A-level Computer Science

Focus on Non Exam Assessment

HANDOUT 1

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Project RED - (Reverse Engineer Database)

Exemplar Coursework Commentary

Introduction

This is an exemplar project that has been produced from a project that was entered for the previous specification. Sections from the old specification that are no longer required have been removed. The subsections left might contain elements that are not fully required by the new specification but give a good idea as to what the contents of a project might be. As this project has been adapted from the old specification and not standardised we have indicated which level it would be marked in for each section of the NEA.

Section	Commentary	Level
General comments	This new specification has a greater requirement for a student to provide a well developed list of objectives in the analysis section. This particular student develops a list of broad objectives that could be improved by splitting them up further and making them more defined. The project is clearly suitable for an A-Level and offers up the possibility of developing some complex algorithms for creating the ER diagram (which this student does not fully complete). The objectives are therefore appropriate to test for completeness when assessing the technical solution.	
Analysis	The student has provided good background information for the project. There is evidence of research by the inclusion of web links visited and analysis of an interview. It is also clear that the student has an appreciation as to the requirements of the problem and how it might be solved. A need has been identified and investigated alongside gathering information from the end-user. The list of objectives is appropriate for the project but could be developed further. To improve this section the student could have: • developed the objectives further by breaking them down so that they have more detail • researched further in the analysis stage the requirement to add some thought to the drawing of the diagram and how this could be linked to the number of relations	Level 2
Documented design	The design section gives a nice overview of the proposed working of the solution by breaking it	Level 3

	down into stages and describing what happens in each stage. There is evidence of pseudo-code that explains the extraction of metadata and also the creation of the ER diagram. It can be seen from the design section that the final objective of refining the diagram will not be met and therefore only describes how most of the key aspects are to be structured. The student has chosen to demonstrate the design by explaining a run through with an example database. Whilst this is not a required part of the design section it is a method of describing how the system works. Marks are awarded for documenting the design of the technical solution so this can happen before and/or after the implementation. To improve this design the student could have: • spent some time thinking about how the diagram could be adapted with reference to the number of tables and the number of connections between each table • explained in more detail how the queries for extracting data actually work and perhaps tested them inside a SQL server and shown the resulting set of data	
Technical solution	The technical solution is definitely of an A-Level standard but is not developed far enough to put this project into the top level for technical solution. The last objective, to refine the diagram, would have offered opportunity to develop the technical solution further and include some variety of optimisation algorithm to arrange the diagram. In terms of completeness the system does not meet the last objective which was to organise the ER diagram in an effective way. If the student had missed this objective out of the analysis then the project should still go in level 2 as the core requirement of the system was to produce an ER diagram and it would be expected that a student would consider how this could be drawn effectively. A quick look at the evidence for test 11 shows the current problems facing the solution. When marking for completeness we are looking at both the objectives set by the student and also an understanding of what might be appropriate of an A-Level student for satisfying the requirements of the initial problem definition. There are some aspects to the technical solution that match the requirement for a complex technical solution: • cross table parameterised SQL query to extract the metadata (but this has come from a	Completeness: Level 2 (top part of level) Techniques used: Level 2 (top part of level)

	source) • creation of local tables in C# whilst the program runs to store the extracted metadata (generated DDL code) • dynamic creation of a ER diagram • there is evidence of defensive programming and exception handling (try catch statements) To improve this technical solution, the student could have: • developed an algorithm to control the layout of the ER diagram in a more effective way • named their elements, such as *Form2*, to reflect what they are and make the code more understandable	
Testing	As testing can take place as part of the design and development we can look at the design section where the student shows how the project works by running through connecting to a test database. There is a good introduction and overview that refers to testing during development and also how the system was tested for robustness. The actual representative testing section is rather brief and does not fully demonstrate that all requirements have been tested. If the teacher can authenticate that extensive testing has been carried out throughout the project then this project, as is the case here, can be marked at level 3. To improve this section the student could have: • provided more testing to show how the ER diagrams produced actually reflect what was in the SQL database • provided evidence of the contents of the saved images to show that they actually do store an image of the ER diagram	Level 3
Evaluation	The evaluation against the objectives has been performed with a comment against each. As the initial objectives were broad this has limited the amount of critical appraisal that can be completed in this section. We have an overview as to how the objective was met but little consideration about whether the method chosen was suitable or how it could be improved. The user feedback did come from an end-user and does pick out elements of the solution that	Level 4

	could indeed be improved upon. Perhaps if the end-user had been involved across more of the project the issues with the user interface could have been corrected. The reflection on the user feedback is present but perhaps does not take up the opportunity to actually reflect on the issues presented by the user and consider how these could be rectified. The consideration of possible extensions is done well and does show an appreciation from the student as to the areas of the solution that could be developed further to bring improvements. Whilst this evaluation has been marked in level 4 it might have been clearer if the project did have a more detailed list of objectives as has already been noted.	

Connect 4

Exemplar Coursework Commentary

Introduction

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Section	**Commentary**	**Level**
General comments	This project has the potential to be very suitable for an A-level project but it fails to meet this due to a lack of detail in the analysis and documented design sections. The technical solution includes code taken from a source but this is not documented in the project. The evidence provided of whether the solution fully works is limited and you are, perhaps, left with a feeling that it might not. A project of this type does offer up the potential for a complex technical solution but, with the amount of tutorials / books available it also highlights the need for close supervision.	
Analysis	The analysis provides a background to the problem and an introduction to the kind of maths questions that are to form part of the quiz. There is an attempt to meet the requirements of the intended users and the discussion around the maths required helps. But it would have been appropriate for the student to gather some ideas from students to help guide the objectives of the project. There is a total lack of clarity as to which 'game' will also be used as part of this quiz. The DFD presents an overview of the system but there are still questions to be answered such as 'how many attempts does a student get?' The objectives are a bit vague and need more detail to them so that they are grounded. The analysis is definitely not fully scoped and you could bring it all the way down to level 1. We have placed it into level 2 (bottom) as there is just enough of the required information provided noting that some points are lacking. There are, however, problems with this analysis that could have been pointed out to the student.	Level 2
Documented design	This design has limited detail about the overall working of the solution and leaves the reader with quite a few questions: - How is a maths question created? - How is the solution generated and then tested against what the user might enter? - How is the game of Connect 4 played (player / computer - AI/best move.....)?	Level 2

	There is a lot of pseudo-code but even this is hard to understand -- would be better broken down into smaller parts and explained (with a focus on the more complex areas). Especially when you look at the pseudo-code for the computer moves. It has the feeling that the pseudo-code was generated after the technical solution highlighting the need for some key design work prior to coding. When looking at the technical solution you see that the program has been structured into subroutines but this is not covered in the documented design. We would expect to see an overview of the solution which would show this structuring.	
Technical Solution	Maths Quiz part: The technical solution shows some interesting aspects of coding but also gives a feel that it could have been structured in a better way. Perhaps this links back to the limited amount of documented design? There are a lot of sections in this code where it appears inefficient. A lot of 'while 1' loops with break exiting - which maybe OK but perhaps could have been implemented in a different way. Connect4 part: When you dig down into the Connect4 code you realise it is actually taken from 'inventwithpython.com' and this is where supervision becomes very important. Some of the calculating of the computer move is complex but copied and not documented in the design so this would have to be treated very carefully. It is important to be able to ensure that code being submitted as 'work of the student' rather than a library is monitored. If the student had decided to use the Connect4 code and add in the maths quiz they could gain credit for the maths quiz part. Overall you can see the real change in coding style from the maths quiz part and the Connect4 game. Completeness: As the game has come from another source this can't be used for looking at completeness. Whilst the quiz does appear to work there is no evidence that it can correctly identify an answer. The teacher of the student might be able to comment on this when submitting the work - however, as it stands, for a moderator it is hard to see this crucial part of the project.	Completeness: Level 1 Techniques used: Level 1

	Techniques used: The coding style is not very good and appears inefficient in places. In terms of algorithms the maths behind some of the calculations is quite complex but held in simple algorithms - so Group B. The code does make use of PyGame as a library to control the GUI and interactions. There is no real data model and the data structures used are only Group C. In terms of coding style the variable names are not very meaningful and there is little use of interfaces with a tendency to just use global variables throughout.	
Testing	The testing provides some evidence that the requirements of the system are met. The evidence provided needed more descriptive text to explain what is happening. As a game - a video recording of the game working would help provide evidence that it meets the requirements of the system. Questions left from looking at the testing: - Does it correctly mark questions? As a teacher some of this could come from observing what happens when the student runs the code and then comment upon this.	Level 2
Evaluation	The objectives are commented upon but only in a very general way. It would have been appropriate to provide a bit more detail as to each objective was met and the appropriateness of the solution. The user feedback is quite weak and not really analysed any further. Some of the extensions are appropriate but could be considered further.	Level 2

Maze Solver

Exemplar Coursework Commentary

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Section	Commentary	Level
General Comments	Even though this project was submitted for COMP4 it has the sense that it could have been more of an 'investigatory project' and this is reflected in the documented design section being written up in stages as the solution developed. This was an able student who took a particular route for the technical solution and realised later on that more appropriate data structures could have been used. The student therefore reflected on this during their evaluation.	
Analysis	The analysis has a good amount of depth when trying to describe the problem area and some of the complexities of what is to be completed. The sketched diagrams explaining floating walls and a current solution are particularly useful in helping the reader form an understanding. There is evidence of research coming from the description of the problem, interviews and observation. The objectives are written quite well and give a good idea as to the required functionality of the system. There could be more specific detail about 'the maze'. For example - Does it have a fixed size? There is also an opportunity in this analysis stage to begin to think about how the maze will be modelled as a data structure and begin to put down some initial ideas. To improve this section the student could have: • developed the objectives a bit further to provide specific details that could be clearly tested against • included some initial modelling for the maze structure	Level 2
Documented design	The documented design is presented as stages (as the project developed and was tested). This	Level 3

	could be an appropriate method when a student picks an investigatory project. There is a good overview of the solution and how it will be developed and the table provides a clear appreciation as to the stages undertaken. The student was encouraged to highlight the more complex decisions they made in the design and you can see elements of initial design, pseudo-code and also snippets of completed code to help put across how the solution works. The descriptive text also gives the feel that the student understands what they are trying to do and has made a good attempt to put across how it will work. To improve this section the student could have: • spent more time detailing the data structure used to store the maze and provided examples of a maze being generated - perhaps with a few steps worked through (this then provides a good opportunity to do some testing and note this down)	
Technical solution	Completeness: The technical does not hit all of the objectives set by the student. Whilst it does generate a random maze and allow the user to perform a walk-through the idea of allowing the computer to test against a variety of algorithms was not completed. The solution does include some of the most important requirements - the unique generation of an allowed maze being one of them. Technical Solution: There is a lot of complexity based in this project but the coding style lets it down slightly. It does feel like a rambling piece of code that has just developed and then been added to. It has enough complexity to be placed into level 3 but it would be towards the bottom of this level. Having explored this project the student did have the ability to perhaps start again with a better structure but there was no time for this.	Completeness: Level 2 Techniques used: Level 3
Testing	The testing section provides evidence that the requirements of the project were met. There is also evidence of robustness as the student talks about testing maze generation 10 times and floating walls 50 times. It might have been appropriate for more evidence of this to have been produced and this could have been captured via a video recording. To improve this section the student could have: • provided more descriptive text alongside the screenshots to explain what is going on	Level 3

	• had a selection of tests that were more prescriptive as to the data / action being used	
Evaluation	The objectives are commented upon quite critically and it is clear that this student appreciates some of the weaknesses of the technical solution. There is no critical comment as to the technical solution as a whole. There is a good section detailing how the project could be extended and also the complexity of trying to find an optimal solution to each maze. There is some evidence of end user feedback but this could have been extended across the larger robotics club. As it stands the end user feedback is quite trivial.	Level 3

Endless Temple

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Introduction

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Section	Commentary	Level
General Comments	A complex technical solution has been completed by a competent programmer. The documented design shows a high level of understanding of game mechanics and an appreciation as to what this project required. Project, as a whole, let down slightly by the analysis, testing and evaluation which is partly due to the project just being the creation of a game.	
Analysis	An analysis has been performed into the current game situation and some research into what students might require but this project does lack a real grounding. The objectives give a clear overview of the complexity of the technical solution required but could be more detailed and specific. This could have been achieved by breaking down each of the current objectives. The initial object analysis diagram is good but needs some explanation underneath so that it fits into the analysis section.	Level 2
Documented design	The documented design contains some in depth discussion of the complex algorithms that are then coded by this student. From reading this section it comes across that the student understands what they are trying to do and has made a good attempt at describing the workings of some complex ideas. There are some parts missing from the documented design including, for example, information about the bullet. But to fully design out everything for this project would have not been appropriate at this level and the student has been guided towards a focus on some key parts.	Level 4
Technical solution	The student clearly has a high level of technical skills and this is reflected in their code. Some of the 'evidence' for the complexity of the implementation does come from the design section where the student has taken time to describe the complex algorithms but it is important to check the code as well.	Completeness: Level 3 Techniques used: Level 3

	The objectives are clearly of an A-level standard and, in some ways, some of the code goes beyond A-level demands. The objectives are met but this mark would have been easier to award if these had been more specific and detailed. Evidence for the techniques used: • Complex object model • Binary space partitioning algorithm (adapted from tutorial but implemented by student) • Recursive shadowcasting (recursive algorithm that calculates shadows necessary around the players current position) • A* pathfinding algorithm	
Testing	The students tests the project with the use of a short table of planned tests. Whilst this demonstrates that the game works it does not show the robustness of the algorithms coded. Sometimes a project is hard to test and this is where a student might need some further guidance and ideas. To improve this section the student could have: • Included some testing during development of the key algorithms (so perhaps testing evidence of the room generation code, the path finding) These could have been included in the documented design section or the testing section. • Supplied a video recording of the game with a table providing a list of key points when it can be seen that objectives are tested / the technical solution works	Level 2
Evaluation	The evaluation section is completed and has the main components necessary. The student did submit a collection of completed feedback forms (not supplied with exemplar) but the questions asked were not structured that well. To improve this section the student could have: • Provide full consideration into the achievement of objectives • Include a more general section as to how well the final outcome met the original problem background / requirements. • Carefully generate feedback from users and then discuss this.	Level 2