HACKING

Version 1.0
BSc Computing for Games

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Introduction

In this assignment, you will work in pairs to design and prototype a novel game controller. Your prototype should function as an input device for either one of the games being developed by students on the BA Digital Games course; or the game you developed in COMP130 last semester. Your prototype should use a hardware platform such as Arduino or Raspberry Pi etc, to convert user actions into game inputs.

Computing for games embraces the core values of the hacker movement. Experimentation, ingenuity and creativity are at the heart of everything we do. Custom game controllers are the perfect place to flex your creative flare and problem solving skills, whilst gaining invaluable experience working with hardware.

Hacker definition: "A person who enjoys exploring the details of programmable systems and stretching their capabilities, as opposed to most users, who prefer to learn only the minimum necessary."

— Jargon File

This assignment is formed of several components:

(A) **Write**, a game controller proposal:
   i. **describe** the game you have chosen as a basis for your interface;
   ii. **justify** your choice of gamethe requirements implied by the contract;
   iii. **outline** your concept;
   iv. **identify** potential issues that you may encounter;

(B) **implement**, an **iterative**, design and development process:
   i. **push** changes to **GitHub** on a regular basis;
   ii. **evidence** substantial progress on a **week-by-week** basis;

(C) **Evaluate**, the work of and receive **feedback** from your **peers**:
   i. **implement** heuristic analysis;
   ii. **discuss** your work;
   iii. **receive** and **reflect** on feedback from peers.

(D) **Present**, as an **individual**, a practical demo of the game controller to your tutor that will:
   i. **demonstrate** your academic integrity;
   ii. as well as **demonstrate** your **individual** programming knowledge **and** communication skills.

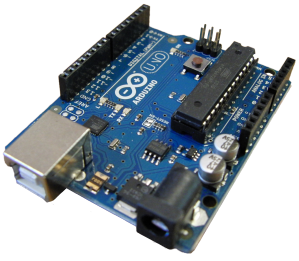
Assignment Setup

Fork the GitHub repository at:

`https://github.com/Falmouth-Games-Academy/comp140-hardware`

Use the existing directory structure and, as required, extend this structure with sub-directories. Ensure that you maintain the `readme.md` file.

Modify the `.gitignore` to the defaults for **Python**. Please, also ensure that you add editor-specific files and folders to `.gitignore`.



A twitterbot sorting a picture by its pixels.

Part A

Part A consists of a **single formative submission**. This work is **collaborative** and will be assessed on a **threshold** basis. The following criteria are used to determine a pass or fail:

(a) research is thorough;
(b) concept is appropriate and distinctive;
(c) approach is considered and justified.

To complete part A, on GitHub, edit the **readme.md** file to contain a description of your proposed game controller. Your proposal should include details of any background research you have done to assess commercial viability. On Trello, create a task board that defines the key requirements (in terms of components and user stories) of the controller.

Formative submission: Arrange a meeting with your tutor to discuss your concept and task board.

Part B

Part B is a **continual formative assessment**. This work is collaborative and will be assessed on a threshold basis. The following criteria are used to determine a pass or fail:

(a) version Control used effectively;
(b) Sufficient progress each week;
(c) Reflective practice.

You will build your **prototype** controller over a period of **4 weeks** utilising a fast, iterative development process. Each week should see a vast improvement in the quality of design and development working towards a shippable product to demo in the fourth week. that is, a prototype which does not have any major flaws or half-finished features that prevent it from being tested, and that can be used (even if lacking some features) as a controller in the game.

Use the forked repository to store any digital artefacts (including but not limited to design sketches, photographs, art assets, source code, electronic circuit designs).

Feedback will be given on a **week-by-week** basis.

Part C

Part C is a single formative submission. This work is collaborative and will be assesses on a threshold basis. The following criteria are used to determine a pass or fail:

(a) Submission is timely;
(b) Enough work is available to conduct a meaningful review;
(c) A broadly appropriate review of a peer?s work is submitted.

To complete Part C, prepare you game controller for review. It must be fully functional and integrated into your chosen game. Ensure that the source code and related assets are pushed to GitHub and a pull request is made prior to the scheduled peer-review session.

Part D

Part D is a **single summative** submission. This work is individual and will be assessed on a threshold basis. The following criteria are used to determine a pass or fail:

(a) enough work is available to hold a meaningful discussion;
(b) Clear evidence of programming knowledge and communication skills;
(c) No breaches of academic integrity.

To complete Part D, prepare a practical demonstration of the game controller. Ensure that the source code and related assets are pushed to GitHub and a pull request is made prior to the scheduled viva session. Then, attend the scheduled viva session.

You will receive **immediate informal** feedback from your tutor.

Additional Guidance

Falmouth University is nationally and internationally renowned as an arts institution. Despite the fact that you are studying for a Bachelor of Science degree in a technical discipline, you are still expected to strive for the same level of innovation and creative flair as your fellow students in other departments. All assignments on this course involve a mix of technical and creative activities; this assignment is more heavily weighted towards the creative than the assignments you have completed thus far. On this assignment, a competent execution of an unimaginative idea is unlikely to achieve higher than a C grade overall, as opposed to an imperfect execution of a unique and ambitious concept ? bear this in mind when working on your design. One approach to promoting creativity is divergent thinking: generation of ideas by exploring many possible solutions. Often the most interesting ideas are subversive: they deliberately go against the accepted or most obvious solution

The history of video games is littered with failed peripherals which consumers simply did not want, which were perceived as expensive gimmicks rather than legitimate enhancements to gameplay. Your creativity should be balanced by commercial awareness: your design should be informed by your research into products that have succeeded and failed in the past, and what underexploited niches exist in the present. An A? project would be a highly divergent idea, but one that has clear commercial viability. Do not be too discouraged if you fall short of this: this is a tall order even for the professionals!

We have given you some of the materials you need: an Arduino and other useful components. You will need to add your own materials to produce a functional physical prototype. A ?Blue Peter? style prototype made from household items is fine, as is something made out of modeling clay, construction toys etc. However you should still choose your materials carefully, as overly flimsy construction may lose you marks on the functionality criterion.

You may also wish to connect electronic components such as LEDs, buzzers, photoresistors etc to the Arduino, or even use a different, more flexible hardware platform such as RaspberryPi. However you are discouraged from spending large sums of money on extra hardware, and doing so is not required to achieve a high mark. If you choose to go down this route, it is possible to purchase a RaspberryPi and other useful peripheral online for around the price of a textbook (£20-£30).

You should aim to demonstrate a high level of sophistication in the technical execution of your prototype. An important part of sophistication is having the insight to choose the right tool for the job: if a simpler technique fulfills all the requirements, use it. The use of unnecessarily complicated techniques, serving only to showcase one?s own cleverness, is a dangerous habit for a software developer. The sole purpose of the video demonstration is to aid moderators and external examiners, who are not present for the demo session, in assessing your work. Your video does not need to be entertaining or highly polished: a smartphone or webcam video of you or someone else using the controller is sufficient.

FAQ

- **What is the deadline for this assignment?**
  Falmouth University policy states that deadlines must only be specified on LearningSpace. Please examine the assignment area where you located this document.
- **What should I do to seek help?**
  You can email your tutor for informal clarifications. For informal feedback, make a pull request on GitHub.
- **Is this a mistake?**
  If you have discovered an issue with the brief itself, the source files are available at:
  `https://github.com/Falmouth-Games-Academy/bsc-assignment-briefs`.
  Please raise an issue and comment accordingly.

Additional Resources

- Wilkinson, K. and Petrich, M. (2014) The Art of Tinkering: Meet 150 Markers Working at the Intersection of Art, Science & Technology. Weldon Owen: London.
- Alicia Gibb. Building Open Source Hardware: DIY Manufacturing for Hackers and Makers. Addison Wesley, 2014.
- Jeremy Blum. Exploring Arduino: Tools and Techniques for Engineering Wizardry. John Wiley, 2013.
- Kelly, K. (2014) Cool Tools: A Catalogue of Possibilities. Cool Tools.
- Hatch, M. (2013) The Maker Movement Manifesto: Rules for Innovation in the New World of Creators, Hackers, and Tinkerers. McGraw Hill: New York.
- https://www.sitepoint.com/heuristic-evaluation-guide/
- https://www.usability.gov/how-to-and-tools/methods/heuristic-evaluation.html

Marking Rubric

Criteria marked with a ‡ are shared by the group. All other criteria are individual.

Criterion	Weight	Refer for Resubmission	Basic Competency	Basic Proficiency	Novice Competency	Novice Proficiency	Professional Competency
Iterative development process	5%	There is little or no evidence of an iterative development process and no improvement over time in regards to the quality of the design and build of the prototype.		A 'potentially shippable' prototype is produced at the end of development period. There is evidence of a 'reasonable' iterative development process but the prototype suffers from 'lock in' in regards to the original concept.		A 'potentially shippable' prototype is produced at the end of the development period. The project has benefitted from an iterative development process and many improvement have been made to the original concept	
Design of the solution	15%	No user stories are provided, or the design does not correspond to the user stories.	Few user stories are distinguishable and easily measured. The correspondence between design and user stories is tenuous.	Some user stories are distinguishable and easily measured. The design somewhat corresponds to the user stories.	Most user stories are distinguishable and easily measured. The design corresponds to the user stories.	Nearly all user stories are distinguishable and easily measured. The design clearly corresponds to the user stories.	All user stories are distinguishable and easily measured. The design clearly and comprehensively corresponds to the user stories.
Commercial awareness	5%	No commercial awareness is demonstrated.	Some commercial awareness is demonstrated. There is no evidence of market research.	Little commercial awareness is demonstrated. Market research is present, but with significant gaps.	Much commercial awareness is demonstrated. Market research is extensive, but with some gaps.	Considerable commercial awareness is demonstrated. Market research is comprehensive.	Significant commercial awareness is demonstrated. Market research is comprehensive and insightful.
Innovation and creative flair	5%	No evidence of innovation and/or creativity.	Some evidence of emerging innovation and/or creativity. The solution is purely derivative of existing products. There is no evidence of divergent thinking.	Little evidence of emerging innovation and/or creativity. The solution is mostly derivative, with some attempts at innovation. There is evidence of an attempt at divergent thinking.	Much evidence of emerging innovation and/or creativity. The solution is an interesting and somewhat innovative product. There is some evidence of divergent thinking.	Considerable evidence of mastery of innovative and creative practice. The solution is a novel and innovative product. There is much evidence of divergent thinking.	Significant evidence of mastery of innovative and creative practice. The solution is a unique and innovative product. There is significant evidence of divergent thinking.
Functionality of physical prototype	15%	A physical prototype is not produced, or the prototype is completely non-functional.	The physical prototype has no functionality. There are serious technical and/or constructional flaws.	The physical prototype has some functionality. There are obvious technical and/or constructional flaws.	The physical prototype has much functionality. There are minor technical and/or constructional flaws.	The physical prototype has considerable functionality. There are superficial technical and/or constructional flaws.	The physical prototype has significant functionality. The technical execution and physical construction are flawless.
Sophistication: Software Electronics Physical construction	20%	The solution lacks even a basic level of sophistication in any of the three areas.	The solution evidences some sophistication in one or more of the three areas. Some insight has been demonstrated in any area.	The solution evidences little sophistication in one or more of the three areas. Little insight has been demonstrated in at least one of the areas.	The solution evidences much sophistication in two or more of the three areas. Much insight has been demonstrated in at least one of the areas.	The solution evidences considerable sophistication in all three areas. Considerable insight has been demonstrated in at least two of these areas.	The solution evidences significant sophistication in all three areas.. Significant insight has been demonstrated in all three areas.
Professional practice	5%	GitHub has not been used.	Some material has been checked into GitHub. Mostly before the deadline.	Little material has been checked into GitHub. At least once per sprint.	Much material has been checked into GitHub. Several times per sprint.	Considerable material has been checked into GitHub. Several times per sprint. Commit messages are clear, concise and relevant.	Significant material has been checked into GitHub. Several times per sprint. Commit messages are clear, concise and relevant. There is evidence of engagement with peers (e.g. voluntary code review).

Criterion	Weight	Refer for Resubmission	Basic Competency	Basic Proficiency	Novice Competency	Novice Proficiency	Professional Competency
Basic Competency Threshold	40%	At least one part is missing or is unsatisfactory.	Submission is timely. Enough work is available to hold a meaningful discussion. Clear evidence of programming knowledge and communication skills. Clear evidence of reflection on own performance and contribution. Only constructive criticism of pair-programming partner is raised. No breaches of academic integrity.				