td>2022-01-13T14:30</td>
<td>2022-01-13T18:00</td>
</tr>
<tr>
<td>ckcheng</td>
<td>2022-01-14T09:00</td>
<td>2022-01-14T18:00</td>
</tr>
<tr>
<td>clyip</td>
<td>2022-01-10T09:00</td>
<td>2022-01-10T12:00</td>
</tr>
<tr>
<td>clyip</td>
<td>2022-01-11T12:00</td>
<td>2022-01-11T18:00</td>
</tr>
<tr>
<td>clyip</td>
<td>2022-01-13T09:00</td>
<td>2022-01-13T18:00</td>
</tr>
<tr>
<td>cqian</td>
<td>2022-01-12T09:00</td>
<td>2022-01-12T18:00</td>
</tr>
</tbody>
</table>

**Figure 17.** The database result of test schedule data for presentation locations.

```sql
SELECT * FROM `fypScheduleSelect` WHERE user LIKE 'CB%' or user LIKE 'HW%' ORDER BY user
```

<table>
<thead>
<tr>
<th>user</th>
<th>startStr</th>
<th>endStr</th>
</tr>
</thead>
<tbody>
<tr>
<td>CB308</td>
<td>2022-01-10T09:00</td>
<td>2022-01-10T18:00</td>
</tr>
<tr>
<td>CB308</td>
<td>2022-01-12T09:00</td>
<td>2022-01-12T18:00</td>
</tr>
<tr>
<td>CB308</td>
<td>2022-01-14T09:00</td>
<td>2022-01-14T18:00</td>
</tr>
<tr>
<td>CB313</td>
<td>2022-01-10T09:00</td>
<td>2022-01-10T18:00</td>
</tr>
<tr>
<td>CB313</td>
<td>2022-01-11T09:00</td>
<td>2022-01-11T18:00</td>
</tr>
<tr>
<td>CB313</td>
<td>2022-01-12T09:00</td>
<td>2022-01-12T13:00</td>
</tr>
<tr>
<td>CB328</td>
<td>2022-01-11T09:00</td>
<td>2022-01-11T18:00</td>
</tr>
<tr>
<td>CB328</td>
<td>2022-01-13T09:00</td>
<td>2022-01-13T09:00</td>
</tr>
<tr>
<td>HW318</td>
<td>2022-01-12T13:00</td>
<td>2022-01-12T18:00</td>
</tr>
<tr>
<td>HW318</td>
<td>2022-01-13T09:00</td>
<td>2022-01-13T18:00</td>
</tr>
<tr>
<td>HW318</td>
<td>2022-01-13T09:00</td>
<td>2022-01-13T15:00</td>
</tr>
</tbody>
</table>
Then, I generated a report using the admin portal in the system. The file is automatically downloaded to my computer and ready for use. The outputted file is shown in Figure 18 below.

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Group No.</th>
<th>Group Members</th>
<th>Room</th>
<th>Supervisor</th>
<th>Second Examiner</th>
</tr>
</thead>
<tbody>
<tr>
<td>2022-01-10</td>
<td>09:00-10:00</td>
<td>fyp21005</td>
<td>3 CB308</td>
<td>nting</td>
<td>yikchoi</td>
<td></td>
</tr>
<tr>
<td>2022-01-10</td>
<td>09:00-10:20</td>
<td>fyp21031</td>
<td>4 CB313</td>
<td>cikohui</td>
<td>twohim</td>
<td></td>
</tr>
<tr>
<td>2022-01-10</td>
<td>10:00-10:20</td>
<td>fyp21026</td>
<td>1 CB308</td>
<td>alienau</td>
<td>thuyen</td>
<td></td>
</tr>
<tr>
<td>2022-01-10</td>
<td>10:20-10:40</td>
<td>fyp21028</td>
<td>1 CB308</td>
<td>clyip</td>
<td>yikchoi</td>
<td></td>
</tr>
<tr>
<td>2022-01-10</td>
<td>10:20-11:00</td>
<td>fyp21056</td>
<td>2 CB313</td>
<td>atctam</td>
<td>twohim</td>
<td></td>
</tr>
<tr>
<td>2022-01-10</td>
<td>10:40-11:40</td>
<td>fyp21036</td>
<td>3 CB308</td>
<td>thuyen</td>
<td>alienau</td>
<td></td>
</tr>
<tr>
<td>2022-01-10</td>
<td>11:00-11:40</td>
<td>fyp21032</td>
<td>2 CB313</td>
<td>yikchoi</td>
<td>atctam</td>
<td></td>
</tr>
<tr>
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<td>11:40-12:40</td>
<td>fyp21029</td>
<td>3 CB313</td>
<td>atctam</td>
<td>yikchoi</td>
<td></td>
</tr>
<tr>
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<td>12:40-13:00</td>
<td>fyp21037</td>
<td>1 CB313</td>
<td>yikchoi</td>
<td>kykwmong</td>
<td></td>
</tr>
<tr>
<td>2022-01-10</td>
<td>13:00-14:20</td>
<td>fyp21021</td>
<td>4 CB308</td>
<td>twohim</td>
<td>kphohan</td>
<td></td>
</tr>
<tr>
<td>2022-01-10</td>
<td>13:00-13:40</td>
<td>fyp21043</td>
<td>2 CB313</td>
<td>yikchoi</td>
<td>atctam</td>
<td></td>
</tr>
<tr>
<td>2022-01-10</td>
<td>14:00-14:00</td>
<td>fyp21063</td>
<td>1 CB313</td>
<td>yikchoi</td>
<td>kykwmong</td>
<td></td>
</tr>
<tr>
<td>2022-01-10</td>
<td>14:00-14:40</td>
<td>fyp21003</td>
<td>2 CB313</td>
<td>kykwmong</td>
<td>yikchoi</td>
<td></td>
</tr>
<tr>
<td>2022-01-10</td>
<td>14:20-15:40</td>
<td>fyp21024</td>
<td>4 CB308</td>
<td>twohim</td>
<td>kphohan</td>
<td></td>
</tr>
<tr>
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<td>14:40-15:20</td>
<td>fyp21075</td>
<td>2 CB313</td>
<td>atctam</td>
<td>kykwmong</td>
<td></td>
</tr>
<tr>
<td>2022-01-10</td>
<td>15:40-16:20</td>
<td>fyp21073</td>
<td>2 CB308</td>
<td>kphohan</td>
<td>twohim</td>
<td></td>
</tr>
<tr>
<td>2022-01-11</td>
<td>09:00-09:40</td>
<td>fyp21027</td>
<td>2 CB313</td>
<td>twohim</td>
<td>atctam</td>
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</tr>
<tr>
<td>2022-01-11</td>
<td>12:00-13:20</td>
<td>fyp21030</td>
<td>4 CB313</td>
<td>yikchoi</td>
<td>clyip</td>
<td></td>
</tr>
<tr>
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<td>fyp21009</td>
<td>2 CB308</td>
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<td>twohim</td>
<td></td>
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<td>13:40-14:00</td>
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<td>1 CB308</td>
<td>clyip</td>
<td>kphohan</td>
<td></td>
</tr>
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<td>fyp21016</td>
<td>3 CB328</td>
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<td>atctam</td>
<td></td>
</tr>
<tr>
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<td>14:20-14:40</td>
<td>fyp21017</td>
<td>1 CB313</td>
<td>kphohan</td>
<td>twohim</td>
<td></td>
</tr>
<tr>
<td>2022-01-11</td>
<td>15:00-16:40</td>
<td>fyp21020</td>
<td>2 CB328</td>
<td>clyip</td>
<td>kphohan</td>
<td></td>
</tr>
<tr>
<td>2022-01-11</td>
<td>15:40-16:00</td>
<td>fyp21004</td>
<td>1 CB315</td>
<td>guiluo</td>
<td>czwu</td>
<td></td>
</tr>
<tr>
<td>2022-01-11</td>
<td>15:40-16:00</td>
<td>fyp21051</td>
<td>1 CB328</td>
<td>clyip</td>
<td>kphohan</td>
<td></td>
</tr>
<tr>
<td>2022-01-12</td>
<td>09:00-09:20</td>
<td>fyp21010</td>
<td>1 CB308</td>
<td>zhiji</td>
<td>hubert</td>
<td></td>
</tr>
<tr>
<td>2022-01-12</td>
<td>09:00-09:40</td>
<td>fyp21014</td>
<td>2 CB313</td>
<td>twohim</td>
<td>kphohan</td>
<td></td>
</tr>
<tr>
<td>2022-01-12</td>
<td>09:20-09:40</td>
<td>fyp21048</td>
<td>1 CB308</td>
<td>zhiji</td>
<td>hubert</td>
<td></td>
</tr>
<tr>
<td>2022-01-12</td>
<td>10:00-11:00</td>
<td>fyp21022</td>
<td>3 CB308</td>
<td>kphohan</td>
<td>twohim</td>
<td></td>
</tr>
<tr>
<td>2022-01-12</td>
<td>11:00-12:00</td>
<td>fyp21006</td>
<td>3 CB308</td>
<td>alienau</td>
<td>thuyen</td>
<td></td>
</tr>
<tr>
<td>2022-01-12</td>
<td>11:40-12:00</td>
<td>fyp21018</td>
<td>1 CB313</td>
<td>kykwmong</td>
<td>yikchoi</td>
<td></td>
</tr>
<tr>
<td>2022-01-12</td>
<td>12:00-12:40</td>
<td>fyp21023</td>
<td>2 CB308</td>
<td>thuyen</td>
<td>alienau</td>
<td></td>
</tr>
<tr>
<td>2022-01-12</td>
<td>12:40-13:20</td>
<td>fyp21025</td>
<td>2 CB308</td>
<td>alienau</td>
<td>thuyen</td>
<td></td>
</tr>
<tr>
<td>2022-01-13</td>
<td>10:00-10:40</td>
<td>fyp21007</td>
<td>2 HNG318</td>
<td>atctam</td>
<td>twohim</td>
<td></td>
</tr>
<tr>
<td>2022-01-13</td>
<td>10:40-11:20</td>
<td>fyp21013</td>
<td>2 HNG318</td>
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<td>hamming</td>
<td></td>
</tr>
<tr>
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<td>11:20-11:40</td>
<td>fyp21040</td>
<td>1 HNG318</td>
<td>clyip</td>
<td>rbluo</td>
<td></td>
</tr>
<tr>
<td>2022-01-14</td>
<td>09:00-11:20</td>
<td>fyp21062</td>
<td>7 CB308</td>
<td>cikoheng</td>
<td>chuang</td>
<td></td>
</tr>
<tr>
<td>2022-01-14</td>
<td>12:00-13:40</td>
<td>fyp21008</td>
<td>5 CB308</td>
<td>cikoheng</td>
<td>chuang</td>
<td></td>
</tr>
<tr>
<td>2022-01-14</td>
<td>13:40-14:20</td>
<td>fyp21019</td>
<td>2 CB308</td>
<td>kykwmong</td>
<td>yikchoi</td>
<td></td>
</tr>
<tr>
<td>Not Satisfied</td>
<td>Time Not Match</td>
<td>fyp21012</td>
<td>2 chenshu</td>
<td>jian</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Satisfied</td>
<td>Time Not Match</td>
<td>fyp21015</td>
<td>1 caian</td>
<td>chenshu</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Satisfied</td>
<td>Time Not Match</td>
<td>fyp21011</td>
<td>2 jian</td>
<td>chenshu</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 18. The entire CSP generated output file for 43 FYP groups.
To better explain the output results, the algorithm look for other groups which are of the same supervisor or second examiner, and attempts to arrange them in a clustered manner. As seen in Figure 18, on the first day, instructor ‘atctam’ has a presentation at 10:20 - 11:00 (fyp21056), followed by presentation at 11:00 - 11:40 (fyp21002), then presentation at 11:40 - 12:40 (fyp21029), lastly at 13:00 - 13:40 before a break. Similarly, for instructor ‘ykchoi’, the first presentation is at 09:00 - 10:00 (fyp21005), followed by presentation at 10:20 - 10:40 (fyp21028), then at 11:00 - 11:40 (fyp21002), followed by 11:40 - 12:40 (fyp21029). To ensure the instructor’s time is efficiently allocated, the presentation at 12:40 - 13:00 (fyp21037), and lastly at 13:00 - 13:40 (fyp21043) is followed.

For crosschecking of the groups that has no allocated time, I will illustrate with group ‘fyp21011’ and group ‘fyp21015’ below. First, the sample schedule data I have inputted into the SQL database for group ‘fyp21011’, the supervisor ‘jpan’ and the second examiner ‘chenshu’ is indicated in Figure X below:

![Figure 19. The database query for schedule of group ‘fyp21011’, supervisor ‘jpan’ and second examiner ‘chenshu’. It can be seen that there’s no overlapping (i.e. available) time for all 3 parties.](image-url)
From Figure 19, it can be seen that since the teachers are available at 11th - 14th, while the group of students is only available on 10th, there are no possible time for the presentation to occur. Therefore the ‘Date not satisfied’ result in the outputted file.

A slightly more complicated example is the group ‘fyp21015’. Their selected available times are shown in Figure 20 below. It is seen that the only overlapping date for the FYP group, the supervisor and the second examiner is on the 12th. Although instructor ‘cqian’ is available the whole day, instructor ‘chenshu’ is available only in the morning while the FYP group is only available in the afternoon. Therefore, there are no available times for presentation under the current schedule selection.

![Database Query](image)

**Figure 20.** The database query for schedule of group ‘fyp21015’, supervisor ‘cqian’ and second examiner ‘chenshu’. It can be seen that there's no overlapping (i.e. available) time for all 3 parties.

To summarise, the system works well as per expected. The front-end was able to handle login, register of presentation availability as well as display relevant information without any obstacles. The back-end PHP logic and MySQL database was set up correctly.
to support the information display on the front-end, as well as provide accurate and efficient presentation time slot scheduling via CSP.
5 Conclusion

The “FYP Management System” final year project has been completed. Vast development has been made in terms of both front-end and back-end to provide an efficient and stable solution of scheduling presentation time slots.

To summarise, the idea of this FYP is based on the lacking of scheduling functionality in the current FYP system, which results in large amount of time consumed in the back-and-forth email exchanges between FYP supervisors and students, as well as during the manual organising of presentation schedules by FYP administrators.

With the use of Constraint Satisfaction Programming combined with Web API implementation of HTML, CSS, JS, PHP and MySQL, a Scheduling system is created and can be readily added to the current FYP management system, which enables supervisors and students to easily indicate their time availabilities. Then, the system administrator can generate time schedules for all FYP groups, with the availability of supervisor and second examiner considered, with a press of a button on the admin portal.

The solution created greatly reduces the time required for generating presentation schedule, and the email exchange between students and teachers in regard of presentation time scheduling can be eliminated.
References


