Analysis

Background to and identification of problem

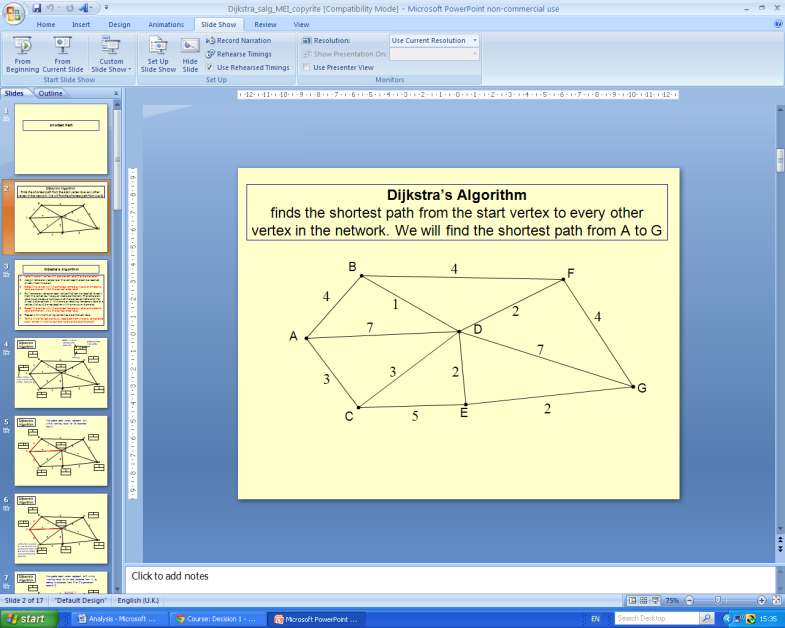
There are three main problems that I will need to solve with this program; they are that students can’t get access to subjects because of timetable problems, but my program will enable students to revise and study D1 on their own without needing to go to lessons. Also students like interactive learning, however there is no existing solution to this, therefore my program will enable students to do interactive learning and will therefore become the solution to this problem. The last main problem is that revision guides and textbooks take a long time to absorb, therefore my program will take a short time to use and be enjoyable to use, thereby making it easier for students who have little time and those who are revising for many exams to revise the module. Other less important problems that are needed to be solved by the proposed system are that it is difficult to completely understand, follow and implement a whole algorithm just by reading the steps involved as practise of doing them is needed along with this. Therefore my program will allow others to practise and be taught how to do the three algorithms. However the program is best used in conjunction with the explanations of the algorithms in the textbook and revision guides.

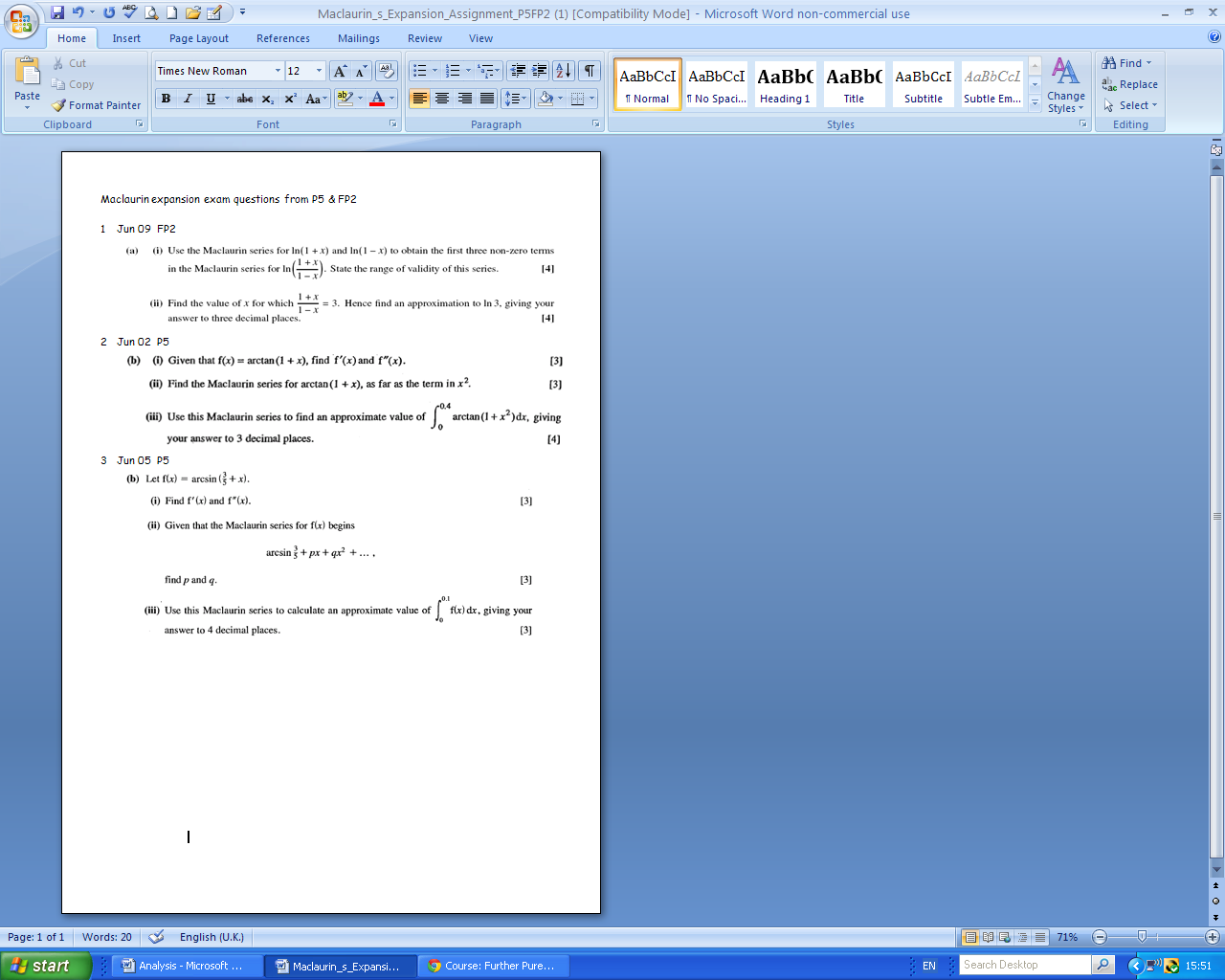
Description of the current system

The current system of teaching pupils D1 is that of a textbook and/or revision guide, therefore making the current system entirely paper based. These two books contain worked solutions to questions along with the theory needed to solve them, questions for them to try and solutions to these questions. The textbook has more in depth theory and questions than the revision guides, however revision guides are easier to read and teach you how to answer the questions in a more interactive and interesting way. The textbook is intended to be used alongside the MEI Integral site which contains resources to aid learning examples of questions; questions; solutions to questions; and past exam papers for each module. The teacher gives out assignments and worksheets along with resources to aid learning, such as PowerPoints and solutions to questions which can be accessed by the student through Yeovil College’s Moodle. Examples of an assignment and PowerPoint that the teacher uploads to Moodle for students to access are shown below:

This PowerPoint helps students by showing the run of Dijkstras and going through it step by step.

This is a PowerPoint which helps students to perform Dijkstras algorithm on a network.

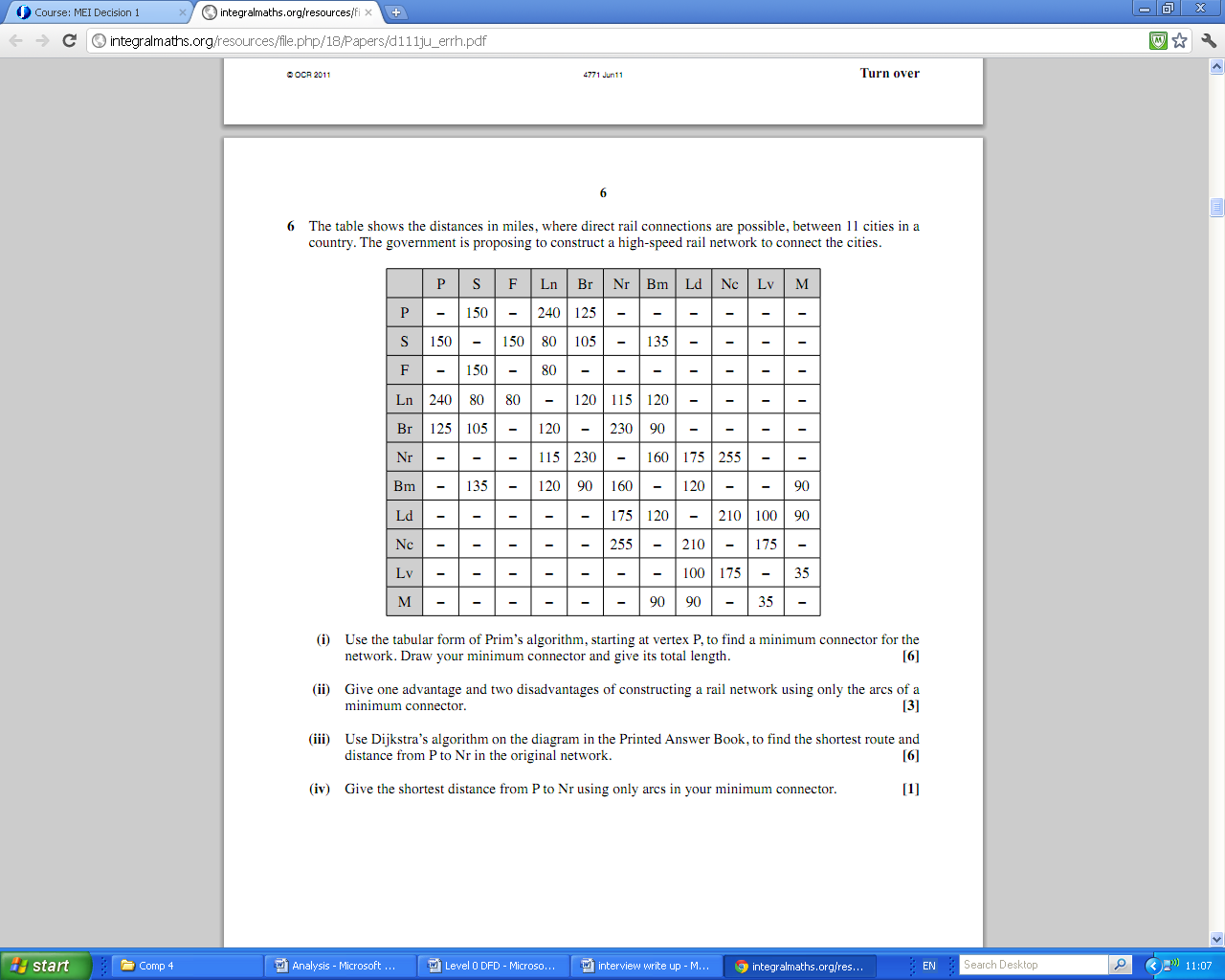




This is an assignment which is used to test people on Maclaurin’s expansion in the FP2 module. The questions are taken from past exam papers which contain similar questions to those that will be faced by the student in the exam. The students answer the questions for homework and it is then marked by the teacher, who will go through the answers, provide feedback and give a mark which will be recorded for future reference.

This assignment helps the student by allowing them to practise doing exam questions, which will build on their understanding and knowledge of the topic.

The end of the system for the student comes once they have finished the D1 exam and achieved the grade they wanted, therefore not needing to be taught D1 again unless they decide to retake the exam. An example of questions in a D1 exam paper is shown below:



This is Q6 of the D1 paper given to students in June 11. This question is about Prim’s and Dijkstra’s algorithm and asks to perform Prim’s on a table and Dijkstra’s on a network in the answer book. My program will help the students to answer the question on Dijkstra’s algorithm.

Identification of the prospective users

The prospective users of the new system are the same as the old system, these are AS and A Level Mathematics and Further Mathematics students and teachers. However I can update the program so that it covers more of the D1 syllabus, thereby also allowing it to be used by AS and A Level Computing students and teachers. I can replicate my program to cover more Mathematics modules and therefore increase the number of prospective users.

Identification of user needs and acceptable limitations

Interview:

Below is the interview that I had with my end user; this shows the questions I asked him and the answers he gave. However this interview has been adapted from the original copy after further discussions with my end user, the original copy is in my appendices section.

Analyst Name: John Every End User Name: Andrew Bradley

1. What is the current system?

The current system of teaching D1 is that of the D1 revision guide, the D1 textbook, the D1 Moodle resources, the MEI Integral site and the teacher that teaches the students D1. The teacher provides questions for students to answer usually through Moodle or from the textbook or the MEI Integral site.

1. What do you think is good about the current system and why?

The textbooks and revision guides have a lot of detail and contain all the information needed for the exam. They also enable students to study and revise on their own. Students can ask teachers specific questions to obtain answers when they are stuck; this makes the teacher informative and a source of information.

1. What do you think is wrong with the current system and why?

It’s not very interesting for students because it takes a long time to absorb the information and can therefore be quite tedious. Also neither the textbook or the revision guide are very interactive or engaging, however a large amount of students like interactive learning therefore these books will not appeal to those students. Revision guides and textbooks are not suitable for students studying on their own for the first time because they are difficult to understand without any teaching of the subject prior to self study.

1. What data is recorded in the current system?

The marks for assignments are recorded to show the teacher the progress the student has made, however this is not a fundamental part of the current system.

1. What processes or functions are performed in the current system?

There are processes and functions performed by the MEI Integral site to bring up pages and generate outputs using their interactive resources. Also when the files and documents are uploaded to Moodle for students to access, processes and functions are used to do this. However, these are not major processes or functions as they don’t directly impact on the current system.

1. What are the inputs to the current system?

The inputs to the current system are from the teacher the demonstrations on the board, talking about the topic and therefore giving the students knowledge, going through examples of questions on the board, giving out worksheets and assignments to the students, marking questions and assignments completed by the student, they provide solutions to past exam papers by working through them step by step and give verification to students about whether they answered a question correct in class. The inputs to the current system from the student are that they answer the questions asked by the teacher, they complete assignments and worksheets given to them by the teacher and they complete past exam papers given to them by the teacher.

1. What are the outputs of the current system?

The outputs of the current system to the teacher are that they receive completed worksheets and assignments from the students in preparation for marking, they receive completed past exam papers done by the student and they answer questions from the student in class. The outputs of the current system to the student are that they receive marked worksheets and assignments that they have completed which contain feedback from the teacher on how to improve, they receive solutions to past exam papers that they have completed which contain feedback from the teacher on how to improve and they receive the acknowledgement of the answer to the question asked by the teacher. They receive knowledge from demonstrations and examples performed by the teacher, they receive worksheets and assignments for them to complete and they receive questions to answer in class.

1. What computing resources do you possess?

Yeovil College’s PCs with internet access, Windows XP, Moodle (the college’s learning environment), Visual Basic.Net 2010 and the college also has memory sticks and CDs to save work onto to access at college when they need to.

1. How are exceptions and errors handled in the current system?

They are not as there is no existing computer based system.

1. Do you have any possible solutions in mind to the problem?

The solution to the problem that Andy and I have both decided upon is that of a D1 teaching program that teaches and allows students to practise doing Kruskal’s algorithm, Prim’s algorithm network form, Prim’s algorithm tabular form and Dijkstra’s algorithm. The program will produce an interactive picture of the network which shows the weights of arcs, nodes and other features needed to perform each algorithm. When doing Prim’s algorithm tabular form the program will produce a picture of the table which contains the arc weights of routes between each node. The program will then perform each stage of the algorithm; it will then move on to the next stage after the user has clicked on the correct arc. If the user clicks on the wrong arc then the program will produce a hint which refers to the algorithm.

1. What do you want the proposed system to do and why?

The proposed system must be interactive because a lot of students like interactive learning. The program must enable students to self study without them having to go to lessons because students can’t access D1 because of timetable clashes. It must teach students about all three of the algorithms and allow them to practise running them on their own as well. This is because these three algorithms are a fundamental part of the D1 module and must be practised thoroughly to allow students to achieve good grades in the exam. It must take a short time to use and be enjoyable, thereby allowing students with less time on their hands to absorb a lot of information. The program must generate and run each algorithm on the network or table where one option for each algorithm allows you to run the algorithm through without the user needing to click on an arc or vertex, but instead presses the enter key to move on to the next stage or the back space key to go back a stage. The second option for each algorithm requires the user to click onto an arc or vertex to move onto the next stage. The program must record and display each person’s time it took to complete the timed run of each algorithm, rank and forename. The program will ask the user to enter their forename after finishing the timed run of the algorithm. After the user has entered their forename and pressed the OK button it will take them back to the main menu which is shown below and generate the student’s rank in the leader board. The timer must be displayed on the screen when the user does a timed run of an algorithm. When arcs or vertices or a table box are chosen by the user are correct they will turn red to indicate that the arc has already been chosen (Prim’s algorithm network form and Kruskals algorithm)and the table box has already been chosen and that the vertex has already been made permanent (Dijkstras algorithm). When the user has chosen the correct arc or vertex or arc weight the program will immediately do the next stage of the algorithm and display what has been performed to the network or table, turn the arc or vertex or table box red and then tell the user to click another arc, vertex or table box this will then allow for as little time as possible to be lost so that it doesn’t affect the final time to run the algorithm. When the program performs a run of an algorithm it will be slower so that it can show the user each step as clearly as possible, so that they can learn to do all the working out in preparation for the exam and to prepare them for the timed run of the algorithm. Also the same network or table with the same arc weights and vertices will be used each time the user chooses to run an algorithm, however the timed run of each algorithm will have the same shaped network and vertices or the same table, but different arc weights will be randomly assigned to each arc of the network or table to prevent students from already knowing which arcs or table boxes to choose. The program must produce a set menu when it is started, this must display 10 choices these being:

1. Run of Kruskal’s algorithm
2. Run of Prim’s algorithm network form
3. Run of Prim’s algorithm tabular from
4. Run of Dijkstra’s algorithm
5. Timed run of Kruskal’s algorithm
6. Timed run of Prim’s algorithm network form
7. Timed run of Prim’s algorithm tabular form
8. Timed run of Dijkstra’s algorithm
9. Times taken to complete each timed run of an algorithm
10. Quit

The program must be able to be used on any ones computer without any specialist software and must be able to be used through Moodle and must be able to be saved and used on a memory stick and CD. Also Timed Runs of an algorithm must display a timer which gives the user a 20 second countdown, where when it reaches zero it will start the timer from 0 seconds to work out the time taken to complete the timed run of the algorithm. This gives the user a chance to read the question. When option 9 is chosen four boxes will be shown which will display some of the times and student forenames achieved during timed runs of algorithms along with the students rank in the leader board, each box will contain a different set of stored data for each algorithm. All of the times can be seen by using the vertical and horizontal scroll bars.

1. What data do you want to be recorded by the proposed system, how will it be stored and how will it be updated?

Record the time it takes each user to complete each timed run of an algorithm and store all the times in a file so that they can be shown or accessed without having to start the program. When storing the times they must be stored with the forename of the person who achieves the time. Also all the times must be stored in order starting with the quickest time achieved for completing the algorithm and inputting the rest downwards. It must store all of the times for timed runs of each algorithm in different files therefore there is only the times achieved for Kruskal’s in one file, times for Prim’s network form in another, times for Prim’s tabular form in another and times for Dijkstras in another. This is to make the times easier to find, easier to update and maintain and easier to code. This will be updated by accessing the notepad file that the timed runs for each algorithm are contained and saved into, which can be added to or changed, however for these updates to remain the save button must be pressed in the file. The files for the timed runs of each algorithm will be contained in the code files for the proposed system, so that it is easier to find and code for. The times and forenames will be stored like this example: “1. John , 00:00:00” where the number denotes the rank in the leader board of the times.

1. What processes or functions are to be performed by the proposed system and why?

The proposed system will be programmed to perform three algorithms where Kruskal’s algorithm and Prim’s algorithm network form are used to find the minimum connector of the network, the Prim’s algorithm tabular form is used to find the minimum connector of a network using a table which contains routes between each vertex and there corresponding arc weights and Dijkstras algorithm is used to find the shortest path between two vertices in a network. The program measures the time taken for a student to complete a timed run of each algorithm and then stores it in a file, to make it easier to access.

1. What inputs will be required by the proposed system?

The inputs to the proposed system will be the same as the current system with others needed for my program because this proposed system will be able to be used alongside the current system and not replace it. A mouse click is required to choose which option to go into on the starting menu and to activate the help button on the runs and timed runs the algorithms. Timed runs of the algorithm require a mouse click on the correct arc for Kruskal’s and Prim’s algorithm network form for the program to run the next stage. It also requires a mouse click on the correct vertex that is needed to be made permanent for Dijkstra’s algorithm, A click on the correct arc weight in the table for Prim’s algorithm tabular form and a press of the return key is required to allow the program to perform the next stage of the algorithm when doing runs of an algorithm. Also letter keys are needed to be pressed in order for the user to enter their name upon completion of a timed run of an algorithm.

1. What outputs will be required from the proposed system?

The outputs of the proposed system will be the same as the current system with others needed for my program because this proposed system will be able to be used alongside the current system and not replace it. On timed runs of the algorithms the program will output images of the network or table as the algorithm is performed and will allow users to click on the arcs or vertices or arc weights. Also when the user hovers over an arc or vertex or table box (depending on the algorithm being run) it turns the colour red and when the cursor is moved away it turns back to the original colour. It will then produce notification of whether the user’s choice of arc is correct or incorrect. When correct the program will then display the next stage of the algorithm or stop depending on what stage of the algorithm the user is at, and the vertex or arc that was correct turns red to indicate to the user that it has already been chosen. When incorrect the program outputs a hint which is based on the algorithm. Also there will be a help button which displays the stages of the algorithm when clicked. During a timed run of an algorithm a clock which displays from -20 seconds to 0 and beyond will be displayed so that the user knows how long he has taken so far. Also from -20 seconds to 0 seconds the timer will be red and beyond 0 seconds be green. Also before 0 seconds the network, question, quit button and the help button will be shown but as soon as the time gets to 0 seconds the arc weights will appear along with a statement which tells the user to choose an arc, vertex or table box. The system will output an error message if any forename entered can’t be stored as a string, has spaces or contains no characters. It will say “This is an invalid forename because either an invalid character has been entered or it contains no characters. Can you please enter your forename again?” It will also display the set menu when the program is started, when the quit button is pressed while running one of the choices, once a run of an algorithm has been completed or a timed run has been completed and the user has entered their forename.

1. Do you have any computing resources that I can use to help me make the proposed system?

Various software programs such as VB.Net 2010, Greenfoot, Netbeans and Microsoft Office 2010. The college has internet access on all college computers, laptops and Netbooks, my home computer also has internet access. I can also get hold of memory sticks, CD’s and general help from the IT department and staff at Yeovil College.

1. Are you prepared to purchase software or hardware resources? If not why?

Yes, however it is Yeovil College who are prepared to purchase hardware and software resources not my end user. This is because they are going to upgrade the computers, upgrade Yeovil Colleges Moodle and their operating systems will be upgraded regularly.

1. Does the proposed system require any security?

Yes, it must only record student’s forenames to protect their identity and only let teachers and students being taught D1 see the times of the users, this will be made easier if the program can be accessed through the D1 Moodle page, so that only participants of this course can access the program. This prevents people who don’t do Maths and don’t go to Yeovil College from accessing my program.

1. What errors and exceptions should be recorded in the proposed system and how?

None, because it isn’t important to the end user, therefore they will not need to be recorded.

1. Are there any working constraints like time, cost, hardware and software?

I am bounded by the hardware and software resources of the College and my parents. Time: The end user would like the system to be operational by Easter to give those studying for summer exams in D1 something else to help them revise. Cost: I am bounded by the college’s funds; however my system shouldn’t require any extra money to make.

1. What products and equipment are needed to produce the solution to the problem?

I will need a computer with an installed Visual Basic.Net 2010 software program, internet access which allows me to access Yeovil College’s Moodle. I will also need a D1 textbook and revision guide to help code the algorithms and decide what the user is to do for the timed runs of the algorithm.

1. What process requirements are needed to produce the solution to the problem?

The user must be able to use the program through Moodle and be able to access the user manual on Moodle. Also the program must allow users to run through each algorithm on their own and allow users to do timed runs of each algorithm, so that they can see their progress and whether they are doing a quick enough time for the exam.

1. Who do you think this proposed system will help and how?

This program can help anyone who is covering these algorithms which are part of the D1 syllabus, for example AS and A-Level Mathematics and Further Mathematics students and teachers. This program will help students because the knowledge of the three algorithms is needed to pass the exam of both of these subjects (depending on which of the two subjects the students takes D1 in) by giving them essential information. Also this program will be able to be updated to include more of the D1 syllabus such as graphs, simulations, algorithms, linear programming, critical path analysis and more on networks. The graphs, simulations and algorithm updates would allow my program to be used by A- Level Computing students for their COMP 3 exam. This increases the range of prospective users and increases the time spent using the program by them. Also my program could be replicated so that I can cover more Maths modules with different programs for C1, FP1 etc, thereby increasing the amount of prospective users.

Observation:

The observation of the current system showed to me that the teacher teaches the students together using a whiteboard or interactive board to allow those who are visual learners to learn better. Also the teacher talks through what he is writing on the board usually by writing an example of a typical question on the board to aid understanding of the topic, this also helps auditory learners to learn better. Then the teacher sets questions for the students to try so that they can learn how to do the questions by themselves, this helps kinaesthetic learners to learn better. While the students are doing this the teacher will usually help the student when they get stuck, so that they can learn how to do the questions. Then the student will be asked to complete the questions for homework or if no questions were set then the teacher would tell them to do questions from the textbook or worksheets obtained from the teacher. I also noticed that the current methods of teaching D1 is different depending on which teacher is teaching it, for example Andy Bradley tends to give out assignments to test knowledge and just give the students questions from the textbook, however another Maths teacher tends to use the MEI Integral site and the Moodle resources more than the textbook by giving out additional exercise printouts made by MEI to test students knowledge and help them learn. Also teachers tend to look beyond what is in the syllabus and also teach students the ideas and theories behind it and how it is used in every day life. This shows to me that the teacher is needed by the student to gain a full grasp of the topic; therefore my program will be able to be used alongside the teacher and be able to be used by the teacher.

Analysis of existing paperwork:

The existing paper work of the current system includes PowerPoint printouts and assignments from Moodle, past exam papers and additional exercise printouts from the MEI Integral side, exam paper solutions on Yeovil College Moodle, the D1 textbook and the D1 revision guides. Therefore most of the paperwork in the current system is either made by the teacher or MEI, this paperwork is then inputted into the current system and is output to the student to learn and study from. An example of a D1 past exam paper is contained in the appendices section of my report. The PowerPoint’s are used to put across complex ideas in a more interactive way, however they only require the user to press buttons and not input answers, therefore they could be more interactive. The printouts contain questions and study notes from the PowerPoint to be used as a study tool. Assignments along with the additional exercise printouts allow students to practise working through exam type questions in preparation for the exam and are then marked by the teacher, where the mark and feedback is given. This is a great way to practise exam type questions and get some help on how to improve, if there is a problem with this it is that your allowed as much time as you want on them which is not like the exam. At home the best way to revise is to do past exam papers while keeping to the time limit or working through them, however knowledge is needed first before doing the past exam papers and for them to get the best out of it they need to mark them using the solutions and go through the step by step methods, so that they know what they are doing correctly. You also need to try the questions you got wrong the first time again so that you can master these types of questions. The D1 textbook and the D1 revision guide are not very interactive or enjoyable which makes those students who take D1 not use them as they don’t think they are important. However they are important as they contain all the information they need for the exam and contain a lot of different types of questions, thereby preparing them for unexpected questions in the exam. It is also a great way to consolidate what they have done in class and builds upon it by giving more questions to try and introducing new ways of doing it.

Questionnaire:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Results of the Student Questionnaire on the current system of teaching D1 | | | | | | | | |
|  |  |  |  |  |  |  |  |  |
| 1. In your opinion which is the most useful resource in the current system? | | | | | |  |  |  |
|  |  |  |  |  |  |  |  |  |
| The D1 textbook | | 1 |  |  |  |  |  |  |
| The D1 revision guide | | 1 |  |  |  |  |  |  |
| The D1 Moodle resources | | 0 |  |  |  |  |  |  |
| The MEI Integral site | | 1 |  |  |  |  |  |  |
| Andy Bradley (Teacher) | | 2 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| 2. Why? |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| It’s interactive | | 1 |  |  |  |  |  |  |
| It’s informative | | 3 |  |  |  |  |  |  |
| It’s enjoyable and engaging | | 1 |  |  |  |  |  |  |
| It enables me to study on my own | | 3 |  |  |  |  |  |  |
| It can be used in bite size chunks | | 3 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| 3. In your opinion which is the least useful resource in the current system? | | | | |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| The D1 textbook | | 0 |  |  |  |  |  |  |
| The D1 revision guide | | 1 |  |  |  |  |  |  |
| The D1 Moodle resources | | 1 |  |  |  |  |  |  |
| The MEI Integral site | | 3 |  |  |  |  |  |  |
| Andy Bradley (Teacher) | | 0 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| 4. Why? |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| It’s not interactive | | 3 |  |  |  |  |  |  |
| It’s not informative | | 0 |  |  |  |  |  |  |
| It’s not enjoyable and engaging/ Boring and confusing | | 3 |  |  |  |  |  |  |
| It doesn’t enable me to study on my own | | 0 |  |  |  |  |  |  |
| It can’t be used in bite size chunks | | 1 |  |  |  |  |  |  |
| I didn't buy it | | 1 |  |  |  |  |  |  |
| I didn't use it | | 2 |  |  |  |  |  |  |
|  | |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| 5. Do you think that a new computer based system will help prospective students with their studies of D1? | | | | | | | | |
|  |  |  |  |  |  |  |  |  |
| Yes |  | 3 |  |  |  |  |  |  |
| No |  | 0 |  |  |  |  |  |  |
| Maybe/Not Sure | | 2 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| 6. What would you like the proposed system to do to help prospective students study for D1? | | | | | | | |  |
|  |  |  |  |  |  |  |  |  |
| Be interactive | | 4 |  |  |  |  |  |  |
| Be informative | | 5 |  |  |  |  |  |  |
| Enable them to study on their own | | 3 |  |  |  |  |  |  |
| Be enjoyable and engaging | | 3 |  |  |  |  |  |  |
| Be able to use in bite size chunks | | 5 |  |  |  |  |  |  |
| Progress tests | | 2 |  |  |  |  |  |  |
| Games |  | 4 |  |  |  |  |  |  |
| Gives rewards like medals | | 1 |  |  |  |  |  |  |

Comments from participants:

5. The two that answered not sure/maybe said this because for them a choice about yes or no depended on how the new resource will turn out with the view that if it is the same as the current resources then they would have answered no, but if it was more interactive and interesting than the current resources then they would have answered yes.

6. Two of the participants who wanted games said that they wanted games that were fun and engaging but also teaches the student.

Analysis of Questionnaire:

My Questionnaire shows that students who experienced the current system of D1 want a new computer based system as long as it is different and better than the current system. Below is a summary of the analysis of each question which will also state what I will change and what I will keep the same with my proposed system.

1. This question showed that most students believe Andy Bradley (the teacher) is the most useful resource and the other resources like the D1 textbook, the D1 revision guide and the MEI Integral site were also chosen as being a most useful resource for someone. However the D1 Moodle resources were chosen as no ones most useful resources therefore it may need improving for it to become useful. To conclude the answers to this question have showed me that it is best to base my program on what Andy Bradley wants it to do. Also making my program be able to be used alongside the textbook and revision guide will be kept the same. Upon seeing these results I would like to make sure that my program can be accessed from the D1 Moodle resources thereby improving the usefulness of it and this improves the security of my program. I will change my program ideas so that my program can be used alongside the MEI integral site as 1 in 5 students believe it to be a useful resource and it will be easy to implement.

2. This question showed that most students believe that a useful resource is made useful if it’s informative; it enables them to study on their own and can be used in bite sized chunks. However most students didn’t say their most useful resource was interactive or enjoyable and engaging, suggesting that they are less interested in whether a resource has these qualities and instead find it more important that it teaches you the information you need for the exam. To conclude the students answers showed me that more students are interested in whether a resource is informative, can enable them to study on their own and can be used in bite sized chunks. Therefore my program will be made with this in mind; however the interactive and enjoyable and engaging options can not be completely left out of my program as there isn’t enough evidence to suggest that they are not important.

3. This question showed that the vast majority of students think that the MEI Integral site is the least useful resource and that some students believed the D1 Moodle resources and the D1 revision guide are not very useful resources. Also no one thought that Andy Bradley (the teacher) or the D1 textbook was the least useful resource therefore my program will definitely be based around Andy’s specifications and the D1 textbook which will be able to be used in conjunction with my program. To conclude my program will not be based around or be able to be used in conjunction with the MEI Integral site very much because in reference to (1.), the site is considered a useful resource by some students even though one person said it was the most useful resource but in this case 3 people said it was the least, therefore this conclusion has been proved incorrect.

4. This question showed that the majority chose their least useful resource because it wasn’t interactive, enjoyable or engaging/boring and confusing and that they had the resource but didn’t use it. This contradicts the conclusions I made in (2.) because in this question it showed that not very many students thought it was important for the resource to be interactive or enjoyable and engaging, but this suggests the opposite therefore these two qualities are clearly important. Also because a lot of students said they did not use their least useful resource, therefore I need to attract people to my program so that students will want to use it. I have decided that to do this I need to make my program interactive and enjoyable and engaging because it will make it more useful to students. Again the results contradicted that in (2.) because it showed that students thought that a resource that was informative, enables students to study on their own and can be used in bite sized chunks is most important to whether a resource is useful, but in this question no one said “it’s not informative” or “It doesn’t enable me to study on my own”. This suggests to me that for a resource to be bad then it isn’t enjoyable or interactive, however to make it a useful resource it must have a mixture of all the different qualities I have mentioned. Also not many said “It can’t be used in bite sized chunks” or “didn’t buy it” suggesting that most of the resources can be used in bite sized chunks, however the least useful ones are less interactive therefore my program will be informative and interactive but not just one. Also those who didn’t buy the resource suggests to me that they didn’t buy it because it was either too expensive or it didn’t have any of the qualities I have mentioned, therefore my program will be free and easy to use, so that everyone can use.

5. The majority of students answered “Yes” to this question, therefore they want a new computer based system to replace the current system. However two students answered “Maybe/Not Sure” because they were unsure about how the proposed system would come out as and were thinking that if the program was the same as the resources currently available they wouldn’t want it. This shows that these two students don’t think the current system is that great and that something fresh and new would be better. Therefore I have decided that I will make something different to what is already on offer; however I will make sure this new program can still be used alongside the current system so that the current system is still useful and it will appeal to fans of the current system.

6. The vast majority of students said that they want the proposed systems to have Games, be interactive, be informative, be able to be used in bite sized chunks, be enjoyable and engaging and allow students to study on their own. Meaning as I mentioned before five of these are very important qualities and will be incorporated into my program and this has therefore confirmed that decision. I will include games because a lot of the students wanted this, however the games will be educational. The game may not be an actual game but instead be a mixture of a test and a game which develops competition between students. Not many people wanted progress tests; however I believe they are important because the teacher gives out progress tests (assignments) to see where students are. Therefore I will make my program record student’s data so that teachers can see how they are getting on with a topic. Also medals or some other award may be given to students who do particularly well but seeing that the interest for this is low then it is not that important for me to put it into my program, although it may give students something to aim for therefore it may be mentioned later for an improvement to my program.

Other acceptable Limitations:

* I am aiming to do four types of algorithms, however depending on how long they take to code it may reduce to two or three types of algorithms. Because the end user hasn’t deemed it necessary for the program to contain all the four types of algorithms, however he does want it to have all four.
* The timed run of an algorithm may have to have a button which says start, to start the timer and make the arc weights appear instead of a 20 second countdown from -20 to 0 and beyond to reduce confusion and make it easier to do.

Data source and destinations

Data Flow Diagrams (existing and proposed system) to Level 1:

Current system Level 0

Student

1

System

The current system of teaching D1.

Teacher

* Knowledge from demonstrations and examples performed by the teacher.
* Worksheets and assignments to complete.
* Questions to answer.
* Demonstrations.
* Writing examples on the board.
* Worksheets and assignments.
* Questions.
* Completed worksheets and assignments.
* Completed past exam papers.
* Answer to question from student.
* Answers to questions.
* Completes assignments and worksheets.
* Completes past exam paper.
* Marks worksheets and assignments.
* Solutions to past exam papers.
* Verification on whether an answer is correct.
* Marked worksheets and assignments.
* Solutions to past exam papers.
* Acknowledgement of answer to question.

Proposed system Level 0

Student

1

System

My D1 teaching program

* Menu choice.
* Mouse click on choice of vertex, arc or table box for timed runs.
* Enter key is needed to be pressed for the algorithm to move onto next stage in runs of algorithms.
* Mouse click to activate help button.
* Mouse click to activate quit button.
* Forename.
* Set menu when the program is started, when the quit button is pressed while running one of the choices, once a run of an algorithm has been completed or a timed run has been complete and the user has entered their forename.
* Processes menu choice.
* Begins running runs and timed runs of algorithm.
* Images referring to choice.
* Tells user they are correct or incorrect with there choice of vertex, arc or table box for timed runs.
* Hint if the choice of vertex, arc or table box is incorrect in timed runs.
* Forename, rank and time.
* Stopwatch.
* Colour of the arcs that have already been chosen and are correct, change to red.
* Moves onto the next stage of the algorithm or stops.
* Outputs arc weights after 20 seconds.
* Error message, if the forename entered isn’t a string, contains spaces or has no characters.

Proposed system Level 1

1

Processes menu choice using separate subroutine of choice.

Student

* Menu choice.
* Menu choice output seen.
* Times achieved by students for timed runs of algorithms.
* Student’s forenames and rank.
* Completes a run of an algorithm.
* Clicks on quit in process of a run or timed run of an algorithm.
* Completes timed run of algorithm.

5

Inputs forename into box and presses OK button.

Notepad files

1

Menu choice = Quit

2

End program.

7

Processes the set menu.

* After storing the student’s forename in the note pad files.
* Outputs to student at start.

The forename entered isn’t a string, contains spaces or has no characters.

6

Displays error message to student.

* Menu choice = Run or timed run of Kruskal’s algorithm.
* Menu choice = Run or timed run of Prim’s algorithm network form.
* Menu choice = Run or timed run of Dijkstra’s algorithm.
* Menu choice = Run or timed run of Prim’s algorithm tabular form.

3

Generates network or table and begins running algorithm.

Student

* Displays network or table
* Shows result of the first stage of the algorithm.
* Displays a stopwatch with 20 s countdown and at 0 s the arc weights.
* The enter key (Runs) or a mouse click (Timed Runs) is needed to show the next stage.
* Displays help button which is activated by a mouse click on it.

Menu choice = Times taken to complete each timed run of an algorithm.

4

Access data stored in notepad files.

* Display data in notepad files to screen.

Data volumes

Below are the volumetric objectives for the proposed system:

1. The system must be able to store at least 100 student’s forenames, times and ranks, so that it can be used by many people for a long time, be able to cover the amount of students in three classes worth and be stored until the students leave the college, where upon leaving, their names and times will be deleted to free up space for the new students.
2. The system must be able to process and display all of the forenames, times and ranks of those students who have completed timed runs; when requested by the user.

Analysis Data Dictionary (from perspective of end user)

Below is the data items that my system will store along with their type, their purpose and there range of permitted values.

1. The first data item that will be stored in the proposed system are the times achieved by the students who completed a timed run of the algorithms. The purpose of storing this data item is to develop competition between students to see who can get the fastest time, thereby encouraging them to use it more often, so they can be the best. To be good in the exam you need to be precise and quick, therefore this will allow the teacher to check if they have any timing issues. Also if the student isn’t precise then they will take longer to perform the timed run of the algorithms. The times for the timed runs for each type of algorithm will be stored in different files for each type. This will make it easier to take out and send the separate algorithm times to the teacher and will make it clearer and easier to access.

Data Type: The minutes will be stored as integers, the seconds will be stored as integers, the milliseconds will be stored as integers and the “:” will be stored as String. Therefore the stopwatch will look like this: 00:00:00.

Range of permitted values: 00<minutes<=59, 00<seconds<=59, 00<milliseconds<=99.

1. The second data item that will be stored in the proposed system are the student’s forenames of those who achieved the times. This is so that others know who achieved the time and it allows the student to find where they are in the leader board easier.

Data type: The student’s forename will be stored as string.

Range of permitted values: There is no limit to the amount of characters that can be entered by the student, however only characters that can be stored as a string can be entered, also spaces can’t be entered and they can’t enter 0 characters.

1. The final data item that will be stored in the proposed system is the rank of the student in the leader board, for example if they have the quickest time they will have a rank of “1”. This is to make it easier for the students to find how high they are in the leader board, especially when there are lot of times for an algorithm and the bar needs to be moved down it can be easy to not know where you are in the leader board.

Data type: The rank will be stored as an integer.

Range of permitted values: There is no limit to the rank; however the system must be able to cope with at least 100 ranks.

All the data items that will be stored in the proposed system will all be stored on the same line in a notepad file. The proposed system will store the data items like this example: 1. John , 00:00:00.

Objectives for the proposed system

Overall objectives:

1. The proposed system must be interactive.
2. The proposed system must enable people to self study without needing to go to lessons.
3. It must be able to be used in bite sized chunks and be enjoyable thereby allowing people with less time to absorb large amounts of information to prepare them for an exam.
4. It must be able to be used alongside the current system.
5. In a question for a run or timed run of Dijkstra’s algorithm the starting vertex must be indicated.
6. The proposed system must be informative.
7. The proposed system must be able to be accessed through the D1 Moodle resources.
8. The proposed system must be able to be used by students without any specialist software.
9. The proposed system must be able to be saved onto and used from memory sticks and CDs.
10. The proposed system must be completed by Easter at the latest.
11. It must encourage students to use it.
12. It must be able to be used by the teacher; by themselves and to teach lessons.
13. It must help students to complete past exam papers on the topic.
14. The proposed system must find the minimum connector of a network for runs and timed runs of Kruskal’s algorithm, Prim’s algorithm network form and Prim’s algorithm tabular form.
15. The proposed system must find the shortest route between two vertices along with its weight for runs and timed runs of Dijkstra’s algorithm.
16. The proposed system should able to be expanded and updated to include other sections of the D1 module.
17. The proposed system should be able to be replicated for other Mathematics and Computing modules.
18. It should also be able to be used without the D1 textbook, the D1 revision guide, the MEI Integral site, The D1 Moodle resources and the teacher.
19. It should teach people about all four of the algorithms.
20. It should be able to be used alongside PowerPoint’s on the subject.

Specific objectives:

1. The system must be able to process and display all of the forenames, times and ranks of those students who have completed timed runs; when requested by the user.
2. The proposed system must run and teach students about at least one of the four algorithms.
3. The program must display the network and the question being answered when either a run or a timed run of the algorithm is chosen.
4. The proposed system must display a set network for runs and timed runs of Kruskal’s algorithm, Prim’s algorithm network form and Dijkstra’s algorithm.
5. The proposed system must display a table for runs and timed runs of Prim’s algorithm tabular form.
6. The proposed system must be able to store at least 100 students forenames along with their times and ranks for timed runs of the algorithms.
7. The timer must be displayed on the screen when the user does a timed run of an algorithm.
8. The program must produce the set menu that it will be coded for when it is started, when the quit button is pressed during runs and timed runs of algorithms and when displaying the times achieved by students.
9. All the times achieved from timed runs of algorithms must be stored in order starting with the quickest time and inputting the rest downwards.
10. The proposed system must store all of the times for timed runs of each algorithm in different files therefore there is only the times achieved for Kruskal’s in one file, times for Prim’s algorithm network form in another, times for Prim’s algorithm tabular form in another and times for Dijkstra’s algorithm in another.
11. The proposed system must be completed by Easter for my end user.
12. It must output an error message if the forename entered contains characters that can’t be stored as string, contains spaces or contains 0 characters.
13. It must display the working involved in performing the algorithm for runs and timed runs of each algorithm. However timed runs will do this immediately and runs will be slower so that the student can see what is going on.
14. It must save the times, forenames and ranks of students into separate files for each timed run of an algorithm.
15. When the user chooses quit on the main menu it must exit the program.
16. The data stored in the proposed system should be able to be easily updated and maintained.
17. The proposed system should be able to run Kruskal’s algorithm, Prim’s algorithm network form, Prim’s algorithm tabular form and Dijkstra’s algorithm in both runs and timed runs.
18. The proposed system should turn the arcs or vertices red if they have been chosen by the user and are correct in runs and timed runs of algorithms.

Analyst Signature: …………………………………….. End User Signature: ………………………………………….

Date:

Realistic appraisal of the feasibility of potential solutions

If I struggle to finish the proposed system in time the end user has given me flexibility on the number of algorithms he wants the program to be coded for. That means that even though I am aiming to code the four algorithms already mentioned it may drop down to three or two algorithms to save time. However the end user wants at least two algorithms to be coded for, therefore I will still be making what he wants even if I have to shorten it slightly.

The two potential solutions to the original problem are that of a D1 teaching program/aid which is made using either VB.Net 2010 or Netbeans which uses the programming language Java. Whether I was to make the proposed system using Java or Visual Basic.Net it could cause me to miss the deadline that my end user has set me, however I believe that using Java will give me less of a chance of completing it in time (The reasons are explained in the “Justification of chosen solution” section). This is because I am aiming to solve a complex problem with a system that will be challenging and will require a lot of my time to complete. Therefore which ever solution I choose it may have to be downscaled so that I am not overworked or I end up doing more work than I need to.

To conclude I believe that I can finish the proposed system on time because I have planned it in mind for it not to be too complicated and I have been careful not to overextend myself so that I don’t spent too much time on the program compared to the report.

Justification of chosen solution

The two potential solutions to the original problem is that of a D1 teaching program/aid which is made using either VB.Net 2010 or Net beans which uses the programming language Java. The program made using VB.Net would be easier for me as I have been using Visual Basic for a year and have become fairly competent at it, but I have hardly used Java therefore I would have to waste time doing a course to learn how to use it. Also Java is more complicated for me to use and it would take a lot longer to code the algorithms that I need to code. Also Visual Basic is a third-generation event-driven programming language and Java is an object orientated language, therefore if I chose to use Java I would have to create object analysis diagrams, which would give me more work to do therefore I would have less of a chance of finishing it in time for the end user. Also I have reference books to help me with coding in Windows forms therefore if I choose Java I would have to spend more money to buy new ones.

However if I did it in Java I would learn how to code programs in another language and therefore would expand my range of languages. Also Java runs on more computers than Visual basic because VB only runs on Windows computers, but Java runs on Windows, Linux, Apple and many more. Therefore I would have more resources at my disposal if I were to create the proposed system using Java. Also if I use an object-orientated approach then it would make it easier to separate roles than in a non-object orientated approach.

To conclude making my proposed system using Java would be more complicated and it would take a lot longer to create than if I used VB.Net as it may cause me not to complete it in time for Easter; when my end user wants it up and running. Also I already know how to code in VB whereas I don’t use Java therefore it would make it easier for me to code the program myself.