INTERFACE HACKING

Version 1.0
BSc Computing for Games

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Introduction

In this assignment, you are required to design and prototype a novel game controller device. 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.

This assignment is formed of **three** parts. The summative submission has **two** parts: an electronic component and a physical component. Begin by forking the GitHub project at the following URL:

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

A. *Design* a novel game controller device

On GitHub, create a Markdown file (or edit `readme.md`) defining the high concept of your controller. 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.

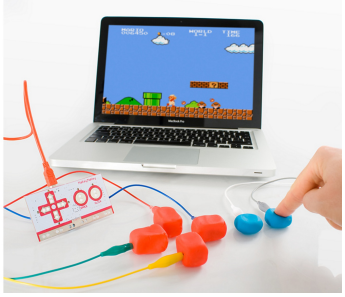
Formative submission: Arrange a meeting with your tutor to discuss your concept and task board.

B. *Build* and *integrate* a prototype of your game controller

You will build your prototype controller over **two sprints**. You should aim to have a 'potentially shippable' prototype at the end of each sprint; 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 this forked repository to store any digital artefacts (including but not limited to design sketches, photographs, art assets, source code, electronic circuit designs).

Formative submission: Participate in the two sprint review sessions in class.



The *MaKey MaKey* allows a multitude of materials to be used to create videogame controllers.

C. *Demonstrate* your controller

Bring your prototype controller to the demo session in class, and be prepared to discuss it with tutors and peers.

For submission, you must also prepare a short **video demonstration** of your controller. The maximum length of this video is **two minutes**; longer videos will be subject to penalties in line with the course word count policy available

on LearningSpace. In your video, briefly demonstrate the functionality of the controller. You may narrate if you wish, but it is not required.

Formative submission: Participate in the demo session.

Summative submission (electronic)

Create a zip file containing the following:

- A markdown file named `readme.md` giving a high-level overview of the project, including your concept and background research from part A.
- Screenshots of your Trello task board from part A. As a minimum, include one from the beginning of each sprint, one from the end of the project, and screenshots documenting any checklists or other information within your cards.
- All source code and other digital artefacts created for part B. You should include source code files or snippets demonstrating the integration of your controller into the game, but you do **not** need to provide the entire source code for the game.
- The video demonstration produced for part C, compressed in AVI or MP4 format.

"Alive with new thinking, buzzing with opportunity, connected with the best in the business, Falmouth University is the perfect place to start shaping your creative career. Thousands of people from around the globe come to us every year, graduating to become the brightest stars in art, design, media, performance and writing industries.

"(...) Falmouth has forged its position as one of the most highly regarded creative arts institutions across the globe."

— Falmouth University website

The recommended way to produce this zip file is to check all of the above into your GitHub repository throughout the course of the project, and then use the "Download Zip" function on the GitHub website.

Material not included in the zip file will not be marked, even if it is available online, and even if tutors have seen it in class. Please ensure that all material you want the markers to consider is included in your submission.

Upload your zip file to the appropriate submission queue on LearningSpace.

Summative submission (physical)

Hand in your prototype controller to the Academic Office in Tremough House. Pack your controller in a suitably sized box, with your student number and "BSc Computing for Games – COMP140 Assignment 1" written clearly on it.

Your prototype will be returned to you after marking, however any components that are property of the university (e.g. MaKey MaKey boards) will first be removed. Thus please do not glue, solder or otherwise permanently affix anything to them.

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: a MaKey MaKey kit, crocodile clip leads and conductive paint. 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 modelling clay, construction toys etc. However you should still choose your materials carefully, as overly flimsy construction may lose you marks on the functionality criterion.

"The first 90 percent of the code accounts for the first 90 percent of the development time.

"The remaining 10 percent of the code accounts for the other 90 percent of the development time."

— Tom Cargill

You may also wish to connect electronic components such as LEDs, buzzers, photoresistors etc to the MaKey MaKey, or even use a different, more flexible hardware platform such as Arduino. 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 an Arduino and a selection of electronic components online for around the price of a textbook (£20 – £30).[1]

"Hofstadter's Law:

"It always takes longer than you expect, even when you take into account Hofstadter's Law."

— Douglas Hofstadter

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 fulfils 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.

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.
- `http://makeymakey.com/howto.php`

[1] Note that the MaKey MaKey kits provided in class are version 1.2, which, unlike earlier versions, is not based on Arduino. Any tutorials you may find online for reprogramming the MaKey MaKey firmware using the Arduino IDE are unfortunately not applicable to this version.

Marking Rubric

Criterion	Weight	Refer for Resubmission	Basic Competency	Basic Proficiency	Novice Competency	Novice Proficiency	Professional Competency
Sprint reviews	Threshold 5% + 5%	Neither the first nor second sprint are delivered, or no 'reasonable' peer reviews are submitted.		A 'potentially shippable' prototype is produced at the end of the first and/or second sprint. A 'reasonable' review of at least one peer's work is provided in one of the review sessions.		A 'potentially shippable' prototype is produced at the end of both the first and second sprints. A 'reasonable' review of at least one peer's work is provided in each of the review sessions.	
Design of the solution	15%	User stories are not 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	10%	No commercial awareness is demonstrated.	Emerging commercial awareness is demonstrated. There is no evidence of market research.	Some 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.	Significant commercial awareness is demonstrated. Market research is comprehensive.	Exemplary commercial awareness is demonstrated. Market research is comprehensive and insightful.
Innovation and creative flair	30%	Demonstrates no evidence of innovation and/or creativity.	Demonstrates evidence of emerging innovation and/or creativity. The solution is purely derivative of existing products. There is no evidence of divergent thinking.	Demonstrates evidence of progressing innovation and/or creativity. The solution is mostly derivative, with some attempts at innovation. There is evidence of an attempt at divergent thinking.	Demonstrates evidence of partial mastery of innovative and creative practice. The solution is an interesting and somewhat innovative product. There is some evidence of divergent thinking.	Demonstrates some evidence of mastery of innovative and creative practice. The solution is a novel and innovative product. There is much evidence of divergent thinking.	Demonstrates much 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	10%	A physical prototype is not produced, or the prototype is completely non-functional.	The physical prototype is barely functional. There are serious technical and/or constructional flaws.	The physical prototype is somewhat functional. There are obvious technical and/or constructional flaws.	The physical prototype is mostly functional. There are minor technical and/or constructional flaws.	The physical prototype is functional. There are superficial technical and/or constructional flaws.	The physical prototype is functional. 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 is basic and unsophisticated in all three areas. Little insight has been demonstrated in any area.	The solution is moderately sophisticated in one of the areas, but lacking in the other two. Emerging insight has been demonstrated in at least one of the areas.	The solution is moderately sophisticated in two of the noted areas, but lacking in the third. Much insight has been demonstrated in at least one of the areas.	The solution combines somewhat sophisticated software, electronics and physical construction. Significant insight has been demonstrated in at least two of these areas.	The solution combines highly sophisticated software, electronics and physical construction. Exemplary insight has been demonstrated in all three areas.
Professional practice	5%	GitHub has not been used.	Material has only been checked into GitHub a few times before the deadline.	Material has been checked into GitHub at least once per sprint.	Material has been checked into GitHub several times per sprint.	Material has been checked into GitHub several times per sprint. Commit messages are clear, concise and relevant.	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).