**AR Group Assignment**

Module CO2403: Professional Skills

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**Summary**

This project requires you to apply the project management techniques discussed in the first semester and a selection of the material studied in your other second year modules to a development project.

You are part of a development team that wishes to explore the potential of emerging Augmented Reality (AR) technologies for use as an assistive technology. More specifically your team is interested in how AR technologies can be used to help young people of different capabilities play together in a physical play space. You are to create a prototype of an ‘Augmented Play Space’ that helps people with different capabilities play together in the physical world. Your team may choose the play spaces topic/game(s)/subject matter.

You may focus the design of your augmented play space prototype to support one of two different user groups. You may choose either:

* People with visual impairment
* People with autism

The prototype should seek to address some of the typical difficulties these user groups face when playing with other people. You should consider what digital augmentations can be made to a physical play space, the people in it or the physical items/toys used during play to help your chosen user group play with other people more effectively. The AR technology you will be developing for is detailed below.

**Prototype Application**

The team want to develop an application for Microsoft HoloLens, which is a ‘mixed’ reality headset currently available to developers.

Like a mobile phone it has several on-board sensors such as cameras, accelerometers, compass, video display & speakers. Software libraries also enable object and voice recognition.

You are to develop a prototype AR application that will run on a mobile device such as a mobile phone or tablet. You are to use the same development software as the Microsoft HoloLens to make porting to the HoloLens device later easier. AR Applications for HoloLens are developed using the Unity Game Engine.

A physical HoloLens device will be available for inspection during lab times for research purposes and to potentially port and showcase your software after project completion.

You are to develop a prototype ‘play’ experience showcasing the potential of AR for use by people with different capabilities in a ‘real world’ group play setting. You should design with eventual deployment to HoloLens in mind, but you can assume that what is seen on the mobile device screen is what is seen by the user wearing the HoloLens device.

You can also emulate functionality not available on a mobile phone, such as substituting hand gesture interaction with touch interaction. You should develop using the Unity Game Engine and programming/scripting should be done using the C# programming language.

This is a software engineering project and all students are expected to demonstrate their programming ability by developing software. This is preparation for your final year project and your future career.

**Deliverables**

**Project Proposal (max 4 pages)**

The proposal is not marked but will help you to think about what you are doing and should be useful when you come to do the evaluative critical review.

The final year individual project proposal form will be available on Blackboard. However, just pick the bits you think are useful and add in the project management information, because you are working as a team. It must contain two parts:

Part 1: Application Information

* Description of the application, problem being solved, requirements.
* Brief description of what the system will do.
* Statement of the key risks.

Part 2: Project Management Information

* Key features of the way you will be working in order to avoid:
* People being told unexpectedly at the end that their work is rubbish.
* People not having enough/having too much to do or not being involved.
* No one knowing where the latest version of the software is.
* A disk crash destroying all copies of the software.
* Someone changing the interface between components without agreement.
* The group falling behind without noticing.
* Everyone interpreting an agreement in a different way.
* Not having a demonstrable system by the deadline.

**User Analysis (max 2 pages)**

It is important to understand your chosen user group and the challenges they face when playing with other people. This report should investigate and identify the key barriers your chosen users face because of their impairment, and what approaches are currently used to overcome these challenges. You may discuss some more general issues related to the person’s impairment, but there should also be a focus on the challenges faced during play. In the report there should be four main sections.

* Types of impairment experienced by your chosen user group.
* Challenges this presents to the users.
* Challenges this presents during play.
* Current approaches to addressing these challenges.

**Technical Plan (max 5 pages)**

In this report you describe all key technical elements of the development.

* Description of the application demonstrating initial investigation.
* Envisaged usage scenarios.
* Outline User Interface/Interaction Designs for your AR application.
* Evaluation of alternative potential approaches.
* Investigation methods, development lifecycle and application structure.
* Implementation approaches.
* Outline of proposed solution to allow feasibility to be assessed.
* Any significant risks and actions to avoid, reduce or tackle them.
* Estimate of how much the project will cost.
* Worker time, cost per day and overheads.
* Commercial software license costs.
* Team processes and operational procedures.

**Literature Review on the use of AR Devices in Assistive Technology (max 5 pages)**

You are to conduct a literature review investigating the academic research that has been carried out using AR as an assistive technology. In your search you can look at impairment in general. You do not need to focus your search on autism or visual impairment, but these impairments should be discussed if appropriate. Your review should focus on peer-reviewed research published in high quality journals or conferences.

**Report on Ethical issues associated with AR technologies (max 2 pages)**

While AR technologies are not new, today’s AR technologies are as capable as they have ever been and are only just becoming available at consumer level. As a result, developing AR applications highlights several ethical and legal considerations. You are to produce a report highlighting the key ethical concerns that need to be considered when developing AR technologies.

All material and ideas from other authors must be cited in the text and referenced at the end of the article (references do not count to your page limit) using Harvard referencing (<http://libweb.anglia.ac.uk/referencing/harvard.htm>).

**Design Review (2-page explanation and a presentation)**

This is a 10-minute presentation to the whole class of your team's design followed by brief questions. Providing that content is relevant, the assessment of this review will concentrate on the presentation skills displayed, that is: the organisation of the material, appropriate use of the available time, the use of simple, clear slides, and the style of delivery. Your team must submit your slides/script prior to the presentation session.

**Demonstration of Software**

During the scheduled lab session, you will be required to give a demonstration of your finished application to the module tutor and a moderator. During the demonstration you will be questioned on your implementation and project management.

**Evaluative Critical Review (max 4 pages)**

This is a review of your processes and product(s), which should identify any problems with either and discuss (i.e. consider alternatives and justify choices) what you could have done to improve your work. Among other things, the review should discuss

* The effectiveness of your project management and potential alternatives.
* Any deficiencies in your design uncovered during implementation or review.
* Recommendations for commercial implementation.
* Any alternatives in the light of your implementation experience.

Whether or not you have fixed any deficiencies in the implementation, you will receive credit for identifying problems and suggesting improvements.

**A subset of records signed during the development (max 10 pages)**

You must submit at least 10 weekly team records. Your team should keep electronic or paper records, (but they must be accessible on demand):

Part 1: Descriptive information

* Meeting times & attendance.
* Decisions taken.
* Agreed actions (identifying who is responsible for the action and deadline).
* Design sketches.
* References to books, web-sites or journals.
* Confirmation that tasks have been completed to an appropriate level.
* Fault reports.
* Change management information (change requests and authorisation).

Part 2: Quantitative information

A record of activities and durations, with a summary of time spent on different activities. The time logs should be sufficiently detailed to account for the time spent on the task, simply recording ‘5 hours spent researching AR libraries’ does not contain enough detail for how the time was spent.

**Deadlines:**

* 8th February: Project proposal.
* 22nd February: User analysis and technical plan.
* 8th March: Literature review and ethical issues report.
* 5th April: Design review.
* 1st May: Software demonstration, critical review and signed records.

**Submission of work**

Work should be submitted on Blackboard by the specified week. Where multiple files are required use **ZIP** format (not *.rar* or other compression format).

Design reviews and demonstrations will take place in class. Discuss any problems with dates in advance.

**Teamwork**

This is a team project where work should be allocated with the expectation that all students will receive the same mark.

10% of the marks are explicitly identified for individual work.

A team may propose an uneven allocation of marks based on the quality or quantity of work done by different students, but this must be discussed and agreed with staff.

If a student is not making an appropriate contribution, this should be identified in the regular reports and action taken to re-allocate duties to ensure that students who are working do not suffer. Make appropriate use of staff as a last resort.

Where the team has taken appropriate action during the case study, marks will be allocated to minimise the effect of individual poor performance on the rest of the team.

**Assessment Criteria:**

This exercise assesses your achievement of the following module learning outcomes:

* (**1**) Use appropriate techniques to plan, monitor and control a team project.
* (**2**) Work effectively, individually and as a team member, to meet deadlines.
* (**3**) Demonstrate a high level of skill in both oral and written communication.
* (**4**) Discuss professional and ethical issues relevant to computing practitioners.
* (**5**) Research and apply relevant literature to a given problem.
* (**6**) Critically review a team-based project.

The mark awarded will be based on the breakdown below:

**Project Management (1, 2, 3, 4) (15%)**

1. Management Processes (team records) 5%
2. Evaluative Critical Review (team management) 10%
   1. Team planning, monitoring & control.
   2. Change control & management.
   3. Team administration.
   4. Quality management.

**Interface/Interaction Design (Demo) (2, 3, 4, 5) (10%)**

1. User Interface 10%
   1. Ease of learning, ease of use, error handling and format of results
   2. Essential facilities, additional useful facilities, specification, clarity, feasibility.

**Application Design (2, 3, 5) (25%)**

1. Technical Plan (Technical Design) 10%
   1. Completeness (how it will work, components and algorithms, stability).
   2. Effectiveness (will it work?).
   3. Simplicity, flexibility (if needs change) and efficiency.
   4. Organisation, appropriate notation and clarity.
2. User Analysis 5%
   1. Knowledge/Understanding of chosen impairment.
   2. Appropriate identification of challenges faced by users.
   3. Exploration of current approaches to challenges faced.
3. Literature Review 5%
4. Design Review 5%
   1. Logical organisation, clarity of visual aids, use of time, and delivery.

**Implementation (2, 3, 5, 6) (40%)**

1. Evaluative Critical Review (technical) 10%
   1. Programming techniques, components.
   2. Remaining problems and potential resolutions.
2. Comments and layout of code 5%
3. Quality (up to 10 marks allocated for individual work) 25%
   1. Use of language facilities, efficiency, simplicity, no errors, easy maintenance.
   2. Software capabilities.
   3. Integration of appropriate functionality into your software.
   4. User interface.
   5. Functionality, design, reliability.

**Report on the Ethical issues within Usability Studies (3, 4) (10%)**

1. Research 3%
   1. Range of material and sources.
   2. High quality and reliable sources.
   3. Use of evidence.
2. Logical Organisation 3%
   1. Summary, introduction, presentation of evaluation, conclusion.
3. Content & understanding 4%
   1. Selection of appropriate material.
   2. Use of information to build up a logical argument.
   3. Assessment of quality of sources.

#### Presentation of assignment work

Except where specifically stated in the assignment brief, assignment work submissions must be word-processed with a footer comprising: your **name; registration number; module code; date; page number**. Ensure that you keep a complete copy of the work you hand in.